Pressure Ulcer Prevention and Treatment
Assessment, Wound Care, and Healing

LEARNING OUTCOME AND OBJECTIVES: Upon completion of this continuing education course, you will have increased your understanding of pressure ulcer assessment, prevention, and treatment. Specific learning objectives include:

- Discuss the impact of pressure ulcers on individuals, healthcare facilities, and society.
- Explain the risk factors for developing pressure ulcers.
- Explain the process of conducting risk assessments and measuring risk associated with pressure ulcers.
- Identify actions to help prevent pressure ulcers.
- Describe the staging of pressure ulcers.
- Discuss effective wound treatment and management of pressure ulcers.
- Describe the factors affecting pressure ulcer healing.
- List the essential information for documentation of pressure ulcers in the patient record.

INTRODUCTION

A pressure ulcer is a wound unlike any other, in that its cause is not surgery or trauma but death of the skin and underlying tissues from ischemia due to unrelieved pressure. There are many factors that contribute to the development of a pressure ulcer and whether or not it will heal, but the biggest factor in all of these is pressure.

Common terms for a pressure ulcer include bed sore, decubitus ulcer, pressure sore, and pressure ulcer. The terms *bed sore* and *decubitus ulcer* originated from the notion that to develop ulcers a
person needed to be bedridden, which we now know is not the case. Ulcers can develop when a patient constantly maintains any position; consequently the term *pressure ulcer* most accurately describes an ulcer from pressure.

**Defining “Pressure Ulcer”**

Over the years, the definition of a pressure ulcer has been refined. In April 2016, the National Pressure Ulcer Advisory Panel (NPUAP) updated the term *pressure ulcer* to *pressure injury*, updated the staging system, replaced the use of Roman numerals with Arabic numerals, and updated the definition of a pressure injury. The new NPUAP definition states:

> A pressure injury is localized damage to the skin and underlying soft tissue usually over a bony prominence or related to a medical or other device. The injury can present as intact skin or an open ulcer and may be painful. The injury occurs as a result of intense and/or prolonged pressure or pressure in combination with shear. The tolerance of soft tissue for pressure and shear may also be affected by microclimate, nutrition, perfusion, comorbidities and condition of the soft tissue.

(NPUAP, 2016a)

(Changes in the staging system will be discussed later in this course.)

The localized damage in pressure ulcers is the result of compression of soft tissue, which interferes with the tissue’s blood supply, leading to vascular insufficiency, tissue anoxia, and cell death. Pressure ulcers can develop within 24 hours of the initial pressure but take as long as a week to present themselves. The first tissues to die are nearest the bone, and as the pressure and anoxia continue, the remaining layers of tissue begin to die. The skin is the last to die. The damage resembles an iceberg, with a smaller amount of damage visible at the surface and a large amount of damage below the surface.

Pressure ulcers usually occur over bony prominences such as the sacrum, ischium, heel, and trochanter, where there is less tissue to compress. Other factors—such as shearing, skin moisture, heat, poor nutrition, comorbidities, and incontinence—also contribute to the tissue breakdown.

**PRESSURE ULCER OR PRESSURE INJURY?**

The 2016 NPUAP changes in terms and definitions have not been universally adopted and may require some time for translation and assimilation into practice. It is important for healthcare professionals to recognize that the updated terminology for pressure ulcers and staging may not align perfectly with that in the published literature and in current use by clinical and regulatory agencies. If there are discrepancies in terminology that is required for documentation by regulatory agencies (e.g., reimbursement, coding, quality reporting) and in use in clinical practice (e.g. clinical documentation systems, EMR), healthcare providers should seek guidance from the regulatory agency or their employer.
The Impact of Pressure Ulcers

Each year, more than 2.5 million patients develop pressure ulcers in the United States (AHRQ, 2014). Pressure ulcers represent a major burden of sickness and reduced quality of life for patients and their caregivers. The impact of pressure ulcers is staggering.

- First and foremost, these wounds are very painful, causing patients a great deal of suffering.
- The anatomical location of the ulcer may result in a loss of dignity.
- Quality of life is affected, as the patient must alter activities to help heal the wound and may face long-term hospitalization.
- The burden of dealing with a chronic wound can result in stress, anxiety, depression, less autonomy and security, and impaired social functioning.
- A nonhealing ulcer is at high risk for infection, which can be life threatening.
- Ulcer treatments may require surgical procedures such as debridement, colostomies (for those ulcers located near the anus), amputations, and grafts or flaps that the patient would otherwise not have to face.
- An ulcer that heals forms scar tissue, which lacks the strength of the original tissue and is more easily ulcerated again and again.
- Most importantly, the presence of a pressure ulcer increases the risk of death. Nearly 60,000 hospital patients in the United States are estimated to die each year from complications due to hospital-acquired pressure ulcers, primarily from sepsis (IHI, 2007).

Healthcare costs increase dramatically due to pressure ulcers. An estimated $11 billion is spent each year to treat pressure ulcers. A single pressure ulcer can increase the hospital length of stay five-fold and cost between $500 and $70,000 per individual pressure ulcer (NPUAP, 2014).

Pressure ulcers are a particular problem for bedbound individuals who are hospitalized, in nursing homes, or have spinal cord injuries. In hospitalized patients, pressure ulcers are more likely to occur among older adults (65 years and older), and patients with pressure ulcers are three times more likely to be discharged to a long-term care facility than those with other diagnoses. As the population of those over 65 years is expected to double within the next 25 years, the number of people with pressure ulcers will likely increase exponentially (WOCN, 2016a).
Pressure ulcers also increase healthcare professionals’ workloads, as additional time and care must be provided to manage and treat patients’ pressure ulcers—more dressing changes, more medications, and more documentation.

Litigation may be brought against a hospital and its staff for neglect, malpractice, and elder abuse if a patient develops a pressure ulcer while in the hospital. Awards can be in the millions of dollars. And the bad publicity that follows will damage the hospital’s reputation, bottom line, and the trust patients have that they can be cared for safely.

Pressure ulcers are reportable to state and federal agencies. The information is placed in published reports accessible by the public, which then allows the public to compare facility outcomes. Regardless of the care setting (acute, skilled nursing facility, home health, and inpatient rehabilitation facilities), all providers must account for the number of pressure ulcers that were present on admission and on subsequent reassessments, whether they have closed or worsened (Lyder & Ayello, 2012).

Governmental agencies may levy fines against the hospital for pressure ulcers. Beginning in recent years, the Centers for Medicare and Medicaid Services no longer pays a hospital for the additional care needed for a patient who develops a hospital-acquired pressure ulcer, but the hospital must provide the care nonetheless. Similarly, the Affordable Care Act established a financial incentive program for hospitals to improve patient safety by applying a 1% payment reduction to hospitals who score poorly with respect to the occurrence of hospital-acquired conditions, of which pressure ulcers are one (CMS, 2014).

In the long-term care setting, the Joint Commission has again made the prevention of healthcare-associated pressure ulcers a 2017 National Patient Safety Goal (Joint Commission, 2016).

Thus, the assessment, prevention, and treatment of pressure ulcers are of major importance to healthcare professionals and to the facilities at which they practice. Most facilities have developed pressure ulcer prevention programs to put these ideas into practice and prevent negative outcomes for both the patient and the facility.

**RISK ASSESSMENT**

The purpose of assessing the risk for developing pressure ulcers is to implement early detection and prevention measures. This is of utmost importance, as assessment without intervention is meaningless.

**Risk Factors for Pressure Ulcers**

**Certain groups of patients** have a higher risk for developing pressure ulcers. These include patients who:

- Are older adults (those over age 65 are at high risk and those over age 75 are at even greater risk)
• Are in critical care
• Have a fractured hip (an increased risk for heel pressure ulcers)
• Have spinal cord injuries (spasticity, the extent of the paralysis, a younger age at onset, difficulty with practicing good skin care, and a delay in seeking treatment or implementing preventive measures increase the risk of skin breakdown)
• Have diabetes, secondary to complications from peripheral neuropathy
• Are wheelchair- or bed-bound
• Are immobile or for whom moving requires significant or taxing effort (i.e., morbidly obese)
• Struggle with incontinence
• Have neuromuscular and progressive neurological diseases (i.e., multiple sclerosis, ALS, Myasthenia gravis, stroke)
• Have neurodegenerative disorders such as Parkinson’s disease and dementia

Changes in both skin structure and function occur with aging. These changes contribute to the occurrence of skin problems and decrease wound healing.

• A flattening of the epidermal-dermal junction decreases the overall strength of the skin, which increases the risk for skin tears and blistering.
• A decrease in the melanocytes and Langerhans cells increases the risk for allergic reactions and sensitivity to sunlight.
• A decrease in fibroblast function increases the time required to synthesize collagen.
• A decrease in blood flow decreases skin temperature and delays healing.
• A decrease in oil and sweat production contributes to dryness and flaking.
• A decrease in subcutaneous tissue, especially fat, decreases the body’s natural insulation and padding.
• A decline in the reproduction of the outermost layer of the epidermis may lead to the skin’s inability to absorb topical medications.

These changes in skin structure and function (together with changes in cellular DNA that affect cell reproduction and the ability to protect the skin) and the risks that occur with a change in overall health and functional ability put an aged patient at very high risk for the formation of a pressure ulcer (WOCN, 2016b).
More than 100 additional risk factors associated with the development a pressure ulcer have been identified. Some of these include:

- General medical conditions, such as diabetes, stroke, multiple sclerosis, cognitive impairment, cardiopulmonary disease, cancer, hemodynamic instability (abnormal/unstable blood pressure), peripheral vascular disease, malnutrition, and dehydration

- Smoking

- History of a previous pressure ulcer (since scar tissue is weaker than the skin it replaced and will breakdown easier than intact skin)

- Increased facility length of stay

- Undergoing surgery longer than four hours

- Significant weight loss

- Prolonged time on a stretcher

- Emergency room stays

- Medications, such as sedatives, analgesics, and nonsteroidal anti-inflammatory drugs

- Impaired sensation

- Refusal of care, such as when a patient refuses to be turned or moved despite education

- Edema

- Obesity

- Patient not being turned

- An ICU stay, due to the high acuity of illness, presence of multiple comorbid conditions, and:
  - Mechanical ventilation
  - Vasopressors and hemodynamic instability
  - Multiple surgeries
  - Increased length of stay
  - Inability to report discomfort

(WOCN, 2016a)
**Risk Assessment Schedules**

The skin is the largest organ in the body, and the clinician needs to assess it regularly. The assessment of pressure ulcer risk should be performed upon a patient’s entry to a healthcare setting and repeated on a regularly scheduled basis (per facility policy) as well as when there is a significant change in the patient’s condition, such as surgery or a decline in health status (WOCN, 2016a).

A schedule for reassessing risk should be established based on the acuity of the patient and an awareness of when pressure ulcers occur in a particular clinical setting (WOCN, 2016a). Recommendations based on the healthcare setting are included in the box below. A particular facility or setting may have different regulations.

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<th>ASSESSMENT SCHEDULES BY HEALTHCARE SETTING</th>
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<td><strong>Acute care:</strong> In acute care, pressure ulcers can develop within the first two weeks of hospitalization. Elderly patients can develop pressure ulcers within the first week of hospitalization. The initial assessment is conducted upon admission and repeated at least every 24 to 48 hours, whenever the patient is transferred from one unit to another, whenever the patient’s condition changes or deteriorates, or per facility policy. Most medical-surgical units reassess daily.</td>
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<td><strong>ICU/critical care:</strong> ICU patients are at high risk for developing pressure ulcers, especially heel pressure ulcers. Pressure ulcers have been associated with a two- to four-fold increase in the risk of death in older people in ICU. ICU patients have been shown to develop pressure ulcers within 72 hours of admission. One study of 84 ICU patients found that over 30 days, 33 patients developed pressure ulcers and seven of the pressure ulcers were medical device–related.</td>
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<td><strong>Inpatient rehabilitation settings:</strong> Studies in this area showed that 1.4% of patients developed a new or worsening pressure ulcer during their stay. The presence of a pressure ulcer was significantly associated with lower gains in motor function, longer length of stay, and decreased odds of being discharged to the community. Assessment is on admission and per facility protocol.</td>
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<td><strong>Long-term care:</strong> In long-term care settings, most pressure ulcers develop within the first four weeks. In skilled facilities, the initial assessment is conducted upon admission and repeated weekly thereafter. In nursing homes with long-term patients, the assessment is conducted upon admission, repeated weekly for the first month, and repeated monthly thereafter, or whenever the patient’s condition changes.</td>
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<td><strong>Home health:</strong> In home healthcare settings, most pressure ulcers develop within the first four weeks. The initial assessment is conducted upon admission and repeated at resumption of care, recertification, transfer or discharge, or whenever the patient’s condition changes. Some agencies reassess with each nursing visit.</td>
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Hospice/palliative care: One study showed that of eight pressure ulcers that developed during the study, five occurred within two weeks of death. Assessment occurs at admission and as patient condition changes.

Across all settings the three groups most at risk for pressure ulcers are individuals over 65 years of age, neonates and children younger than three, and those with spinal cord injury.

Source: WOCN, 2016a.

What Needs to Be Assessed

Prevention of pressure ulcers must begin with frequent and routine assessment of the patient’s skin and of the risk factors that, if left unmanaged, will contribute to the development of an ulcer. Risk assessment without interventions to modify the risk is meaningless.

A head-to-toe inspection of the skin must be done on admission and at least daily (or per facility regulation). Five parameters for skin assessment are recommended by the Centers for Medicare and Medicaid Services, including skin color, skin temperature, skin texture/turgor, skin integrity, and moisture status (WOCN, 2016a). The assessment should focus on high-risk areas such as bony prominences, areas of redness, and under medical devices. The specific areas to assess are shown in the table and diagram below.

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<tr>
<th>ASSESSING A PATIENT’S SKIN</th>
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<td>If the patient’s position is:</td>
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<td>Lateral</td>
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<td>Supine</td>
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<td>Semi-recumbent</td>
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<td>Seated</td>
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Bony prominences are high-risk areas for pressure ulcers. (Source: © Invacare Corporation.)

Blanchable erythema is a reddened area that temporarily turns white or pale when pressure is applied with a fingertip. This is an early indication to redistribute pressure. Nonblanchable erythema is redness that persists when fingertip pressure is applied. It means that tissue damage has already occurred.

It can be difficult to identify skin problems in patients with dark skin. Redness may not be easy to see. The clinician needs to compare the at-risk area (such as the coccyx or hip) with skin next to it and look for color differences or changes in temperature or pain.
ASSESSMENT AND MEDICAL DEVICES

Medical devices such as shoes, heel and elbow protectors, splints, oxygen tubing, face masks, endotracheal tube holders, compression stockings and TED hose, and others must be removed and the skin inspected daily. For example, oxygen tubing can cause pressure ulcers on the ears, and compression stockings and TED hose have been known to cause heel ulcers. If the device cannot be removed—such as a nasogastric (NG) tube, urinary catheter, tracheostomy holder, neck brace, or cast—then the skin around the device must be carefully inspected: the nares for an NG tube, the neck for a tracheostomy, the mucosa for a urinary catheter, etc. If the patient complains of pain under an unremovable device, notify the physician.

Consider all adults with medical devices to be at risk for pressure ulcers. Children with medical devices are also considered at risk for pressure ulcers. A recent study showed a 29% rate of tracheostomy-related pressure ulcers in children. Another showed that 86% of pressure ulcers in children were related to CPAP. And a third study showed that of children hospitalized for at least 24 hours, 40% of the children with external medical devices were assessed as having a pressure ulcer related to the device (NPUAP, 2014).

Ulcers caused by medical devices are reportable to state and federal agencies, just as are those caused by pressure on bony prominences.

ASSESSMENT AND MOBILITY

Immobility is the most significant risk factor for pressure ulcer development. More frequent monitoring to prevent pressure ulcers is conducted for patients who have some degree of immobility, including those who are:

- Nonambulatory
- Confined to bed, chairs, wheelchairs, recliners, or couches for long periods of time
- Paralyzed and/or have contractures
- Wearing orthopedic devices that limit function and range of motion
- Dependent on assistance to ambulate or reposition themselves

ASSESSMENT FOR FRICTION VERSUS SHEARING

Friction is the rubbing of one body part against another. There are two types of friction: static and dynamic. Static friction is the force that resists motion when there is no sliding; for example, static friction prevents an individual from sliding down in bed when the head of the bed is elevated. Dynamic friction is the force between two bodies when there is sliding, for example, when a person is sliding down in bed. Skin trauma can result. Patients who cannot lift themselves during repositioning and transferring are at high risk for friction injuries.
Friction may contribute to the development or worsening of a pressure ulcer due to the shear it creates. **Shear** is the mechanical force that is parallel to the skin and can damage deep tissues such as muscle. Shear can result when friction stretches the top layers of skin as it slides against a surface, or deeper layers when tissues attached to the bone are pulled in one direction while the surface tissues remain stationary.

Shearing most commonly occurs when the head of the bed is elevated above 30 degrees and the patient slides downward. Friction is most common when patients are turned or pulled up in bed (WOCN, 2016a).

**ASSESSMENT FOR INCONTINENCE**

Moisture from incontinence can contribute to pressure ulcer development by macerating the skin and increasing friction injuries. Fecal incontinence is an even greater risk for pressure ulcer development than urinary incontinence because the stool contains bacteria and enzymes that are caustic to the skin. When both urinary and fecal incontinence occur, the fecal enzymes convert the urea in the urine to ammonia, which raises the skin’s pH. When the skin pH is elevated (alkaline), the skin is more susceptible to damage. Pressure ulcers are four times more likely to develop in patients who are incontinent than in those who are continent (WOCN, 2016a).

**ASSESSMENT FOR NUTRITIONAL STATUS**

Although individual nutrients and their specific role in preventing pressure ulcers have not been determined, malnutrition is associated with overall morbidity and mortality. A nutritional assessment should be conducted upon admission or when there is a change in the patient’s condition that would increase the risk of malnutrition, such as the patient’s refusal to eat or eating less than usual, prolonged NPO status, development of a wound(s) or other conditions that increase metabolic demand, and/or when a pressure ulcer is not progressing toward healing. The clinician must also keep in mind that overweight and obese patients can be malnourished and should undergo a nutritional assessment.

Parameters to assess include current and usual weight, history of unintentional weight loss or gain, food intake, dental health, ability to swallow and/or feed oneself, medical interventions (such as surgeries of the gastrointestinal tract that may affect absorption of nutrients such as vitamin B₁₂), psychosocial factors (such as the ability to obtain and pay for food), and cultural influences on food selection.

Serum albumin and prealbumin are no longer considered reliable indicators of nutritional status, as there are multiple factors that will decrease albumin levels even with adequate protein intake. These include inflammation, stress, surgery, hydration, insulin, and renal function. Therefore laboratory evaluation should be only one part of a nutrition assessment (WOCN, 2016a; NPUAP, 2014).
CASE

Mr. Frank is a 90-year-old man who has been admitted to the hospital with pneumonia. He fell at home three months ago and was also hospitalized at that time. His equally elderly wife denies that she is having any difficulty caring for him and says that he eats well and takes all his medications.

The admitting nurse finds Mr. Frank to be very thin and that he weighs 10 pounds less than when he was hospitalized after his fall. His incontinence brief is saturated with urine, and his perineal skin is raw. He does not move himself in the bed. The nurse recognizes that Mr. Frank is at high risk for developing a pressure ulcer due to his poor nutrition, his immobility, and his incontinence.

The nurse discusses with the physician the patient’s need for a dietitian referral, a pressure reduction mattress, and a barrier product to protect his skin. She alerts the discharge planner that Mr. Frank may require home health or possibly nursing home placement after the pneumonia is cleared, as his wife, despite her intentions, is having difficulty caring for her husband.

Determining Risk Levels

Several risk assessment tools or scales are available to help predict the risk of a pressure ulcer, based primarily on those assessments mentioned above. These tools consist of several categories with scores that when added together determine the total risk score.

The Braden Scale for Predicting Pressure Ulcer Risk is the most popular, widely used risk assessment tool in use today for predicting pressure ulcers. It was first published in 1987 and has thus been in use for about 30 years across a variety of settings. Two other scales are the Norton Scale and the Waterloo Scale (WOCN, 2016d). The clinician uses these tools to help determine risk so that interventions can be started promptly.

These tools are only used for assessing adults. The Braden-Q Scale has subcategories that relate to assessing children.

It is important that when the clinician uses a scale, the scale must not be altered in any way, meaning there cannot be shortcuts or changes to the definitions. Any changes would alter the accuracy and usefulness of the scale in predicting the risk of developing pressure ulcers.

Assessment tools notwithstanding, if a patient has other major risk factors present (such as age, fever, poor perfusion, etc.), the patient may be at higher risk than a risk score would indicate. Clinicians should work to assure that, regardless of the specific risk assessment tool being used, the professionals using it are proficient in its use and knowledgeable regarding potential risk factors within their patient population that are not accounted for in the assessment tool they are using (WOCN, 2016b).
BRADEN SCALE

The Braden Scale consists of six categories:

1. Sensory perception: Can the patient respond to pressure-related discomfort?
2. Moisture: What is the patient’s degree of exposure to incontinence, sweat, and drainage?
3. Activity: What is the patient’s degree of physical activity?
4. Mobility: Is the patient able to change and control body position?
5. Nutrition: How much does the patient eat?
6. Friction/shear: How much sliding/dragging does the patient undergo?

There are four subcategories in each of the first five categories and three subcategories in the last category. The scores in each of the subcategories are added together to calculate a total score, which ranges from 6 to 23. The higher the patient’s score, the lower his or her risk.

- Less than mild risk: ≥19
- Mild risk: 15–18
- Moderate risk: 13–14
- High risk: 10–12
- Very high risk: ≤9

It is recommended that if other risk factors are present (such as age, fever, poor protein intake, hemodynamic instability), the risk level should be advanced to the next level. Each deficit that is found when using the tool should be individually addressed, even if the total score is above 18. The best care occurs when the scale is used in conjunction with nursing judgment. Some patients will have high scores and still have risk factors that must be addressed, whereas others with low scores may be reasonably expected to recover so rapidly that those factors need not be addressed (Braden, 2012; WOCN, 2016b).

(See also “Resources” at the end of this course.)

NORTON SCALE

The very first pressure ulcer risk evaluation scale, called the Norton Scale, was created in 1962 and is still in use today in some facilities. It consists of five categories:

1. Physical condition
2. Mental condition
3. Activity
4. Mobility
5. Incontinence
Each category is rated from 1 to 4, with a possible total score ranging from 5 to 20. A score of less than 14 indicates a high risk of pressure ulcer development.

**WATERLOO SCALE**

This scale consists of seven items:

1. Weight for height
2. Skin type
3. Sex and age
4. Malnutrition screening tool
5. Continence
6. Mobility
7. Special risk factors

Potential scores range from 1 to 64. The tool identifies three categories of risk: at risk (score of 10–14), high risk (score of 15–19), very high risk (score of 20 and above).

**PRESSURE ULCER PREVENTION**

As the saying goes, “An ounce of prevention is worth a pound of cure.” It is more cost efficient to prevent a pressure ulcer than to cure one. Interventions that will help the clinician prevent pressure ulcers do so from both an outside and inside approach. With the **outside approach**, the clinician can minimize pressure through regular repositioning, using a support surface, and managing incontinence to prevent skin damage from moisture. The **inside approach** includes the management of nutrition and hydration to support the body in preventing damage and healing any damage that has occurred.

**Regular Repositioning and Early Mobilization**

While the underlying cause and formation of pressure ulcers is multifaceted, by definition a pressure ulcer cannot form without pressure on the tissue. Thus, immobility is the most significant risk for the development of pressure ulcers. High pressures over bony prominences for a short time and low pressures over bony prominences for a long time are equally damaging (NPUAP, 2014). In order to decrease the risk, it is important to reduce the time and amount of pressure the patient is exposed to.

All patients must have their positions changed on a regular schedule. How often this is done is determined by each patient’s activity/mobility level, tissue tolerance, skin condition, overall medical condition, treatment goals, type of pressure redistribution support surface used, and the comfort of the patient (NPAUP, 2014).
A referral to physical therapy is helpful in devising interventions and providing education to increase mobility. The therapist can educate the patient, family, and staff on safe ways to help keep the patient as mobile as possible. A referral to occupational therapy can also provide interventions for transfers, skill training for mobility, and independence skills for hygiene and toileting. Skills learned from an occupational therapist can reduce incontinence and immobility, which can reduce the risk of pressure ulcer development.

**INTERDISCIPLINARY APPROACH**

Improving the mobility of patients, or mitigating the effects of immobility, requires the assistance of many in the healthcare team:

- The physical and occupational therapists, who teach the patient, family, and staff how best to safely mobilize the patient
- Occupational therapists, who address lifestyle factors that can lead to increased incidence of pressure ulcers and provide physical, psychosocial, and environmental modifications to benefit treatment and prevention (Ghaisas et al., 2015)
- The medical equipment department, who determines what equipment is available for the patient
- The social worker, who uncovers what resources are available to the patient
- Most of all, the bedside clinicians, whose role it is to assess all of the risk factors, to see that needed interventions are provided, and to reassess outcomes frequently

**BED-BOUND PATIENTS**

For bed-bound patients, the standard “turn every two hours” may be more than adequate for some but not at all adequate for others. Evidence suggests that turning/repositioning every four hours, when combined with a pressure-redistributing mattress, is as effective for prevention of pressure ulcers as repositioning or turning every two hours (WOCN, 2016a).

(It is important to keep in mind that when lateral rotation mattresses are used for pulmonary and cardiovascular care, such rotation does not off-load the skin; the patient must still be repositioned off the bed surface and the skin checked frequently.)

If the medical condition is so severe that repositioning the patient regularly is not possible, then a support surface designed to decrease pressure must be used and the patient repositioned with frequent small shifts (e.g., mini or low-angle turns, elevating heels off the bed, repositioning the head and extremities every hour, and passive range of motion). (See also “Using Support Surfaces” below.)
When we think of turning the patient, we often think that the patient must be completely over on a side. This can be difficult for the clinician/caregiver to do, is uncomfortable for the patient, can result in cardio-pulmonary compromise, and actually increases pressure on the side of the body.

Frequent small position changes, rather than completely turning the patient, is faster, easier, and safer for all. Any change in position is beneficial. The patient need only be tilted to the side, no more than 30 degrees, with pillows or wedges to help support and reduce the pressure over bony prominences. A small pillow behind the shoulder or the hip alters position without having to move the entire body. Bending the knee alters the pressure on the sacrum and hip. A pillow between the knees prevents pressure when one bony prominence is lying directly on top of another. A small pillow behind the heel will elevate the heel off the surface and prevent pressure.

A small turn using a bolster can be as effective as a full turn. (Source: Author.)

NPUAP provides the following **general recommendations for repositioning**:

- Reposition the patient in such a way that pressure is relieved or redistributed.
- Avoid positioning the patient on bony prominences with existing nonblanchable erythema.
- Avoid subjecting the skin to pressure and shear forces and use manual handling aids to reduce friction and shear. Lift—do not drag—the patient while repositioning. Dragging the patient will cause skin damage due to friction. In most situations, simple devices like lift sheets can be used.
- Use a split leg sling mechanical lift device when available to transfer a patient into a wheelchair or bedside chair when the patient needs total assistance to transfer.
- Do not leave moving and handling equipment under the patient after use unless the equipment is specifically designed for that purpose.
• Avoid positioning directly onto medical devices such as tubes, drainage systems, or other foreign objects.

• Do not leave the patient on a bedpan longer than necessary.

• Use principles of safe patient handling to prevent injury to both the patient and the staff.

Recommendations for repositioning in bed include:

• Use the 30-degree tilted side-lying position, alternating between right side, back, left side, or prone position if patient can tolerate this and the medical condition allows.

• Encourage individuals who can reposition themselves to sleep in a 30- to 40-degree side-lying position or flat in bed if not contraindicated.

• Avoid lying postures that increase pressure, such as a 90-degree side-lying position or the semirecumbent position.

• Limit head-of-bed elevation to 30 degrees for an individual on bedrest unless contraindicated by medical condition or feeding considerations. If not contraindicated, lower the head of the bed one hour after eating or intermittent bolus tube feedings.

• If sitting in bed is necessary, avoid head-of-bed elevation or a slouched position that places pressure and shear on the sacrum and coccyx.

For a patient with an existing pressure ulcer:

• Do not position the patient directly on the ulcer or on areas of nonblanchable redness or deep tissue injury. Pressure reduces perfusion to the injured tissues and will delay healing and may cause deterioration of the wound.

• Continue to turn and reposition the patient regardless of the support surface in use.

• Inspect the skin for additional damage each time the patient is turned or repositioned.

**PREVENTING HEEL PRESSURE ULCERS**

The reduction of pressure and shear at the heels is very important in clinical practice. Two studies found that 24% and 38% of the most severe pressure ulcers (stage IV) were located on the heels (NPUAP, 2014). The posterior heel sustains intense pressure, even when a pressure reduction surface is used. Because the heel has so little tissue, the pressure is transmitted directly to the bone.

Ideally, heels should be free of all pressure, sometimes called “floating” the heels. Pressure can be relieved by elevating the lower leg and calf from the mattress by placing a pillow under the lower leg or using a suspension device that floats the heel. The pressure will then be spread to the lower leg, relieving the heel. The recommended position for the pillow is lengthwise under
the calf, with the heel suspended off the pillow. The patient must still be turned at regular intervals to promote pulmonary, renal, and vascular function along with protecting skin integrity.

Heels are properly floated. (Source: Author.)

Padding devices such as synthetic sheep skin, bunny boots, and rigid splints protect the heels and remove friction and shear but do not remove the pressure. (This author had two patients who had below-the-knee amputations due to pressure ulcers along the Achilles tendon caused by rigid splints.) Common devices such as intravenous bags, rolled towels or sheets, cut-out rings, and water-filled gloves are not designed to redistribute pressure and can actually increase pressure.


CHAIR-BOUND PATIENTS

A chair-bound patient must be repositioned as well. When a patient is seated, the weight of the body causes the greatest amount of pressure to occur over the ischial tuberosities. Since this area of the body is relatively small, the ischia bear intense pressure when a person is seated; without pressure relief, a pressure ulcer will occur quickly. If the patient cannot sit upright but slouches in the chair, then the sacral area is at risk as well. Pressure remains unrelieved in a paralyzed person because the small involuntary movements that restore blood flow to the tissues are absent.

Specialized wheelchairs that offer a tilt and/or recline option may be indicated for positioning patients at risk of developing pressure ulcers. Tilt and recline, though often confused, actually serve distinct and complementary positioning roles. Reclining a chair changes the hip angle and provides some pressure relief, but shearing forces may remain on the back. A tilt-in-space chair both tilts the head back and raises the feet up concurrently, thereby providing more pressure relief and less shearing forces. It is often recommended to use a combination of tilt and recline positioning when addressing pressure relief for a mobility-impaired individual (RESNA, 2008).

General recommendations for the chair-bound patient include:

- Stand the patient and reseat them in the chair frequently if possible.
- Provide adequate seat tilt to prevent sliding forward in the chair and adjust footrests and armrests to maintain proper posture and pressure redistribution.
• Elevate the legs or place the feet on a stool if the feet do not reach the floor in such a way as to slightly tilt the pelvis forward by positioning the thighs slightly lower than horizontally. This will prevent sliding forward out of the chair and reduce pressure on the sacrum.

• Elevate the feet and recline the chair by 30 degrees to reduce pressure.

• If the patient can change his/her own position, encourage pressure relief every 15 minutes. This includes chair pushups, leaning forward, leaning side to side, or tilting backwards. Leaning forward is the most effective and might be easier than chair push-ups.

• Acutely ill patients at risk for pressure ulcers should not sit for longer than two hours at a time and not return to sitting for at least an hour.

• Patients who are incapable of changing their position while sitting should be repositioned at least every hour by a caregiver.

For a patient with an existing pressure ulcer:

• Minimize sitting time and consult a seating specialist if the ulcer worsens on the seating surface selected.

• Consider periods of bed rest to promote ischial and sacral ulcer healing.

• Avoid sitting a patient with an ischial pressure ulcer in a fully erect posture.

• Patients with existing pressure ulcers on the ischial areas should limit time sitting up in the chair to three times a day for 60 minutes or less, and they must use a cushion (gel or air cushions are best) that redistributes pressure.

  (NPUAP, 2014)

**PHYSICAL AND OCCUPATIONAL THERAPY AND WHEELCHAIR POSITIONING**

Physical and occupational therapists are of great importance in assessing and managing the immobile patient’s activities and instructing staff, patients, and families in proper techniques to avoid injury and prevent ulcers. This may include assessing the seating and positioning needs of individuals who are wheelchair bound. Proper wheelchair positioning with an individualized seating system can promote good posture, enhance breathing and digestion, prevent complications such as pressure sores and skin irritation, slow further loss of mobility, minimize pain, and maximize functioning. Components of a wheelchair seating system include appropriate size and width as well as specialized supportive cushions, backrests, headrests, and trunk, arm, and leg supports when indicated.
### CASE

Patricia is a 61-year-old female with multiple sclerosis, leaving her bedridden and unable to move her legs. Despite being on a pressure reduction surface, she has developed a stage 3 pressure injury at her sacrum because of refusing to be turned due to the severe pain she experiences each time her right leg is moved. This has made it very difficult for the staff to provide wound care and keep Patricia clean. Furthermore, pain medication has not been effective for Patricia’s very intense but brief pain.

The nurse asks the physical therapist for recommendations to make moving Patricia less painful for her and less stressful for the staff. After the initial evaluation with Patricia, the therapist recommends localized heat treatments to her right leg, gentle active-assisted range of motion, and bed exercises to tolerance. After several treatments with the therapist, Patricia is able to tolerate turning toward her right side and staying in position for the time needed to care for her wound and clean her. The therapist also instructs the staff about less painful ways to move Patricia’s leg when necessary. As a result, Patricia no longer screams out in pain when repositioned.

### Using Support Surfaces

Factors in the development of pressure ulcers include prolonged pressure, friction and shear, and moist, warm skin. Each of these factors can be at least partially controlled by an appropriate surface for the bed and/or chair. A support surface is a specialized mattress or mattress overlay, chair cushion, or stretcher/operating room pad designed for the management of pressure loads and microclimate. (*Microclimate* is the term used to describe the local tissue temperature and moisture at the body/support interface, and microclimate control is a function of some support surfaces.) (See also “Emerging Therapies” later in this course.)

Pressure redistribution is the most important feature of a support surface. The body’s tissues can withstand higher loads of pressure for short periods of time and lower loads for longer periods of time. A surface that effectively redistributes pressure across the entire body (contact) surface effectively reduces the amount of pressure and extends the time a patient can safely remain in one position (WOCN, 2016b).

It is critical to remember, however, that there is no mattress, cushion, or bed available today, at any price, that will eliminate pressure and relieve the clinician or caregiver from having to reposition the patient. Patients must still be repositioned no matter what surface is used. Likewise, pressure is not the only contributing factor to skin breakdown and does not replace attention to perfusion, nutritional support, and management of comorbidities (WOCN, 2016b).

### IMMERSION, ENVELOPMENT AND BOTTOMING OUT

In order to redistribute pressure, a support surface needs to conform to the contours of the body through immersion and envelopment. **Immersion** is the depth to which the body “sinks into”
the surface. As the body does this, the pressure is spread out along the body surface. Immersion is dependent on the stiffness and thickness of the support surface and the flexibility of its cover.

**Envelopment** is the ability of the support surface to conform to irregularities such as clothing, bedding, and bony prominences without causing substantial increase in pressure. This maximizes pressure redistribution.

In contrast to the functions of immersion and envelopment, the term **bottoming out** is used to indicate excessive penetration of the surface, meaning the body sinks so deeply into the surface that its bony prominences are actually resting on the underlying bed frame. Factors that contribute to bottoming out include:

- Patient weight that exceeds the support surface’s limits
- A disproportion between weight and size, such as in a patient with bilateral leg amputations, which results in more of the body weight being concentrated in the trunk
- Consistently keeping the head of the bed over 30 degrees
- Inadequate support settings such as under or over inflation

For some support surfaces, bottoming out can be evaluated by placing one’s hand palm up beneath the support surface in the area underlying the patient’s bony prominence. If the patient’s bony prominence can be felt by the hand, then the support surface is not supporting the patient properly. However, many support surfaces cannot be assessed this way; the clinician must contact the equipment department of the facility or the supplier or manufacturer of the support surface for information on how to assess the functioning of the support surface.

### COMPONENTS OF A SUPPORT SURFACE

The most important component of a support surface is the medium used to provide the pressure redistribution. This can be air, fluid, or solid, alone or in combination.

**Foam** is a solid material and is available in all configurations. Foam surfaces are generally low-cost, lightweight, and minimal maintenance. Disadvantages include the fact that foam does not last as long since it compresses over time, it absorbs moisture (which can be a potential for infection), and it is hard to dispose of. Closed-cell foam does not allow air through, which can increase skin temperature, and open-cell foam does allow air to enter and exit, making it more conformable to the body. One type of open-cell foam is memory foam. If a foam pad is used on top of a mattress (known as an overlay) to redistribute pressure, it needs to be at least three inches thick.

**Gel pads** contain a mix of substances that allow them to respond like memory foam. They are good at preventing shear, but they can result in increased skin moisture.
**Fluids** include a viscous substance that is thick but free flowing, which allows it to redistribute weight. Water-filled surfaces reduce pressure better than a standard mattress but are undesirable for use in a hospital due to multiple concerns such as temperature control, leakage, difficulty with transfers, performance of CPR, and the time and labor involved in draining the mattress and moving the bed.

**Air** is frequently used in support surfaces, however air-filled surfaces have the potential to leak if damaged and require either periodic manual reinflation (if nonpowered) or an electrical pump to remain inflated.

Some support surfaces have **low-friction covers** (like Gore-Tex) to reduce friction so that the skin slides more easily over the surface without putting strain on the skin that could cause damage. However, even such support surfaces cannot provide total prevention against the shearing that occurs when the patient slides down in bed when the head is raised; other interventions are needed to prevent that (WOCN, 2016b).

**CATEGORIES OF SUPPORT SURFACES**

Support surfaces are commonly used in a variety of applications:

- Mattresses and mattress overlays
- Operating room surfaces
- Examination and procedure table surfaces
- Pads for emergency and transport stretchers or gurneys

General categories of support surfaces include mattresses, overlays, and integrated bed systems. Specific features include cushions and pads. They may be powered or nonpowered, active or reactive. Added features may include low air loss, air fluidization, lateral rotation, and alternating pressure (see below).

Rings, foam cutouts, or donuts under the patient should not be used as support surfaces, as these concentrate pressure on surrounding tissue, causing swelling and decreasing circulation. The fact that they can be found in medical supply stores does not mean they are safe to use.

With the use of any support surface, the number of linens and other items used under the patient must be kept at a minimum or the pressure-reducing ability of the surface will be altered significantly. Staff, patients, and family members must be instructed to use no more than two items between the patient and the surface (e.g., one pull sheet and one incontinence pad or product).
**General Categories**

**Mattresses** can be composed of any medium or a combination, and may require a specialized bed frame. They create much less risk of bottoming out and can provide other therapeutic functions such as reduced friction and shear and improved microclimate management between the patient’s skin and the surface.

**Overlays** can be composed of any medium and are placed on top of an existing mattress. They are thinner than mattresses, putting the patient at risk for bottoming out. Other drawbacks are: they elevate the height of the sleep surface, can complicate patient transfers, alter the fit of linens, and increase the risk of falls or entrapments. When a foam overlay is used, it should be a minimum of three inches thick to provide pressure redistribution.

**Integrated bed systems** are comprised of the support surface and bed frame combined into a single unit. Their advantage is that the frame may include many features to make the bed easier and safer to use, such as alarms, scales, and the ability to support more weight.

**Specific Categories**

**Procedure, transport, ER, and OR mattresses** are used for patients who need a support surface in bed, since this means they also need one while on gurneys or tables. Many companies provide pressure redistribution pads for surfaces other than beds.

**Chair cushions** are utilized for patients who sit for a long time due to their risk for ischial pressure ulcers. These cushions must be matched to the patient based on size, posture, mobility, and lifestyle needs, and with covers that can dissipate heat. Some specialized wheelchair cushions may also address incontinence.

**Active surfaces** can be either a powered mattress or an overlay that changes its load distribution whether or not someone is on the surface. This feature is called alternating pressure. The air cells in such surfaces cyclically inflate and deflate, which changes the areas of the body under pressure. These are recommended for patients at high risk and for whom frequent manual repositioning is not possible.

**Reactive surfaces** move only in response to the patient’s body. These can be powered or nonpowered (nonpowered also being referred to as static air surfaces). These are low-tech, compact, and low in weight (Esberg et al., 2016). They are available as chair cushions, overlays, mattresses, and procedure pads. All reactive support surfaces are appropriate for pressure ulcer prevention in patients who are frequently repositioned. Some are appropriate for patients with existing pressure ulcers.

**Low air-loss surfaces** have a pump that provides a slow, continuous airflow into the mattress for even pressure distribution and continuous airflow across the skin for microclimate management. The amount of pressure in the mattress can be adjusted for the
height and weight of the patient, and the mattress further adjusts when a patient sits up in bed to prevent bottoming out. Controls allow instant deflation for CPR. They cannot be used on patients with unstable spines.

**Air-fluidized surfaces** contain silicone-coated beads that provide both air and fluid support. When air is pumped through the beads, the beads behave like a liquid and the patient floats, with two thirds of the body immersed in the warm, dry beads. When the bed is turned off, it becomes hard enough for repositioning or CPR. Some beds now combine air-fluidized therapy in the lower half of the bed and low air-loss in the upper half, allowing the bed to be adjustable. This is a very expensive therapy and should only be used for patients who require very high-level care, such as those with multiple wounds or flap procedures (a surgical procedure to close a pressure ulcer). The beds are also extremely heavy and may not be safe in a home.

Lateral rotation is used to prevent and treat certain cardiopulmonary conditions. With this feature, the patient is continually rotated from side to side. While some low air-loss beds may incorporate lateral rotation, **this does not eliminate the need for routine manual repositioning**. This is because when the bed turns the patient, the patient’s skin and tissues never leave the surface of the bed, and thus pressure is not relieved (WOCN, 2016b).

**CHOOSING A SURFACE**

A support surface must be selected that will meet the patient’s needs. Consider the patient’s need for pressure redistribution based on the following factors:

- Level of immobility and inactivity
- Need for microclimate control and shear reduction
- Size and weight of the patient
- Risk for development of new pressure ulcers
- Number, severity, and location of existing pressure ulcers (NPUAP, 2014)

Other factors to consider include:

- Fall and entrapment risk (overlays and mattresses can increase the height of the sleep surface)
- In a patient who is a candidate for progressive mobility, a surface that makes it easier to get out of bed
- Compatibility of the surface with the care setting
- Availability of the product
- Previous support surface usage and patient preference (WOCN, 2016b)
Determining the appropriate support surface is based first on the patient’s condition and the healthcare setting. Overall, if the patient is able to be turned and has at least two intact turning surfaces, meaning the skin is intact on two sides of the body (e.g., the right and left trochanters), then a mattress overlay or an alternating pressure pad can be used over a regular mattress. If the patient has skin breakdown on more than one side of the body, then a mattress replacement should be used. Depending on the healthcare setting, patients who already have stage III or IV pressure ulcers on their trunks qualify for a mattress replacement.

Cost and product availability must also be considered in choosing a surface. The healthcare setting will also determine the product used. For instance, in the home setting the weight of the bed, the structure of the home, the width of the doors, and the availability of uninterrupted electrical power will have a major impact on the support surface available for use. A patient’s health insurance will be a significant determining factor as to which surface will be available to the patient.

In general, a standard hospital mattress should not be used with at-risk patients. It is important to contact the medical equipment department to determine what is available for pressure reduction (WOCN, 2016a).

**Patient Size and Weight**

The support surface chosen must be approved for the patient’s body size and weight. Most conventional support surfaces are for patients who weigh 300 pounds or less. If the patient weighs more than this, then a bariatric mattress and frame must be obtained.

Even in patients who weigh less than the weight limit, where their weight is concentrated may make a difference in the mattress needed. The mattress may not be able to support the patient when the body weight is not evenly distributed. For instance, a paralyzed patient or an amputee may weigh under the limit, but most of the weight will be concentrated in the trunk. If it looks as though the patient is lying or sitting in a “well,” the surface may not be able to support the patient’s weight.

In the event a surface does not appear to be supporting a patient’s weight—and provided the support surface is the correct one—it is important to check for any disconnected hoses or improper machine settings. It may also be necessary to contact the appropriate hospital department, supplier, or manufacturer to have the support surface checked as needed.

**Managing Moisture**

Moisture can lead to skin damage of various types. The most common form of moisture-associated skin damage (MASD)—known as incontinence-associated dermatitis (IAD)—is frequently misidentified as a pressure ulcer. While they are not the same thing, preventing IAD can also help to prevent the formation of pressure ulcers.
TYPES OF SKIN DAMAGE DUE TO MOISTURE

MASD is defined as inflammation and erosion of skin caused by prolonged exposure to various sources of moisture, including urine or stool, perspiration, wound exudate, mucus, or saliva. The four forms of MASD are:

- Incontinence-associated dermatitis (IAD)
- Intertriginous dermatitis (ITD)
- Periwound moisture-associated skin damage
- Peristomal moisture-associated skin damage
  (WOCN, 2016b)

**Incontinence-associated dermatitis** due to urinary incontinence may involve the perineum and the area between the vulva and scrotum or anus. IAD due to fecal incontinence may involve the anus, buttocks, coccyx, perigenital areas, groin folds, and posterior thigh regions. Its characteristics are moist, bright red skin, inflammation, denudement (skin stripped raw), erosion, and blisters. The damage is usually superficial but can progress to full-thickness lesions. The patient will complain of burning, pain, and itching.

Moisture alone causes maceration, but acute inflammation and skin loss are due to a combination of maceration and some other source of injury such as a chemical irritant, friction, or pathogenic invasion. Wet skin loses strength and is more prone to damage from friction and shearing. It allows irritants to penetrate the epidermal layers of skin, which then allows common pathogens such as *Candida* and *Staphylococcus* to enter (WOCN, 2016b).

**Skin injury by friction** appears as redness and progresses to abrasion. It occurs when skin is rubbed vigorously during cleaning or when skin rubs against incontinence garments or bed or chair surfaces. Areas of skin rubbing against each other cause “kissing” lesions such as are seen between the buttocks cheeks.

Mechanical damage (friction) abrades and disrupts the skin from the “top down,” whereas pressure and shear cause blood vessel compression and ischemic damage from the “bottom up.” Determining the cause of the lesion—and distinguishing between IAD and a pressure ulcer—includes an assessment of the location, characteristics, and most importantly, the patient’s history.
DISTINGUISHING TYPES OF DAMAGE DUE TO MOISTURE

<table>
<thead>
<tr>
<th></th>
<th>Friction (top down)</th>
<th>IAD (top down)</th>
<th>Pressure/Shear (bottom up)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Fleshy surfaces exposed to repetitive rubbing</td>
<td>Perineal area, inner thighs, buttocks</td>
<td>Bony prominences, under medical devices</td>
</tr>
<tr>
<td>Depth</td>
<td>Superficial</td>
<td>Superficial</td>
<td>Full thickness</td>
</tr>
<tr>
<td>Characteristics</td>
<td>Pink/red wounds without necrosis</td>
<td>Edges indistinct, fungal rashes common, pink/red wounds without necrosis</td>
<td>Well-defined lesions, tunneling and undermining, tissue necrosis</td>
</tr>
<tr>
<td>History</td>
<td>Restlessness, frequent sliding, malnourished, diaphoretic, on steroids</td>
<td>Prolonged or recurrent exposure to urine and/or stool</td>
<td>Prolonged immobility, sliding, use of medical device at site of damage</td>
</tr>
</tbody>
</table>

Source: WOCN, 2016b.

MANAGING INCONTINENCE

It is important to **cleanse skin gently** with a pH-balanced cleanser at each incidence of soiling. Perineal skin cleansers are more effective for prevention and treatment of IAD than traditional soap and water. This is because bar soap, which is alkaline and very drying, disrupts the skin’s protective abilities. Vigorous cleaning, as well as the use of rough washcloths, can also lead to skin erosion. Soft, disposable cloths are easier on the skin. Fragrance or alcohol are irritants, and cleaning products containing these are to be avoided. Some facilities use no-rinse foams, which are another good option.

An incontinence **skin barrier product** should be used to protect the skin after cleansing. Products such as creams, ointments, pastes, or those that form a film on the skin are all useful. Protective products with dimethicone, petroleum, or zinc oxide are recommended for patients with fecal incontinence or both urinary and fecal incontinence to protect against IAD. Several manufacturers offer products that both clean and protect, saving time for the caregiver and increasing the likelihood that perineal care will be performed.

**Absorbent underpads or incontinence briefs** are chosen to wick moisture away from the skin instead of trapping the moisture against the skin. However, all briefs increase moisture at the perineal region because they are occlusive and do not “breathe.” This creates warmth near the skin that, when combined with moisture, ammonia, and enzymes, increases skin breakdown. There is an increased risk with the use of briefs because they may not be changed as often as they should be due to the difficulty in seeing when a patient has voided. Briefs are not recommended for fecal incontinence because they can trap stool against the skin.

Many hospitals have moved away from using briefs except when a patient is ambulating or going off the ward. Instead, they use underpads that are especially designed to keep the skin dry and breathable and do not allow heat or moisture to be trapped against the skin.
A **toileting program** can also decrease incontinence and thus IAD. In situations where the severity of urinary incontinence has contributed to or may contaminate an existing pressure ulcer, placing a urinary catheter may be indicated (WOCN, 2016a).

Much attention has been paid to infections related to the use of **indwelling catheters**, particularly since 2008, when CMS (Center for Medicare and Medicaid Services) changed reimbursement regulations, calling catheter associated urinary tract infections (CAUTI) “preventable harm” and withholding payment for additional costs related to CAUTI treatment (WOCN, 2016c). Significant bacterial colonization occurs with a few days of catheter insertion, which can lead to infection. The prevention of CAUTI begins with the decision to **not** insert a catheter.

The CDC developed guidelines for the appropriate use of indwelling catheters as follows:

- To manage urinary retention or bladder outlet obstruction
- To provide accurate urine output measurements
- To manage bladder short term following select surgical procedures
- To assist in the healing of perineal wounds at risk of contamination by urine
- To improve comfort at end of life (WOCN, 2016c)

Therefore, incontinence is not a valid reason for insertion of an indwelling catheter to replace alternative means of care for the incontinent patient. It can be used in the treatment of a wound but not in prevention, since the risk of CAUTI is too high (WOCN, 2016c).

### TYPES OF URINARY INCONTINENCE

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Causes/Associated Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urge incontinence</td>
<td>Involuntary loss of urine with an abrupt strong need to void; occurs with the involuntary contractions of the detrusor muscle or uncontrolled urethral relaxation</td>
<td>Associated neurological disorders include stroke, paraplegia, multiple sclerosis, Parkinsonism, or dementia.</td>
</tr>
<tr>
<td>Stress incontinence</td>
<td>Involuntary leakage of small amounts of urine with a rise in intra-abdominal pressure that occurs during coughing, sneezing, laughing, and physical activity</td>
<td>Often seen in women; causes include estrogen deficiency, weakness in pelvic floor musculature, urethral sphincter weakness, childbirth, and obesity.</td>
</tr>
</tbody>
</table>
Functional incontinence

Individual with a functional urinary tract is unable or unwilling to get to the toilet to urinate

Often occurs in older adults; contributing factors include use of physical restraints, musculoskeletal dysfunction, unavailability of a urinal, visual impairment, impaired mobility, cognitive deficits, unfamiliarity of environment, and psychosocial difficulties.

Overflow incontinence

Involuntary loss of urine secondary to over distension of the bladder; results in the leakage of small amounts of urine due to an outflow obstruction or a hypotonic bladder

Common causes include medications, neurological conditions such as diabetic neuropathy or spinal cord injury, prostate enlargement, detrusor weakness, or urethra stricture.

Mixed incontinence

Combination of other types of urinary incontinence, typically urge and stress incontinence

Common in older adults.

Source: WOCN, 2016c.

TREATING FECAL INCONTINENCE

Fecal incontinence occurs when structures controlling defecation do not function correctly, usually because of diarrhea, trauma to the structures, or nerve damage.

- Causes of diarrhea include anything that increases gut motility or decreases water absorption, including medications, certain foods, and diseases that cause intestinal inflammation.
- Trauma to the structures includes scarring from chronic inflammation (as in irritable bowel syndrome), radiation, surgery, and childbirth.
- Nerve damage can also be the result of childbirth or of spinal cord injury, multiple sclerosis, Parkinson’s disease, stroke, and diabetic neuropathy.

Those with cognitive difficulties may not perceive the need to defecate. Patients with fecal incontinence should be referred to a specialist for accurate diagnosis and appropriate treatment.

When the underlying cause cannot be treated, regulation of bowel function by promoting ideal stool consistency can lead to few or no periods of incontinence. Modifying the diet can help, as certain foods can exacerbate fecal incontinence, such as alcohol, caffeine, fruit, gas-producing foods, sugar-free products that contain sorbitol, and dairy products for those who are lactose-intolerant. Dietary fiber adds bulk and can improve passage of stool.

Adequate fluid intake is essential because dietary fiber pulls water into the feces; without adequate water the patient will have very dry stools that are difficult to pass.
Emptying the bowel at regular intervals through time-toileting, digital stimulation, or use of suppositories prevents incontinence because an empty rectum will not leak.

Incontinence containment products are useful in community settings, but a plan for skin protection must be in place. In hospital settings, fecal management systems can be used. A colostomy is also an option if everything else has failed and quality of life is severely restricted due to fecal incontinence (Gump & Schmelzer, 2016).

**OCCUPATIONAL AND PHYSICAL THERAPY AND INCONTINENCE**

Occupational and physical therapists are both specialists in assessing, identifying, and treating the underlying impairments associated with urinary incontinence. Common interventions that can be implemented by these professionals include:

- Pelvic floor muscle training (PFMT): a program of repeated pelvic floor muscle contractions
- Scheduled toileting (i.e., timed voiding): monitoring and then matching of the individual’s typical toileting schedule
- Habit retraining: identifying the individual’s natural voiding pattern and developing an individualized toileting schedule
- Prompted voiding: establishing a routine in which a caregiver suggests voiding and provides assistance as needed
- Biofeedback: showing the individual how the muscles are working
- Electrical stimulation: improving awareness and strength of the muscles

Research indicates that the use of a toileting routine in combination with medication and education results in decreasing urinary incontinence.


**CASE**

Ruth is an elderly woman living in a residential treatment facility. She has a stage 4 pressure injury on her sacrum that the nurse is treating per physician’s orders. The home health nurse has been educating the facility’s caregivers about the importance of keeping Ruth’s perineal skin clean, dry, and protected. Upon several instances of checking Ruth, however, the nurse finds both Ruth and her sacral dressing to be wet with urine. A caregiver also reports to the nurse that the dressing requires changing several times a day due to urine saturation.

The nurse knows that exposure to urine can delay or prevent wound healing. Remembering that frequent dressing changes can also delay healing, the nurse advises the physician of Ruth’s
incontinence and wound status. The physician states that she is concerned about a possible urinary tract infection due to use of a catheter and writes an order for an indwelling urinary catheter to be used for one month. At that time, the nurse is to contact the physician as to the status of the wound and whether or not it is improving.

The nurse inserts the catheter per protocol and instructs the caregivers in its maintenance. When assessing Ruth at the next visit, the nurse notes that the catheter has kept Ruth and the sacral dressing dry. At the end of the month’s use of the catheter, the nurse compares the wound’s condition and measurements and finds that there is now granulation tissue in the wound bed and the wound size has decreased by 75%. The nurse contacts the physician, who authorizes continuance of the catheter for five more weeks.

Managing Nutrition

Malnutrition is associated with overall morbidity and mortality. Assessing the patient’s nutritional status must be part of the total assessment for pressure ulcer risk. A nutrition assessment should be performed upon admission and whenever there is a change in the patient’s condition that puts him or her at risk for malnutrition.

Numerous studies in multiple countries and across clinical settings have demonstrated a relationship between malnutrition and pressure ulcer risk, development, severity, and prolonged healing. Malnutrition is defined as the presence of two or more of the following characteristics:

- Inadequate energy intake (calories)
- Unintended weight loss
- Loss of muscle mass
- Loss of subcutaneous tissue
- Localized or generalized fluid accumulation
- Decreased functional status

NUTRITION ASSESSMENT PARAMETERS

- Current weight and usual weight
- History of unintentional weight loss or gain (>5% change in 30 days or >10% change in 180 days)
- Body mass index (BMI)
- Food intake
- Dental health
• Ability to chew, swallow, and feed oneself
• Medical and/or surgical history that influences intake or absorption of nutrients
• Drug-food interactions
• Psychosocial factors that can affect food intake
• Ability to obtain and pay for food
• Facilities for cooking and eating
• Food preferences
• Cultural and lifestyle influences on food selection
• Over 65 years of age

The patient should be monitored for signs of dehydration, such as decreased skin turgor and/or urine output or elevated serum sodium. Serum protein tests, such as for albumin and pre-albumin, may be affected by inflammation, renal function, and hydration and so may not correspond with overall nutritional status. Thus, laboratory tests should be considered as only one part of the nutritional assessment.

Recent weight loss in older adults is a key factor in mortality risk. The “anorexia of aging”—which includes appetite decline, weight loss, and decreased metabolic rate—places the older adult at risk for malnutrition. While unintended weight loss is a risk factor for malnutrition, bariatric adults may also be poorly nourished (NPUAP, 2014).

NPUAP (2014) provides these dietary recommendations for those who are at risk or have an existing pressure ulcer and who are at risk for malnutrition:

• Calorie intake of 30 kcal to 35 kcal per kg of body weight
• Protein intake of 1.25 g to 1.5 g protein per kg body weight
• Supplement with high-calorie, high-protein, arginine (an amino acid), and vitamins and minerals when nutritional needs cannot be met with dietary intake
• Provide adequate daily fluid intake
• Assess renal function to ensure that high levels of protein are appropriate for the patient

Any patient with nutritional and pressure ulcer risks, suspected or identified nutritional deficiencies, or a need for nutritional supplementation to prevent undernutrition should be referred to a registered dietitian. Any patient with a pressure ulcer should be referred to the dietitian as well (NPUAP, 2014).
Emerging Therapies for Pressure Ulcer Prevention

Emerging therapies for pressure ulcer prevention include microclimate manipulation, fabrics designed to reduce shear and friction, and use of prophylactic dressings (NPUAP, 2014).

MICROCLIMATE CONTROL

Microclimate is the term used to describe the local tissue temperature and moisture at the body/support interface, and microclimate control is a function of some support surfaces. This feature can be of benefit to patients who are diaphoretic (sweat heavily) or with elevated temperatures and perspiration, since they are at increased risk for developing pressure ulcers. For instance, elderly patients have a reduced ability to dissipate excess heat, resulting in skin warming. High levels of moisture from perspiration, incontinence, or drainage result in maceration, which reduces skin strength and increases damage caused by friction (NPUAP, 2014).

The need for moisture and temperature control should be considered when selecting a support surface. A support surface with microclimate control can help maintain normal skin hydration and temperature through the use of porous covers that promote air transfer between the skin and surface, which results in the decrease of moisture and body heat. Other surfaces pump air through microperforations in the support cover to decrease moisture and heat (WOCN, 2016a).

FABRICS

Silk-like fabrics rather than cotton or cotton-blend fabrics can be used to reduce friction and shear. Research has shown that the use of silk-like fabric undergarments, booties, and linen (alone or in combination) significantly reduces the incidence of developing pressure ulcers and reduces the deterioration of existing pressure ulcers (NPUAP, 2014).

PROPHYLACTIC DRESSINGS

A polyurethane foam dressing can be applied prophylactically to bony prominences (e.g., heels, sacrum) for the prevention of pressure ulcers in anatomical areas frequently subjected to friction and shear. Multiple studies have shown that patients who received a foam dressing developed far fewer pressure ulcers than those who did not. The dressings helped to reduce friction, shearing, and moisture damage (NPUAP, 2014).

Considerations when selecting a prophylactic dressing include:

- Ability of the dressing to manage microclimate
- Ease of application and removal
- Ability to regularly assess the skin
- Anatomical location where the dressing will be applied
- The correct dressing size based on area to be protected
Foam dressings have a greater ability to absorb moisture than film or hydrocolloids and often have easy-to-lift borders. Some dressings adhere well but can damage fragile skin on removal. All other preventive measures must be continued along with the dressings; the skin must still be inspected daily and the dressings replaced as needed (NPAUP, 2014).

**Preventing Pressure Ulcers in Special Populations**

**PATIENTS WITH MEDICAL DEVICES**

With the recognition that the use of medical devices can contribute to pressure ulcer formation, NPUAP has also developed “Best Practices for Prevention of Medical Device-Related Pressure Injuries” (NPUAP, 2016b). These include:

- Choose the correct size of medical devices to fit the individual.
- Cushion and protect the skin with dressings in high-risk areas (e.g., nasal bridge).
- Remove or move the device daily to assess skin.
- Avoid placement of devices over sites of prior or existing pressure injury.
- Educate staff (and caregivers) on correct use of devices and prevention of pressure injury.
- Be aware of edema under devices and potential for pressure injury.
- Confirm that devices are not placed directly under an individual who is bedridden or immobile.

**BARIATRIC PATIENTS**

Pressure ulcer prevention and treatment for the bariatric patient is similar to that for nonbariatric patients; however, it is more challenging for a number of reasons:

- The bariatric patient has increased difficulty moving either independently or with assistance.
- Increased body weight makes it difficult to view bony prominences and to redistribute pressure.
- Shear and friction are often increased, as the patient is inclined to drag the heels and sacrum when getting out of bed.
- The increased pressure on the bowel and bladder from abdominal weight increases the risk of stress incontinence and diaphoresis, which increases the risk of skin maceration.
- Obesity can compromise respiration due to impaired diaphragmatic movement and subsequent impaired tissue perfusion.
• Pressure ulcers develop over bony prominences but may also result from tissue pressure across the buttocks and other areas of high adipose tissue concentration. They may develop in unique locations, such as underneath folds of skin and in locations where devices may have been compressed between skin folds.

• The weight of the pannus (the skin “apron”) can cause pressure ulcers to develop in areas such as the hip, thighs, trunk, and torso.

• Skin must be checked for maceration, which is common due to increased diaphoresis.

• Additional positioning devices may be needed to offload the pannus or other large skin folds.

• Infection and delayed healing are more common.

• Deeper tissue layers can impede assessment of cavity wounds and increase the risk of retained wound dressings.

• Equipment must be provided that is the appropriate size and great care taken that neither the patient nor the staff are injured during the provision of care. (NPUAP, 2014)

It is important that the clinician recognize the difference between intertriginous dermatitis (intertrigo) and stage I and II pressure ulcers (NPUAP, 2014). Intertrigo is an inflammatory skin condition that affects opposing skin surfaces, caused by trapped moisture and friction between the opposing skin folds (i.e., skin rubbing against skin) (WOCN, 2016b).

Intertrigo can progress to severe inflammation with mirrored areas of skin erosion or even ulceration. Linear skin tears at the base of the skin fold occur when the skin is pulled or stretched when skin folds are separated, such as occurs during cleaning. Complications include secondary infections such as candidiasis and bacterial infections. These erosions and skin tears are not pressure ulcers.

Bariatric patients are at high risk for this dermatitis because their multiple skin folds form ideal conditions for inflammation and maceration. The differentiation on whether the lesion is intertrigo or a pressure ulcer will be based on the etiology of the skin damage and the appearance (see the definitions of stage 1 and 2 pressure injuries later in this course). The most common areas for intertrigo to develop are under the pannus, the breasts, between the buttock cheeks, and in the groin or perineum.

PEDIATRIC PATIENTS

Pressure ulcers are a significant concern for the pediatric population (NPUAP, 2014). Pressure ulcer incidence rates have been reported as high as 27%, with the highest rates in those children with chronic illness and those with medical devices.
Pressure ulcers in children cannot be presumed to be uncommon, and a pressure ulcer risk assessment is as important in this population as it is in adults. There are pressure ulcer risk assessment tools for pediatrics. Two of them are the Braden-Q and the Pediatric Pressure Ulcer Prediction and Evaluation Tool (PPUPET) (Sterken et al., 2015). (See “Resources” at the end of this course.)

Several factors are associated with pediatric pressure ulcer development:

- Low birth weight
- Skin texture (e.g., neonatal skin is very thin)
- Incubator temperature and humidity
- Support surface used
- Limited position changes
- Endotracheal intubation
- Incontinence
- Poor tissue perfusion
- Fever
- Larger head proportion to the body, putting the occiput at high risk for pressure ulcer development

Consider children with medical devices to be at risk for pressure ulcers. At high risk are those with mechanical ventilation, including tracheostomies, CPAP or BPAP, and ECMO. One study showed that for children hospitalized at least 24 hours, 40% of them with an external medical device were assessed as having a pressure ulcer related to the device. The clinician must inspect the skin under and around medical devices at least twice a day for signs of a pressure-related injury (NPUAP, 2014).

As in adults, assessment and monitoring, involvement of the family, nutritional management, support surfaces, and repositioning are important.

Wound care strategies and dressing selections must be taken with great care, as baby skin is more permeable and more fragile than adult skin, with the result that products commonly used on adults may not be appropriate for children, such as skin preps, barrier products, antimicrobials, and adhesives. Wound care product choices should be discussed with pediatric specialists.
Pressure ulcers are staged to classify the degree of tissue damage that is present. The staging system was originally created in 1975 as a means to describe the amount of anatomical tissue loss in a pressure ulcer. The use of stages in pressure ulcer assessment is a way to classify the amount and type of tissue destroyed based on anatomic depth. Having and using a common classification system allows all clinicians a way of communicating accurately about what is wrong. It is only used to describe pressure ulcers, not other wounds.

The clinician must first determine the etiology of the injury being assessed and the presence of pressure and/or shear. If these factors are not present, the injury is not a pressure injury. First, the ulcer is cleansed to remove loose debris and to validate the etiology is pressure or shear; then the staging system is used to stage the injury appropriately. When labeling a pressure injury, it is important to use correct anatomical terms to identify its location on the body.
Stage 1 Pressure Injury (Stage I Pressure Ulcer)

A stage 1 pressure injury is indicated by **intact skin with a localized area of nonblanchable erythema** (which may appear differently in darkly pigmented skin) (see images). Presence of blanchable erythema or changes in sensation, temperature, or firmness may precede visual changes. Color changes in stage 1 pressure injuries do not include purple or maroon discoloration; these may instead indicate deep tissue pressure injury (see “Deep Tissue Pressure Injury” below).

Blanchable erythema (redness) means that when the red area is compressed by the finger, the area turns white or pale and the redness returns when the pressure is released. Nonblanchable erythema means the area under the finger remains red as it is compressed. Nonblanchable redness indicates that tissue damage has already occurred.

Blanchable versus nonblanchable erythema. (Source: © NPUAP, used with permission.)
Pressure Ulcer Prevention and Treatment

Stage 1 Pressure Injury

Terminology

Slough is a soft, moist, avascular tissue. It may be white, yellow, tan, or green; loose or firmly adherent; and described as resembling chicken fat.

Eschar is black or brown necrotic tissue. It can be loose or firmly adherent; hard, soft, or boggy; and look like a scab, although there is no healing occurring beneath it.

Undermining is tissue destruction to underlying, intact skin along the wound edges.

Tunneling is a path of tissue destruction that occurs in any direction from the surface or edge of the wound.

Stage 2 Pressure Injury (Stage II Pressure Ulcer)

A stage 2 pressure injury is indicated by partial-thickness loss of skin with exposed dermis (see images). The wound bed is viable, pink, or red; moist; and may also present as an intact or ruptured serum-filled blister. Adipose (fat) and deeper tissues are not visible. Granulation tissue, slough, and eschar are not present. These injuries commonly result from adverse microclimate and shear in the skin over the pelvis and shear in the heel.

It is especially important that the presence or history of pressure and/or shear be confirmed in a suspected stage 2 pressure injury. This stage should not be used to describe moisture-associated skin damage (MASD), including incontinence associated dermatitis (IAD), intertriginous dermatitis (rashes in skin folds), medical adhesive–related skin injury, or traumatic wounds (skin tears, burns, abrasions).
Stage 2 pressure injuries heal by reepithelialization and not by granulation tissue formation (i.e., by return of intact skin and not by scarring). At times the superficial fascia under the dermis is visible and evident as a thin, ivory-colored, nonremovable layer. A viable dermis is pink or red, shiny, and blanchable; it is not granular.

“Partial thickness” means that the damage is confined to the epidermis and/or dermis but does not penetrate below the dermis.

Stage 2 Pressure Injury

![Diagram of Stage 2 Pressure Injury](image1)

Stage 2 pressure injury, with exposed dermis. (Sources: [illustration] © NPUAP, used with permission; [photo] © WOCN, used with permission.)

Stage 3 Pressure Injury (Stage III Pressure Ulcer)

A stage 3 pressure injury is indicated by **full-thickness loss of skin**, in which adipose (fat) is visible in the ulcer and granulation tissue and epibole (rolled wound edges) are often present (see images). Slough and/or eschar may be visible. Undermining and tunneling may occur. Fascia, muscle, tendon, ligament, cartilage, and/or bone are **not** exposed. When slough or eschar obscures the extent of tissue loss, the injury is considered unstageable.

The depth of a stage 3 pressure injury varies by anatomical location. The bridge of the nose, ear, occiput, and malleolus do not have subcutaneous tissue, and stage 3 injuries here will be shallow. In contrast, areas of significant fat deposits can develop extremely deep stage 3 pressure injuries. Accurate staging is based on assessment of the extent of damage and the visible tissue layer, **not** depth.
Stage 3 Pressure Injury

Stage 4 Pressure Injury (Stage IV Pressure Ulcer)

A stage 4 pressure injury is indicated by full-thickness skin and tissue loss with exposed or directly palpable fascia, muscle, tendon, ligament, cartilage, or bone in the ulcer (see images). Slough and/or eschar may be visible. Epibole (rolled edges), undermining, and/or tunneling often occur. Depth varies by anatomical location. As bone may be in the ulcer, clinicians should consider the presence of osteomyelitis in stage 4 pressure injuries. When slough or eschar obscures the extent of tissue loss, the injury is considered unstageable.

Stage 4 Pressure Injury

Stage 4 pressure injuries. (Sources: [illustration] © NPUAP, used with permission; [photo] © Association for the Advancement of Wound Care (AAWC), used with permission.)
Unstageable Pressure Injury (Unstageable Pressure Ulcer)

An unstageable pressure injury is indicated by full-thickness skin and tissue loss in which the extent of tissue damage within the ulcer cannot be confirmed because it is obscured by slough or eschar (see images). If slough and eschar is removed, a stage 3 or stage 4 pressure injury will be revealed because slough and/or eschar do not form in stage 1 or 2 injuries.

Clinicians should bear in mind that “unstageable” refers to the inability to visualize the wound base rather than the clinician’s inability to determine the injury stage.

Stable eschar (i.e., dry, adherent, intact without erythema or fluctuance) on the heel or ischemic limb should not be softened or removed. Stable eschar acts as the body’s natural or biological cover dressing. Removing stable eschar in the poorly perfused area results in an open wound that may expose the body to infection and decrease the ability to heal. Treat stable eschar on a poorly perfused area as dry gangrene; do not moisten or soften it. The most important intervention when managing this type of injury is pressure redistribution rather than eschar removal. As the eschar loosens from the wound bed, trim the edges to avoid inadvertent removal.

Deep Tissue Pressure Injury (DTPI) (Suspected Deep Tissue Injury [SDTI])

A deep tissue pressure injury is indicated by intact or nonintact skin with localized area of persistent nonblanchable, deep red, maroon, purple discoloration or epidermal separation revealing a dark wound bed or blood-filled blister (see images). Pain and temperature change often precede skin color changes. Discoloration may appear differently in darkly pigmented skin. DTPI is not used to describe vascular, traumatic, neuropathic, or dermatologic conditions.

This injury results from intense and/or prolonged pressure and shear forces at the bone-muscle interface. The wound may evolve rapidly to reveal the actual extent of tissue injury, or may...
resolve without tissue loss. If necrotic tissue, subcutaneous tissue, granulation tissue, fascia, muscle, or other underlying structures are visible, this indicates a full-thickness pressure injury (unstageable, stage 3, or stage 4).

It must be confirmed that the purple skin (appearing as ecchymoses or bruising) is due to pressure or shear and not a response to medication or trauma. Identifying the timing and setting of the pressure/shear that led to the deep tissue pressure injury will help in analyzing the cause. Documentation includes the evolution of the injury after discovery (sloughing of the epidermis that reveals deeper tissue damage) and, if injury becomes full thickness, the stage of the resultant injury.

Additional Pressure Injury Definitions

The National Pressure Ulcer Advisory Panel has also updated definitions for the following two additional types of pressure injuries (NPUAP, 2016a):

**MEDICAL DEVICE–RELATED PRESSURE INJURY**

Medical device–related pressure injuries result from the use of devices designed and applied for diagnostic or therapeutic purposes. The resultant pressure injury generally conforms to the pattern or shape of the device. The injury should be staged using the staging system.

The skin must be examined under the device. Some devices are easily removed or moved for assessment; others may require two people to assist, such as under a tracheostomy if the patient is agitated and likely to grab at the device. Pressure reduction under a medical device can occur
when thin dressings are applied between the device and the skin. These dressings (thin silicone foams, hydrocolloids, etc.) should be applied before the device is applied, as it may be difficult to lift the device later to apply the dressing.

This type of wound should be documented, for example, as “stage 4 pressure injury on bridge of nose from a medical device.” The name of the device should be included in documentation to allow for analysis of the injury.

MUCOSAL MEMBRANE PRESSURE INJURY

Mucosal membrane pressure injury is found on mucous membranes with a history of a medical device in use at the location of the injury (see image). Mucosal tissues are especially vulnerable to pressure from medical devices such as oxygen tubing, endotracheal tubes, bite blocks, nasogastric tubes, urinary catheters, and fecal containment devices.

Because the staging system for pressure injuries is based on the anatomy of the skin, it cannot be used to stage mucosal pressure injuries. Nonblanchable erythema cannot be seen in mucous membranes; shallow open ulcers indicating superficial skin loss in the epithelium are so shallow that the naked eye cannot distinguish them from deeper, full-thickness ulcers.

The injured mucosal membrane is often inflamed and may be tender and edematous. It does not form slough or eschar. Scars do not form in mucous membranes. The medical device should be repositioned to reduce pressure. Stabilizing systems can be used to hold tubes in place without pressure.

Since the staging system cannot be used, the clinician should document the pressure injury as a “mucosal membrane tissue injury” on the body area (lip, urethra, nares, tongue, labia, etc.) and document the name of the actual device that caused the injury.

Mucosal membrane pressure injury. (Source: © NPUAP, used with permission.)
Reverse Staging

The term reverse staging came about in the 1980s as a way of describing improvement in an ulcer. However, this term does not accurately describe what is physiologically occurring in the ulcer. Because staging is used only to describe the amount and type of tissue destroyed based on anatomic depth, it cannot be used to describe healing.

As a pressure ulcer heals, it does decrease in depth, but the body does not replace the lost bone, muscle, subcutaneous fat, or dermis. Instead, the full-thickness ulcer is filled with granulation, or scar tissue, and then covered with new epithelium. Even a partial-thickness stage 2 injury does not return to the nonblanchable redness of a stage 1 injury. A stage 4 pressure injury that has closed should be classified as a closed stage 4 pressure injury. If a pressure ulcer reopens in the same anatomical site, the ulcer resumes the previous staging diagnosis—once a stage 4, always a stage 4 (NPUAP, 2000).

NPUAP CLARIFICATIONS

On January 24, 2017, the NPUAP issued “Position Statement on Staging—2017 Clarifications” to address the many requests it had received for clarification of the its 2016 pressure injury guidelines. The statements are summarized here.

Position Statement 1: The diagnosis of a “pressure injury” does not mean that the healthcare provider(s) “caused” the injury. Pressure injury simply means the tissue is injured by pressure (and/or shear). It does not assign blame or in any way imply that the injury was “caused” by anything that healthcare providers “did” or “failed to do.” The word injury occurs frequently in the medical literature (e.g., kidney injury, spinal cord injury, closed head injury) to identify the existence of tissue injury, without assigning blame.

Position Statement 2: Some pressure injuries are unavoidable despite provision of evidence-based care by the healthcare team. NPUAP has long maintained that some pressure injuries are unavoidable. Evidence must be presented to support a theory of causation based on a careful analysis of the preventive care provided (or not provided) to the individual in accordance with acceptable standards of evidence-based pressure injury prevention.

Position Statement 3: The numerical staging system does not imply linear progression of pressure injuries from stage 1 through stage 4, nor does it imply healing from stage 4 through stage 1. NPUAP has long maintained this position and issued a position statement against “down staging” as early as the year 2000.

Position Statement 4: The NPUAP Staging System classifies pressure injuries based on the type of tissue loss that can be visualized or directly palpated. Pressure injuries can be staged if the type of tissue injured can be visualized or directly palpated (as with stage 4, when exposed bone is visible or
directly palpated). But because there are limitations to what can be seen, two additional options for staging are provided: 1) unstageable pressure injuries to address situations where the wound base is obscured by slough and/or eschar and 2) deep tissue pressure injury (DTPI), where the skin may be intact but is purple or maroon, indicating deeper tissue damage has occurred.

Position Statement 5: The pressure injury may be more extensive than initially apparent. The wound base and surrounding tissue should be assessed for variations in sensation, temperature, firmness, color, and any expression of drainage from surrounding tissues when palpated. Tissue surrounding the “visible injury” should be assessed for changes (e.g., pain, temperature, firmness, color, and drainage) which may alert the clinician to more extensive damage than is readily visible. Additional findings should be described and documented.

Position Statement 6: Deep tissue pressure injury (DTPI) may evolve into a full-thickness wound despite optimal care. A DTPI may evolve rapidly to reveal the actual extent of tissue injury, or may resolve without tissue loss. Off-loading the area still offers the best chance for tissue that is ischemic or injured but not infarcted.

Position Statement 7: Any pressure injury should be treated in accordance with current evidence-based practices and monitored closely for changes that require reevaluation of treatment strategies.

NPUAP Staging System revisions are designed to improve the accuracy of staging when reporting “new” or “worsening” pressure injuries. NPUAP will continue to work with CMS (Center for Medicare and Medicaid Services) on further refinements of quality measures to more accurately monitor healing versus deterioration.

NPAUP has released three revisions of the staging system, in 1989, 2007, and 2016. Each was based on the best available evidence of the time. NPUAP has provided the gold standard for pressure injury diagnosis and classification for nearly three decades and will continue to do so to “improve patient outcomes in pressure injury prevention and treatment through public policy, education, and research.”


PRESSURE ULCER TREATMENT

Treating a pressure ulcer involves all of the activities used in preventing a pressure ulcer: the proper pressure-reducing surface, repositioning the patient correctly and frequently, maintaining intact skin, and improving nutrition. While these interventions are started, the treatment of the
wound itself also begins. There are basic wound care principles that can be used in deciding which treatments will be the best for the wound and for the patient. Frequent reassessment of the wound and its response to the treatment is required, as well as eliminating or reducing the factors that inhibit wound healing.

Of all the interventions that must be done to heal the ulcer, **pressure reduction measures are the most important**. Simply put, the wound will not heal unless the pressure is removed. Trying to heal a pressure ulcer without reducing the pressure is like trying to heal a stab wound with the knife still in it. There might be some improvement, but the wound will never heal because the primary cause has not been removed. (Techniques to reduce pressure are discussed earlier in this course.)

The object of pressure ulcer treatment is to reproduce (to the best of one’s ability) the normal environment of the exposed tissue of the wound. The normal environment of all tissue and cells, with the exception of the epidermis, is warm, dark, moist, and protected.

In order to heal any wound, including pressure ulcers, some **basic principles and management strategies** need to be followed (WOCN, 2016a). The strategies for pressure ulcer treatment are:

- Cleanse the wound and periwound at each dressing change.
- Manage wound infections.
- Debride the pressure ulcer of devitalized or necrotic tissue.
- Utilize appropriate dressings.

Some of these strategies will require medical intervention; others, good clinical care. By carrying out these strategies, caregivers will provide the wound with the environment it needs to heal.

**Pain Management**

Before treatment begins, clinicians address the patient’s pain. Pressure ulcers hurt. The pain may be constant and severe, and it may be the most distressing pressure ulcer symptom that the patient reports. Pressure ulcer pain can be **caused** by:

- Pressure, friction, shear
- Damaged nerve endings
- Inflammation
- Infection
- Procedures and treatments
  (NPUAP, 2014)

Multiple studies have shown that the pain increases as the stage increases (WOCN, 2016a; NPUAP, 2014). The words most frequently used to describe pressure ulcer pain in all stages (2–4) include “tender,” “hurting,” “burning/hot burning,” “sharp,” “throbbing,” and “aching.” The
pain can occur when the patient is at rest and when no treatments are being done. The greatest pain occurs with dressing changes and wound care. Thus, pain must be assessed before, during, and after wound care and prevented/treated accordingly.

It should not be assumed that because the patient is paralyzed that the body cannot feel or respond to pain. Similarly, it should not be assumed that the patient with dementia, who never complains of pain, does not in fact have pain. The clinician should assume that if the wound would cause oneself pain, it is causing the patient pain. Assess and treat accordingly.

Some **wound care strategies** that can help reduce pain are:

- Organize care to coordinate it with pain medication administration.
- Encourage patients to request a “time out” during procedures, and then be sure to give a time out.
- Reduce the pain by keeping the wound bed covered and moist, and use a nonadherent dressing.
- Select dressings that require less frequent changes such as hydrocolloids, hydrogels, alginates, foams, and soft silicone dressings.
- Protect the periwound skin with liquid film barriers or barrier ointments or creams to prevent skin damage from drainage and tape stripping.
- Encourage repositioning as a way to reduce pain, and use appropriate support surfaces.
- Provide pain medication prior to procedures.
  (NPUAP, 2014)

**Topical analgesics** can be applied to the wound prior to dressing changes. Topical lidocaine gels, creams, sprays, and patches are now available over the counter in concentrations as high as 5%. Lidocaine should be used with caution in wounds with large surface areas, as it can be absorbed through the wound and possibly cause neurologic or cardiovascular adverse side effects. EMLA cream (a eutectic mixture of local anesthetics, namely lidocaine and prilocaine) is another product used for topical analgesia. It must be in contact with the wound for at least 20 minutes under occlusion (e.g., plastic wrap over the top) and is quite effective (WOCN, 2016b).

**CASE**

Bill is a 76-year-old male with a history of multiple strokes (CVAs) and respiratory failure. He has a tracheostomy (but is able to breathe on his own), a G-tube for enteral feeding, and a urinary catheter. He’s been admitted with pneumonia and has community-acquired stage 4 pressure injuries on his sacrum and left ischium.

Bill cannot speak but makes eye contact, shakes his head yes and no appropriately to questions, and is usually smiling. He always shakes his head no when asked if he is having pain. After a
few days of doing his wound care, the nurse notices that during care he is frowning, his breathing rate is a little faster, and he closes his eyes. When asked if he is having pain, Bill indicates no, but the nurse believes that he might be hurting.

The nurse discusses this with the physician, who agrees that a dose of oral pain medication can be given through the G-tube an hour before wound care. The physician also agrees to the nurse’s suggestion for the use of 2% lidocaine gel applied to the wound beds and allowed to remain in place for 10 to 15 minutes prior to wound care. With these additions to his care plan, Bill no longer frowns and seems a bit more relaxed during wound care. Bill’s son has noticed this as well and thanks the nurse for his father’s care.

Wound Cleansing

Cleansing is the important first step in preparing the pressure ulcer wound bed to heal by removing surface debris and dressing remnants and allowing better wound visualization for assessment. The goal is to flush away exudate without damaging tissues.

How often a wound is cleansed is determined by the amount of drainage (e.g., heavily draining wounds may need to be cleansed three to four times a day), dressings used, and wound care treatment orders. The wound and periwound are cleansed at each dressing change, minimizing trauma to the wound.

While no specific studies demonstrate the superiority of a particular wound-cleansing product or technique for pressure ulcers, NPUAP (2014) and WOCN (2016a) offer some recommendations:

CLEANSING SOLUTIONS

Most pressure ulcers can be cleansed with potable water (i.e., water suitable for drinking), water that has been boiled and cooled, or normal saline. A pressure ulcer is a chronic, nonsterile wound and thus water is appropriate for cleaning. When possible, showering a patient using a hand-held spray can do a good job of cleaning the wound and the surrounding skin.

Cleansing solutions with surfactants and/or antimicrobials can be used if there is confirmed or suspected infection. Surfactants help remove wound contaminants. Avoid using cleansing products or solutions in open wounds that are intended for use on intact skin and/or designed to remove fecal material. These products can be toxic to the wound bed. Skin cleansers used on intact periwound skin are appropriate.

Aseptic techniques are to be considered if the patient or the wound is immunocompromised or if the wound enters a sterile body cavity.

CLEANSING TECHNIQUES

Techniques for cleansing may include irrigation, pressurized irrigation/pulsatile lavage, gently swabbing the wound, showering, or bathing.
**Scrubbing devices** such as cloths or sponges can increase the efficacy of the cleansing solution. However, it is important to minimize trauma to the wound bed by using as little force as necessary to achieve cleansing. Wounds scrubbed with coarse sponges are at significantly higher risk for infection than wounds scrubbed with softer sponges.

**Pressurized irrigation** may be needed in the presence of slough or necrotic tissue. Pressure should be adequate to clean the surface without causing trauma. This can be done with a 35 ml syringe and a 19-gauge needle or angiocatheter or with one of several commercial devices for this use. In many institutions, physical therapists perform the irrigations. Environmental contamination can occur, and thus infection control precautions should be routinely followed.

Cleanse **pressure ulcers with tunneling or undermining** with caution to avoid instilling solution that might not be retrieved.

**Managing Wound Infections**

Pressure ulcers are the consequence of ischemia and are more susceptible to the development of infection than other wounds since the tissue does not receive normal nutrition, oxygen, immune cells, antibodies, and antibiotics. Other risk factors for infection compromise the host’s defenses, such as malnutrition.

Infection is not common in stage 1 or 2 pressure injuries, so the focus on assessment of infection is on stage 3, 4, and unstageable injuries. In a recent study of hospitalized patients with pressure ulcers, 76% of the ulcers were infected, 50% of the patients had bacteremia, and the ulcers were a major reservoir of multidrug-resistant organisms (WOCN, 2016a).

**CLINICAL INDICATORS OF INFECTION**

In chronic wounds such as pressure ulcers, bacteria may be present and interfere with wound healing without the classic signs/symptoms of infection being displayed. **Critical colonization** is a term used to describe the point at which bacteria on the wound’s surface interferes with healing. Signs of critical colonization include an unexplained plateau in healing, deterioration of granulation tissue, and increased drainage without odor.

Clinical indicators of **localized infection** include:

- New or increased pain
- Lack of signs of healing for two weeks
- Friable granulation
- Discolored tissue in the wound bed
- Changed or increased odor
- Increased drainage
- Induration (firmness)
• Necrotic tissue
• Pocketing or bridging

Clinical signs of spreading or systemic infection include:

• Erythema extending from the wound edges
• Induration
• New or increased pain
• Purulent drainage
• Increased size
• Crepitus or fluctuance
• Discoloration in the surrounding skin
• Fever and malaise
• Confusion, delirium, or anorexia, especially in older adults

OTHER RISK FACTORS FOR INFECTION

In addition to the signs/symptoms of infection, the clinician should have a high index of suspicion for the likelihood of infection in pressure ulcers that:

• Have necrotic tissue or a foreign body present
• Have been present for a long time
• Are large in size or deep
• Are likely to be repetitively contaminated, such as those near the anus

And in individuals with:

• Diabetes
• Protein-calorie malnutrition
• Hypoxia or poor tissue perfusion
• Autoimmune disease
• Immunosuppression

WOUND CULTURE

Wound cultures are used to confirm or modify the plan of treatment when antibiotic therapy is indicated, and the results should be compared to the clinical picture (WOCN, 2016b). The gold standard method for obtaining a culture is a tissue biopsy, as this reflects the bacteria invading the wound, not just those on the surface.
However, a biopsy can be difficult to obtain, and thus the **swab technique**, while at high risk for contamination by surface debris and skin contaminants, is the most commonly used. Because of the high risk for contamination, it is imperative that clinicians use optimal technique when obtaining the specimen (WOCN, 2016b; NPUAP, 2014).

There are two guidelines that are essential to accurate and valuable information. The first is adherence to the optimal time frame for transport of the specimen to the lab. Use of culture specimen containers and tubes that stabilize and fix the bacteria reduces the risk of bacterial replication or death and allow for a reasonable time frame for transport; particularly important for cultures obtained in the home, an outpatient center, or a skilled nursing facility. The second guideline is to carefully and accurately obtain the specimen.

Modern moisture retentive dressings are designed to maintain an ideal environment and are left in place for several days. The accumulated exudate found upon removal of these dressings usually contains bacteria from the surface of the wound and the surrounding skin. Swab cultures of this exudate are likely to generate high numbers of microbes that may not reflect actual bacterial status of the wound and can lead to initiation of systemic antibiotic therapy targeting organisms that are not negatively affecting the wound.

**SWAB TECHNIQUES**

A technique called the **Z-Stroke** involves starting at the top of the wound, pressing the swab into the wound surface, and moving it from skin edge to skin edge in a “Z” pattern down to the bottom of the wound. The probability of contaminating the swab with resident skin bacteria or devitalized tissue on the wound surface is high.

A second swab procedure, called the **Levine technique**, decreases the accidental contamination of the swab and begins with wound cleansing prior to the obtaining the swab culture. The procedure is as follows:

- Remove or debride nonviable tissue if appropriate, since necrotic tissue harbors high numbers of microorganisms that may not be affecting healing.
- Clean the wound with a nonpreserved, nonantimicrobial cleanser such as normal saline to remove surface debris and residual dressing material.
- Wait two to five minutes.
- If the ulcer is dry, moisten the swab with sterile normal saline.
- Culture the healthiest-looking tissue in the wound bed.
- Do not culture exudate, pus, eschar, or heavily fibrous tissue.
- Rotate the end of a sterile wound culture swab over a 1 cm square area for five seconds.
- Apply sufficient pressure to the swab to cause tissue fluid to be expressed.
- Use sterile technique to break off the tip of the swab into the collection device (or follow manufacturer’s directions) and get the specimen to the lab.
The most common bacteria identified in pressure ulcers are *Staphylococcus aureus*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, and *Enterococcus faecalis*.

**TREATING INFECTION**

In general, **topical antibiotics are not recommended** for treating pressure ulcers. Patients with pressure ulcers are at high risk for acquiring antibiotic-resistant organisms. In addition, there is concern over side effects, resistance, and hypersensitivity reactions. If needed, a short course of topical antibiotics (two-week) could be used in wounds that have been debrided and cleansed but still have high bacterial counts. Silver sulfadiazine could be useful; metronidazole can be used in the treatment of malodor in fungating wounds or wounds with anaerobic infections (NPUAP 2014).

**Systemic antibiotics** should be used in patients with clinical evidence of systemic infections, such as positive blood cultures, cellulitis, osteomyelitis, or sepsis.

Besides systemic antimicrobial treatment, the clinician can optimize the patient’s ability to combat infection by:

- Evaluating nutritional status and addressing deficits
- Stabilizing blood sugar control
- Improving arterial blood flow
- Reducing immunosuppressant therapy if possible
- Preventing contamination of the ulcer with meticulous skin cleansing and use of dressings to prevent exposure to fecal matter

(See also “Antimicrobial Dressings” later in this course.)

**Debridement: Removing Necrotic Tissue**

Removing necrotic tissue is a critical step when healing the ulcer is the goal. By removing dead tissue, bacteria and the risk for infection are decreased as well as drainage and odor. Removing necrotic tissue may also contribute to the release of available growth factors in the wound, thus allowing the cells to multiply and heal the wound.

The removal of necrotic tissue is called debridement, of which there are several types:

- Surgical/sharp
- Conservative sharp
- Autolytic
- Enzymatic
- Larval or maggot
- Mechanical (including ultrasound and hydrosurgical)

The most appropriate type of debridement will depend on the patient’s overall condition and goals of care. Factors to consider include the status of the ulcer; the type, quantity, and location of the necrotic tissue; the presence or absence of infection; pain tolerance; the care setting; and professional accessibility (NPUAP, 2014).

Removing the necrotic tissue will often reveal the true size of the ulcer and the damage done—the “iceberg” effect. The patient and family should be educated that the ulcer will look worse after debridement and that the ulcer cannot heal without debridement.

**BIOFILM**

Debridement of biofilm can also help a wound progress towards healing. Bacterial biofilms are extremely common in the natural environment. They are known to cause chronic inflammation that contributes to many diseases, including periodontal disease (the plaque on teeth), surgical device infections, urinary catheter infections, chronic ear infections, and contact lens–associated eye infections.

Biofilms are complex microbial communities containing multiple species of bacteria and fungi. These organisms produce and secrete a matrix that firmly attaches the film (and bacteria in it) to a surface. This matrix protects the bacteria in it from antibodies and white blood cells and from antiseptics and disinfectants, making the repeated use of sharp or conservative sharp debridement the only effective way of removing them. Although a biofilm can reform within 4 to 24 hours, this time can help a wound start to heal.

Biofilms can be difficult to detect visually. Some studies have identified them as shiny, translucent, slimy layers on a wound bed that can be pale yellow or green. However, further studies are required to test the accuracy of this finding.

Suspicion of biofilm in a pressure ulcer should be high if the ulcer:

- Has been present for more than four weeks
- Lacks signs of any healing in the previous two weeks
- Displays clinical signs and symptoms of inflammation
- Does not respond to antimicrobial therapy


**SURGICAL/SHARP DEBRIDEMENT**

This form of debridement is performed by a surgeon or advanced practitioner at the bedside or in the operating room, using scalpel and scissors under general or local topical anesthetic. Surgical
debridement extends into viable tissue, and the resultant bleeding helps stimulate production of growth factors to aid in healing.

Surgical debridement is the quickest way to remove extensive necrotic tissue, undermining, and tunneling. The benefits of surgical debridement in the presence of advancing cellulitis, crepitus, fluctuance, and/or sepsis secondary to ulcer-related infection usually outweigh the risks. However, relative contraindications include anticoagulant therapy, bleeding disorders, and immune incompetence.

If the necrotic ulcer is on a limb, a thorough vascular assessment is conducted prior to debridement to rule out arterial insufficiency. The NPUAP recommends against debridement of stable, hard, dry eschar in ischemic limbs.

CONSERVATIVE SHARP DEBRIDEMENT

This technique uses scalpels, curettes, scissors, and forceps to remove clearly identifiable devitalized tissue above the level of viable tissue. This method removes necrotic tissue and decreases bacterial burden on the wound surface. It may be performed by specially trained, competent, qualified, and licensed healthcare professionals consistent with local, legal, and regulatory statutes.

Both surgical/sharp and conservative sharp debridement should only be performed in wound locations that have adequate blood flow to support the ability to heal. They are not performed on dry stable eschar on ischemic limbs or in other areas where healing is not expected.

AUTOLYTIC DEBRIDEMENT

This method allows the body to break down necrotic tissue by using its own enzymes and defense mechanisms. Autolytic debridement is accomplished with the use of occlusive dressings such as hydrocolloids and films. These dressings help maintain a moist wound environment, reduce pain, and provide a barrier to infections. The dressing is left on for a few days, allowing the accumulation of fluids and enzymes at the site. The dressing is removed, the wound cleansed, and new dressing applied. This method is effective but takes time, which varies by what is used and the wound’s response, usually about four weeks.

ENZYMATIC DEBRIDEMENT

This method involves the use of an enzyme debriding agent. This agent breaks down necrotic tissue without affecting viable tissue. The enzyme product is applied daily to the necrotic tissue and then covered by a moist dressing. Dry eschar needs to be scored or crosshatched prior to the use of the enzyme so the enzyme can penetrate the eschar. Enzymes are by prescription only, and currently only one (Santyl) is available on the market. It cannot be used with any dressings containing heavy metal ions, specifically silver or iodine, as these will reduce the activity of the enzyme.
LARVAL (MAGGOT) THERAPY

This method uses sterilized bottlefly maggots, which debride the wound by dissolving dead and infected tissue with their digestive enzymes (in other words, the maggots eat the dead tissue). The maggots also disinfect the wound by killing bacteria. This in turn stimulates the growth of healthy tissue. It should not be used in the presence of active hemorrhage or bleeding disorders, exposed blood vessels, limb- or life-threatening infection, necrotic bones or tendons, inadequate perfusion for healing, wounds in deep cavities or sinus tracts, or rapidly advancing tissue necrosis (WOCN, 2016b). (For further information, see “Resources” at the end of this course.)

MECHANICAL DEBRIDEMENT

Mechanical debridement utilizes physical forces to remove necrotic tissue. In the past, the most common type of mechanical debridement was the use of wet-to-dry dressings and whirlpools, but wet-to-dry dressings are no longer recommended. In this method, wet gauze is applied to the wound and necrotic tissue is allowed to dry and then forcibly removed without rewetting. The gauze will have stuck to the necrotic tissue, thus removing it when the gauze is removed. However, this method is nonselective in that healing tissue will also be removed, thus retraumatizing the wound bed and causing significant pain. The use of whirlpools has also fallen out of favor due to the difficulty in assuring that the equipment is free of pathogens before its use on the next patient.

Low-frequency ultrasound (ultrasonic mist) is increasingly being used to remove devitalized tissue. It has been found to reduce purulent drainage and assist with debridement. This requires trained clinicians and specialized equipment to administer.

<table>
<thead>
<tr>
<th>COMPARISON OF DEBRIDEMENT TYPES</th>
</tr>
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<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td>Conservative sharp</td>
</tr>
<tr>
<td>Enzymatic (collagenase)</td>
</tr>
<tr>
<td>Autolytic</td>
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<tr>
<td>Larval/maggot</td>
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</tbody>
</table>
Dressings

Wound dressings are a central component of pressure ulcer care since the appropriate selection and use of dressings can facilitate pressure ulcer healing. The selection of the dressing for the ulcer is very important and based on many parameters, such as:

- Presence of infection or necrosis
- Size, depth, and presence of undermining or tunneling
- Location
- Type of tissue in wound bed
- Drainage/exudate
- Condition of the periwound skin and tissue
- Goals for healing
- Individual or caregiver needs, such as pain reduction or odor control
- Cost/reimbursement of the dressing
- Availability
- Ease of use
  (WOCN, 2016b)

Maintaining a moist wound is a primary factor in dressing selection. It has been accepted that wound healing is optimized when the wound is kept in a moist environment rather than air-dried or dried with heat lamps or topically applied drying agents (NPUAP, 2014). If the ulcer is draining a large amount, then a dressing that will absorb but not dry out the wound is needed. If the ulcer has minimal drainage, then a dressing that replaces moisture and/or does not allow the ulcer to dry out is needed.

Dressings are also changed based on the amount of drainage. A heavily draining wound will need to be changed often, while a minimally draining wound can be changed less than daily.

The type of dressing needed or indicated may change over time as the pressure ulcer heals or deteriorates. The wound must be monitored at every dressing change and regularly assessed to determine whether the type of dressing being used is appropriate or should be modified.

Manufacturer’s recommendations should be followed, especially related to frequency of dressing changes. The plan of care should guide the dressing changes and wear times and contain plans for dressing changes as needed (for family, the patient, and staff) due to soilage, loosening, etc. All of the wound dressing product is to be completely removed with each dressing change.

It is important to note, however, that every time a dressing is removed and the wound cleansed, the temperature of the wound bed drops to room temperature. The body then must expend energy to bring the wound bed back to body temperature so that cell repair and growth can continue.
This can take several hours. Less-frequent dressing changes aid the wound in healing by giving it time to do so.

**DRESSING TYPES**

*Hydrocolloid*

Hydrocolloid dressings (e.g., Duoderm) are occlusive, wafer-type dressings made of gelatin materials combined with other products to create a self-adhesive dressing. Some also have a thin border of adhesive around the edge of the dressing. The hydrocolloid interacts with the wound drainage to form a gel, which allows it to come off the wound without damaging it. This gel can resemble purulent drainage, but it is not. (The clinician should assess the wound after cleansing to determine if the wound is infected; such a determination cannot be made according to drainage alone).

Because the dressing is occlusive, water vapor from perspiration cannot evaporate, and only small amounts of wound drainage can be absorbed, which causes leakage. Hydrocolloids are not used in infected wounds, since infected wounds have increased drainage. They are a good choice for shallow wounds with minimal drainage, such as stage 2 and shallow stage 3 pressure injuries.

They should only be used on body areas where they will not roll or melt. They can be used as cover dressings, with filler dressings used underneath deeper ulcers to fill dead space. They are also used for autolytic debridement because they maintain a moist wound environment that assists the body in removing dead tissue. They can prevent contamination of the wound from incontinence.

Hydrocolloid dressings are easy to apply and come in many shapes and sizes for different body areas. These dressings have strong adhesives and should not be used if the dressing needs to be changed more than three times per week. They should be removed carefully to reduce skin trauma.

*Transparent Films*

These dressings were originally designed to cover intact skin over IV sites. They cannot absorb drainage from a wound. They can be used to protect body areas at risk for friction injury and used to support autolytic debridement. They may be used as a secondary dressing to hold in other dressings and to protect a dressing from urine and stool. They should be removed carefully.

*Hydrogels*

Solid gel dressings and liquid (amorphous) gels are designed to hydrate the wound. The gels are applied directly to the wound or to another dressing first, such as gauze. A cover
dressing is needed to help to retain the moisture, such as a hydrocolloid or a transparent dressing.

Solid or wafer-type gel dressings can absorb varying amounts of drainage and promote autolysis due to the moist environment they create. They also have a cooling effect, which can decrease pain. The moist environment promotes wound healing and can assist in autolytic debridement. Other advantages are reduced wound pain, as the gels do not adhere to the wound surface, and decreased dressing time and frequency.

Amorphous gels are best for ulcers located in areas where the dressing is likely to move or shift, such as on a lower leg. Sheet gels are best on ulcers on nonmoving body parts. Generally, these dressings are used on shallow, minimally draining ulcers.

**Alginates**

Alginate dressings, commonly referred to as calcium alginate or seaweed dressings, are able to absorb exudate and maintain ulcer bed moisture. They allow for nontraumatic removal. They can be left in an ulcer for several days, decreasing the frequency of dressing changes; the frequency of dressing changes is usually one to three days. They are indicated for moderately to heavily draining ulcers only. If the ulcer is heavily draining, the cover dressing used should be absorptive as well.

They come in sheet or rope forms. The clinical choice between the sheet or rope forms is based on the depth and shape of the ulcer. If the ulcer is deep, alginate sheets should not be “stacked” to fill the ulcer; this is unnecessarily expensive. In an ulcer that is deep and draining heavily, the alginate is placed on the ulcer bed and fluffed gauze is used as a secondary filler for additional absorption. They should not be used in tunnels.

Alginate fibers are not biodegradable and so must be completely removed from the ulcer bed during cleaning. Because they have minimal antimicrobial properties, they are generally not used as the primary or only treatment for infected ulcers.

**Hydrofiber**

These dressings are similar to alginate dressings but composed instead of carboxymethylcellulose. They are highly absorptive, and when exposed to drainage, they form a gel. They are available plain and with antimicrobials, in sheets or ropes. They are nonadherent and require a secondary dressing. Dressing change frequency depends on the amount of drainage and the ability of the secondary dressing to absorb, but typically ranges from one to three days. They can be used in stage 3 and 4 pressure injuries.

**Foam**

Foam dressings are most commonly made of polyurethane and contain small, open cells for absorbing exudate. How much they absorb depends on the specific dressing. They
come in a variety of shapes and sizes, with and without antimicrobial agents, and in adhesive and nonadhesive types. They are used as both primary and secondary dressings and can be used on low- to heavily draining wounds. They can be used as primary dressings for draining stage 2 and shallow stage 3 injuries and as cover dressings for deeper stage 3 and 4 injuries.

Frequency of dressing changes depends on the amount of drainage and the absorptive capacity of the foam. They must be changed before they become soaked to prevent periwound maceration and bacterial invasion.

They are not appropriate for use on dry wounds or wounds with minimal drainage. They cannot promote autolysis of dry eschar.

**Gauze**

Gauze is a common dressing used for wound cleansing and as a wick, filler, or cover dressing. Gauze can be moistened with saline or an antiseptic agent and can be used for both clean and dirty wounds. It comes in a variety of forms, both plain and antimicrobial. Nonwoven gauze should be used for dressings in a wound, since woven gauze has loose fibers that can become embedded in the wound and act as foreign bodies.

Gauze should be moistened before placing in the wound. It does not absorb well, dries quickly, and thus requires more frequent dressing changes. It is more likely to stick to the wound surface than other products, which can cause trauma when removed. It is best as a cover dressing, not a primary dressing. If gauze is all that is available, then nonwoven is best, moistened and fluffed into the wound bed to fill defects and dead space and to avoid over packing.

**Negative Pressure Wound Therapy (NPWT)**

Negative-pressure wound therapy (also called vacuum-assisted closure devices or sub-atmospheric-pressure dressings) are devices that can greatly assist pressure ulcer wound healing. Dressings do not need to be changed as often with the use of NPWT.

NPWT has as its greatest benefit the reduction of wound volume. NPWT promotes wound healing through removal of third-space edema, which improves nutrient and oxygen delivery, removal of wound drainage that would otherwise promote bacterial growth, and the promotion of granulation tissue. The intent of using NPWT is to facilitate wound closure rather than to fully close the wound.

NPWT is recommended for deep stage 3 and 4 pressure injuries. The wound bed must first be debrided of necrotic tissue. It cannot be used in malignant wounds, where vital organs or vessels are exposed, in dry wounds, or in patients with untreated infections. Not every pressure ulcer or every patient is a candidate for NPWT. A wound bed that is friable (bleeds easily) with weak tissue may not be able to handle the suction placed on it.
by the equipment and may break down further. The location of ulcer might make it very difficult to maintain a seal.

As with any other type of wound care treatment, ongoing assessment must be made to be sure that the wound is progressing toward healing. Wounds treated with NPWT are no different. As always, manufacturer guidelines should be followed.

ANTIMICROBIAL DRESSINGS

Impregnated dressings are an option for ulcers infected with multiple organisms because these dressings offer broad antimicrobial coverage, including essentially all known wound pathogens. They are available in various forms, including cream, ointment, powder, spray, and all forms of dressings. They vary in the duration of antimicrobial effectiveness, absorptive capacity, management of odor, and management of pain. Many of these advanced dressings do not need to be changed daily, which reduces pain, time, and expense. Manufacturer guidelines for use should be followed. Several types are described below:

Silver-Impregnated

Silver has proven antimicrobial activity against resistant bacteria such as methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *Enterococcus* (VRE). It is available as amorphous hydrogels, sheet hydrogels, alginates, hydrofibers, foams, contact layers, wound powders, ointments, and negative-pressure foams. These dressing may be considered for pressure ulcers that are clinically infected, heavily colonized, or at high risk for infection. They should be discontinued when the infection is controlled. Silver can turn tissues a dark color. It is contraindicated in patients allergic to silver. Some brand names are Acticoat, Aquacel Ag, Silvasorb, and Mepilex Ag.

Silver Sulfadizine

Silver sulfadizine (Silvadene) is a combination of silver and a sulfonamide antibiotic in a cream base. It has been used for decades in burn management because it is effective in preventing infection. However, it is rapidly inactivated in the wound, and thus frequent dressing changes are necessary to maintain therapeutic levels. Frequent dressing changes are time-consuming, expensive, and can be painful, which is why silver-impregnated dressings are more desirable. NPUAP (2014) recommends silver sulfadizine in heavily contaminated or infected pressure ulcers until definitive debridement is accomplished.

Honey-Impregnated

Medical-grade honey is used for heavily contaminated or infected pressure ulcers. It has antimicrobial effects against viruses, fungi, and over 50 species of bacteria, including *Pseudomonas aeruginosa*, *S. aureus*, MRSA, and VRE. Honey acts as an antimicrobial by creating an osmotic effect that dehydrates the bacteria and by producing hydrogen peroxide, which lowers the pH of the wound and inhibits bacterial growth. It contains
antioxidants and releases anti-inflammatory products. It reduces odor as well. Medical-grade honey dressings are FDA approved and sterilized; it is not recommended that regular honey be used due to possible contaminates.

Honey-impregnated dressings come in several forms, including alginites, hydrocolloids, ropes, hydrogel sheets, and amorphous gels and pastes. The dressings can be left in place for several days depending on the amount of drainage, patient response, and soiling of secondary dressings. Some patients complain of a stinging or burning pain, which is usually temporary. They may be used in stage 2, 3, and 4 pressure injuries. They assist in debridement. They are contraindicated in patients allergic to honey. The most common brand name is MediHoney.

**Cadexomer Iodine**

As the product absorbs wound drainage, iodine is delivered by sustained released into the wound bed, maintaining a steady level of iodine that is toxic to bacteria but nontoxic to the “good cells” in the wound bed. It is available as an ointment, dressing, and powder. For the product to work best, it requires an adequate amount of drainage or moisture to release the iodine; thus, dry wounds will not active the dressing. It is not for use in patients allergic to iodine, dyes, or shellfish; those with thyroid disease; those taking lithium; or women who are pregnant or breastfeeding. The risk of systemic absorption increases when iodine products are used on larger, deeper wounds or for prolonged periods. Common brand names are Iodoflex and Iodosorb.

**Impregnated Gauze**

A gauze dressing impregnated with polyhexamethylene biguanide (PHMB) provides a barrier to bacteria and inhibits the growth of bacteria in the dressing, thus protecting the wound and potential spread of bacteria from the wound. It should not be used in patients with reactions to PHMB or chlorhexidine. It should be moistened only with normal saline or water, since antiseptic solutions can inactive it. It is most useful to prevent infection in a wound or for the critically colonized wound, rather than as a primary treatment for an active wound infection.

**Antiseptic Foam**

Hydrofera Blue is the most common brand name foam dressing containing methylene blue crystal and gentian violet, two antiseptics that have been used for over 50 years. They have bacteriostatic properties (prevent bacterial growth) against many bacteria, including MRSA. When rehydrated, the foam becomes soft and absorptive and traps bacteria in it. This must remain moist and is thus useful for packing draining wounds. Recently, the two antiseptics have been available in a foam that does not need rehydration and can be used over shallow wounds. It can also be used with the enzyme debriding agent Santyl to provide both antimicrobial and debriding ability for the wound.
ANTISEPTIC SOLUTIONS

The use of nontoxic topical antiseptics for pressure ulcer care can be considered for a limited time to control bacterial bioburden (the diversity, virulence, and interactions of organisms with each other and with the body). These are agents that destroy or inhibit the growth and development of bacteria on living tissue. Resistance to antiseptics can develop.

These products can be toxic to “good cells” and should be used for only a short period of time until the wound is clean and surrounding inflammation is reduced. However, if the risk of delayed wound healing due to infection is great, then the use of the antiseptics may override the risk of damage to healthy cells. The periwound skin area must be protected.

The most commonly used products are:

- **Povidone iodine**: Low cost and commonly available. It is bactericidal, but studies have shown it does not aid in wound healing. Only the solution should be used in wounds; the scrub form is mixed with detergent and used on intact skin only.

- **Sodium hypochlorite** (Dakin’s solution or Clorapactin): The active ingredient is dilute bleach. It is available in retail stores or formulated by a pharmacy if there is a specific dilution required. It is effective against most bacteria in a wound and significantly reduces wound odor. It may also help with debridement. Quarter-strength (0.125% sodium hypochlorite) is bactericidal and with reduced toxicity to healthy cells. (Full-strength Dakin’s is actually 0.5%; thus half-strength is 0.25%, quarter-strength is 0.125%, etc.) It must be stored away from sunlight and out of the reach of children, since it is poisonous. It can be used for cleaning or as wound packing. Dressings are changed daily and should be discontinued when the wound is clean.

- **Acetic acid**: Dilute acetic acid may be of benefit in pressure ulcers infected with *Pseudomonas aeruginosa*. It is not effective against any other pathogen. The most commonly used concentration is quarter-strength. It can be used as a wound cleanser or as a daily dressing and discontinued when the wound is clean. The periwound skin must be protected.

These products can also be used on “maintenance wounds,” which are wounds not expected to heal but for which control of the bacterial burden is desired.
## Summary of Dressing Types

<table>
<thead>
<tr>
<th>Name (Type)</th>
<th>Use(s)</th>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alginates</strong></td>
<td>In moderately to heavily draining wounds; for stages 3 and 4</td>
<td>• Can stay in the wound for up to 72 hours</td>
</tr>
<tr>
<td>(absorbent, made from light seaweed)</td>
<td></td>
<td>• Flat and rope dressings available</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Silver impregnated available</td>
</tr>
<tr>
<td><strong>Hydrocolloids</strong></td>
<td>Shallow wounds with scant drainage, autolytic debridement; to protect periwound area from trauma and drainage; not appropriate for stage 3 or 4</td>
<td>• Simple to apply</td>
</tr>
<tr>
<td>(occlusive)</td>
<td></td>
<td>• Wide range of sizes and shapes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Conformity to wounds on most parts of the body</td>
</tr>
<tr>
<td><strong>Hydrogels</strong></td>
<td>In shallow wounds with scant drainage; for stage 2 and shallow stage 3</td>
<td>• Cost effective</td>
</tr>
<tr>
<td>(hydrating; donate water to the wound bed)</td>
<td></td>
<td>• Easy to apply; helps with pain management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Can be used on donor sites</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Promote autolytic debridement</td>
</tr>
<tr>
<td><strong>Hydrofiber</strong></td>
<td>In moderately to heavily draining wounds; for stages 3 and 4</td>
<td>• Will not adhere to wound bed (unless allowed to dry out)</td>
</tr>
<tr>
<td>(absorbent; made from carboxymethylcellulose)</td>
<td></td>
<td>• Available in plain and antimicrobial forms</td>
</tr>
<tr>
<td><strong>Foam</strong></td>
<td>In moderately to heavily draining wounds; to protect against shear injuries; primarily a cover dressing; stages 2, 3, and 4</td>
<td>• Highly versatile; reduce wound pain</td>
</tr>
<tr>
<td>(absorbent, can be adhesive or nonadhesive)</td>
<td></td>
<td>• Available with and without adhesive borders</td>
</tr>
<tr>
<td><strong>Antimicrobial</strong></td>
<td>Against a broad spectrum of microorganisms that cause wound infection and biofilm formation; stages 3 and 4; honey gel can also be used on stage 2</td>
<td>• Help reduce wound odor</td>
</tr>
<tr>
<td>(cadexomer iodine, silver, honey, hydrofera blue)</td>
<td></td>
<td>• Easily removed; decrease discomfort during dressing changes</td>
</tr>
</tbody>
</table>
Adjunctive Therapies and Biophysical Agents

There are many other types of therapies that are used in the treatment and management of wounds in general. However, there are only a few recommended specifically in the treatment of pressure ulcers.

The adjunctive treatment that is recommended by NPUAP (2014) is recombinant platelet-derived growth factor (PDGF) (becaplermin gel, brand name Regranex). Growth factors play a role in regulating cell growth and division. This treatment can be considered for stage 3 and 4 pressure ulcers that have delayed healing. (Note that PDGF has not been approved by the FDA for use in pressure ulcers [Nix, 2016]; however, it is recommended for consideration in the treatment of pressure ulcers by NPUAP and WOCN [2016a].)

The biophysical agents recommended by NPUAP are:

- Electrical stimulation
- Electromagnetic agents
- Pulsed radio frequency energy
- Ultraviolet light therapy
- Pulsatile lavage for wound cleaning and debridement

The following adjunctive and biophysical agents are not recommended by NPUAP due to insufficient evidence of effectiveness in pressure ulcer treatment:

- Any other growth factors other than recombinant platelet-derived growth factor
- Bioengineered skin substitutes
- Infrared therapy
- Laser therapy
- Ultrasound
- Whirlpool
- Vibration therapy
- Topical oxygen therapy
- Hyperbaric oxygen therapy

(A discussion of these modalities is beyond the scope of this course.)

Surgical Intervention

Stage 3 and 4 pressure ulcers are often difficult to heal using conventional wound healing techniques. When a pressure ulcer does not respond to traditional management—including debridement, infection management, and advanced wound dressings—then surgical management
may be considered (NPUAP, 2016). However, surgical reconstructive options may be limited due to a shortage of available tissue to use for a flap and/or impaired blood flow to the area.

Prior to surgery the patient should be in an optimal state both mentally and physically, and factors that impair healing should be minimized. The patient’s ability to tolerate the surgery and participate in the postoperative rehabilitation must be assessed prior to any surgery. Some patients may not be surgical candidates due to malnutrition, immobility, poor compliance with treatment, or chronic diseases.

Operative procedures may include skin grafts or flaps (surgical reconstruction). Myocutaneous flaps (which include both skin and muscle) are the treatment of choice for full-thickness pressure ulcers because they provide good protection and blood supply to the area. Immediately after surgery, the operated region must be totally and completely offloaded using a support surface that provides a high level of pressure redistribution, shear reduction, and microclimate control, with ongoing repositioning. Many hospitals use an air-fluidized support surface postoperatively. Once the surgical incision has healed, the patient will be allowed to gradually apply pressure to the area.

Surgery is a last resort because rates of surgical complications and pressure ulcer recurrence rates are high. Dehiscence of the suture line is the most common complication after surgery, ranging from 11% to 38% (WOCN, 2016a). Another study showed dehiscence rates from 10% to 49% and ulcer recurrence rates from 11% to 39%. A third study showed that only 27% of cases healed without complications and never recurred, 48% had dehiscence, 16% required surgical revision, and 39% had long-term recurrence at the same site (NPUAP, 2014). The most common location for breakdown of the flap itself is on the ischium. Osteomyelitis affects up to 32% of patients with pressure ulcers and is the major cause of breakdown after surgery (WOCN, 2016a).

**HEALING ASSESSMENT AND DOCUMENTATION**

Pressure ulcers are assessed initially and reassessed at least weekly, with careful documentation of the findings. This includes measuring the wound dimensions on a regular basis using a consistent method of measurement.

With each dressing change, the ulcer is observed for anything that may indicate the need for a change in treatment—e.g., improvement or deterioration, more or less drainage, signs of infection, or other complications. Any signs of deterioration should be addressed immediately. The type of dressing may need to be changed based on this assessment. For example, an antimicrobial dressing may be needed, or a more absorptive dressing used, or a change made in frequency of wound care.

**Signs and Factors in Wound Healing**

General signs of healing are decreased size, less exudate, and tissue changes from devitalized tissues (slough and eschar) to granulation tissue and epithelialization.
• Stage 1 and 2 pressure injuries should show evidence of healing within one to two weeks.

• Stage 3 and 4 pressure injuries should show evidence of healing within two to four weeks.

• Large, deep, infected pressure ulcers and those with large amounts of drainage and/or covered with slough or eschar are significantly less likely to heal within even three months, and some may not be fully healed even after five or six months of treatment. (WOCN, 2016a)

If after two weeks of treatment there has been no healing or signs of improvement, then all the risk factors need to be reevaluated and the plan of care revised to reflect new interventions.

In the case of a nonhealing pressure ulcer—and after the choice of wound care has been evaluated as appropriate and pressure is being relieved—then the patient is reassessed for other reasons why the ulcer is not improving. One systematic approach to determining what other factors might be affecting wound healing utilizes the acronym DIDN’T HEAL. Using this acronym and correcting those factors that can be corrected will aid in healing the ulcer. If factors cannot be corrected, healing the ulcer may not be possible.

<table>
<thead>
<tr>
<th>“DIDN’T HEAL”</th>
<th>Cause</th>
<th>Description</th>
<th>Additional Factors</th>
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| D             | Diabetes | Lack of diabetic control, causing diminished cardiac output, poor peripheral perfusion, and a decrease in the ability of WBCs to function | • Fasting blood sugar >80–120 mg/dl  
• A1C >6.5% |
| I             | Infection | Increased destruction of collagen needed for repair | • Overwhelms body defenses |
| D             | Drugs | Possible impaired collagen synthesis | • Steroids  
• Chemotherapy (high risk for infection/malnutrition)  
• Immunosuppressants (interfere with healing) |
Nutrition Deficiencies impairing normal wound healing • Diet lacks adequate calories, protein, vitamins • Obese patients not necessarily well-nourished

Tissue necrosis Lack of oxygen impairing healing • Cell death as a result of all the factors

Hypoxia Inadequate tissue oxygenation impairing healing • \( O_2 \) saturation <92% • Anemia • Poor circulation • Comorbid conditions such as heart failure, pneumonia, CVA • Pain

Excessive tension Tension on wound edges leading to local tissue ischemia and necrosis • When the patient is moved, wound is pulled

Another wound Competition for factors needed for wound healing, impairing wound healing at all sites • Increased nutritional needs

Low temperature Deceases to oxygen to the wound • Poor circulation • Use of cold cleansing solutions • Frequent dressing changes that cause wound temperature to drop to room temperature

Source: Stillman, 2010.

CASE

James, a 29-year-old male patient who is paraplegic, arrived to the emergency department because of a recurrent stage IV pressure ulcer at his left ischium. The patient states that his pressure ulcer returned because his wheelchair support cushion malfunctioned and the resulting pressure reopened the ulcer at the site of the scar tissue. James underwent surgery to the same area five years ago, which promoted healing of the previous ulcer through removal of infected bone and a flap-graft surgical reconstruction.

The size of the reopened wound is extensive, and the amount of drainage saturates a large, thick dressing in 12 hours. There is no necrotic tissue, but the patient’s bone is visible. Due to sepsis, James is admitted to the hospital. The infectious disease physician prescribes IV antibiotics for probable osteomyelitis. A surgical consult suggests possible surgery to the area again to close the wound, but not until the infection is cleared and the patient’s nutritional status is optimized.

To manage the drainage and protect the wound, a negative-pressure wound therapy dressing system is applied per protocol. The dietitian assesses James and recommends ways to improve his nutritional status, particularly his protein intake. After a week in the hospital, James is discharged with home health care for six weeks of IV antibiotics and negative-pressure wound therapy.
therapy. Referrals are made to the social worker for resources, the occupational therapist for a wheelchair cushion recommendation, and the dietitian for continued recommendations. A low air-loss mattress is obtained to reduce pressure while he is in bed.

The physical therapist visits James at home to assess his mobility. The patient is able to move himself in bed and to safely transfer himself from the bed to a chair. He is independent with his activities of daily living. The occupational therapist assesses the wheelchair and the support cushion and orders new equipment. The home health nurse visits James three times per week to change his wound dressing, draw labs, change the IV dressing, and assess his adherence to self-administering the IV antibiotics. The home health dietitian finds a source for an affordable protein supplement for James’s loss of protein from his wound drainage.

Healing Assessment Tools

There are several tools for assessing pressure ulcer healing. The Bates-Jensen Wound Assessment Tool (BWAT) is comprised of 15 items, of which 13 are scored from 1 to 5. The total scores and dates of assessment can be plotted on a graph, which provides an index of improvement or deterioration of the wound.

The PUSH tool (Pressure Ulcer Scale for Healing) was developed by NPUAP. An ulcer is categorized using numerical scores of 0 to 5 according to surface area (length multiplied by width), drainage amount, and tissue type. A comparison of the total scores measured over time provides an indication of improvement or deterioration in the ulcer.

The Spinal Cord Impairment Pressure Ulcer Monitoring Tool (SCI-PUMT) was developed to assess pressure ulcer healing in patients with spinal cord injury. Pressure ulcer healing is defined as the reduction in volume of the pressure ulcer and complete healing as resurfacing of the wound. Volume is an estimate obtained by multiplying length by width by depth (WOCN, 2016a).

Many computer systems also have programs to monitor ulcer progress. Of course, the clinician will also use clinical judgment to assess signs of healing, such as a decrease in the amount of drainage, pain, and wound size and an improvement in wound bed tissue. The clinician can also use photography, comparing baseline and serial photographs to monitor healing over time. Follow facility policy on the use of photography (see “Photography” below).

(See also “Resources” at the end of this course.)

Documenting the Healing Process

Wound care documentation includes a variety of information that reflects the wound status while it heals. Providing an accurate description of the skin and wound characteristics is critical following each dressing change. These findings of the ulcer’s current status will help the clinician in revising the plan of care and treatment strategies over time.
The very basics of documentation are to document what was observed, what was done (including education provided), and how the patient responded. Documentation of pressure ulcer management includes an assessment of the ulcer on admission, with each dressing change, on transfer, at discharge, or when a change in condition occurs (and per agency regulations) for any signs of skin and/or wound improvement or deterioration. Documentation also includes risk assessment and patient/family education provided. The skin under and around medical devices in particular is assessed for injury twice a day or more often if patient is prone to edema.

The following parameters are documented:

- At admission, onset, course, and duration of the ulcer
- Description of the ulcer
- Pain (location, intensity, quality, onset, duration, alleviating/aggravating factors)
- Patient/caregiver’s ability and willingness to adhere to the prevention and treatment program
- Prevention interventions that were initiated (referrals to dietary, physical therapy, occupational therapy, support surface management, skin care management, etc.)
- Discussions conducted with and observations made by physicians

The following elements should be documented in any wound assessment (WOCN, 2016b):

**ANATOMIC LOCATION**

The anatomic location of the pressure ulcer is identified using proper terminology in documentation. (Terms such as anterior-posterior, medial-lateral, or proximal-distal can clarify location.) Anatomical drawings or photography may be used.

**STAGING**

The stage of the ulcer is determined and documented. (See “Staging Pressure Ulcers” earlier in this course.)

**DRAINAGE/EXUDATE**

Color, type, consistency, and amount are identified and documented. **Amount** may be indicated as: none, light/scant, moderate, heavy/large, or copious. **Color** may be indicated as serous (clear, watery plasma); sanguineous (bloody); serosanguineous (plasma and red blood); or purulent (thick, odorous, possibly yellow, green, or brown).
ODOR

Odor defines the presence or absence of high bacteria counts in the ulcer and should be assessed only after cleaning the wound. Almost all drainage has an odor. A strong or foul odor from the wound bed suggests infection. A mild odor may be due to the particular wound care products in use.

DESCRIPTION OF WOUND EDGES

Wound edges may be documented as:

- **Attached:** Edges are attached, moist, and flush with the wound base.
- **Unattached/rolled:** Undermining is present between the dermis and subcutaneous tissues. The edge of the wound is raised and a lighter color than the surrounding tissue.
- **Undermined:** There is a gap in the edge of the tissue that creates a lip or overhang of the edge.

DESCRIPTION OF THE PERIWOUND SKIN

Periwound skin is observed at least 4 cm around the wound. The periwound skin should be intact. It is documented as to the following qualities:

- **Color:** There may be redness, pallor, blanchable erythema, nonblanchable erythema, or purple discoloration.
- **Temperature:** Warmth may indicate further tissue breakdown or underlying infection.
- **Induration:** Abnormal firmness with a definite margin may indicate infection.
- **Maceration:** Softening of tissues may be due to soaking from wound drainage or contact with urine and/or stool.
- **Denuded:** Superficial skin loss may be due to drainage or trauma (such as from tape). *Excoriation* refers to linear scratch-like marks, not to skin loss from trauma or incontinence.

TYPE OF TISSUE EXPOSED (APPEARANCE OF WOUND BED)

- **Red:** This may indicate clean, healthy granulation tissue. Granulation is a pink or red moist tissue composed of new blood vessels and connective tissue that fills an open wound when it starts to heal. It usually has an irregular, granular surface, like velvet. Not all red tissue is granulation.
Yellow: This may indicate the presence of drainage or slough. Slough is a soft, moist, avascular (lacking blood supply) tissue that may be yellow, white, tan, or green. It may be loosely or firmly attached. It sometimes resembles chicken fat. Not all yellow tissue is avascular; it could be fibrous.

Black: This may indicate the presence of eschar or necrotic tissue, which slows healing and allows bacteria to grow. It may be brown or tan and can be hard or soft or loosely or firmly attached. It can resemble a scab, but there is no healing occurring under it.

(See “Staging Pressure Ulcers” earlier in this course for images of types of exposed tissue.)

WOUND MEASUREMENTS

Measurements should be done at least weekly and following debridement. It is not necessary to document measurements with each dressing change, as changes in wound size do not occur that rapidly.

Measurements are taken using a single-use, metric tape measure; “coins” (dime-sized, quartersized, etc.) are not used. Descriptors such as round, oval, irregular, etc., are also useful. If possible, the patient is in the same position each time the wound is measured to promote consistency of measurements. Communication of the wound size is useful for other members of the healthcare team, regulatory agencies, and payers to determine progress.

Length: Linear distances are taken from wound edge to wound edge and measured consistently over time. One method is to look at the wound as if it were a clock face: the top of the wound (12 o’clock) is toward the patient’s head. The bottom of the wound (6 o’clock) is toward the patient’s feet. Length is the longest distance measured from head to toe, or 12 to 6 o’clock.

Width: Width is longest distance measured from side to side, perpendicular to the length, or from 9 to 3 o’clock.

Depth: This is the distance from the visible surface to the deepest point in the wound base. Depth can be measured using a cotton-tip applicator, holding it perpendicular to the wound edge, placing the finger at the point on the swab that corresponds to the wound edge. The swab is then removed, with the distance on the swab measured on the tape measure.

Undermining: A cotton-tip applicator is used to probe to the deepest part of the undermining, marking the depth between the end of the applicator and the wound edge with the finger and measuring it against the tape measure. The location of the undermining can be indicated using the clock face (e.g., “undermining extends from 12 o’clock to 5 o’clock and is deepest at 3 o’clock at 3 cm”).

Tunneling or sinus tract: The tract is measured as for undermining and its location described using the clock-face method.
PHOTOGRAPHY

Some healthcare facilities use baseline and serial photographs as a method of monitoring pressure ulcer progress over time. Photographs should not replace bedside assessment but may be useful for documentation. Techniques and equipment need to be standardized and staff trained in taking the types of photographs required to ensure an accurate representation of the condition of the ulcer so it can be reliably compared over time (NPUAP, 2014).

The question arises, how often should photos of the wound be taken? The answer depends on individual facility policies, but at a minimum photos are taken the first time the wound is assessed, once healing has occurred, and when the patient is transferred to another care setting. Some facilities have policies in place that require weekly wound photography, and this again can help to evaluate the effectiveness of the current wound care.

Prior patient consent is required for wound photography, and the use and confidentiality of the photos needs to be thoroughly explained to the patient. A written facility policy on wound photography will address:

- Patient consent (including a form)
- Frequency of photography
- Staff authorized to take wound photos
- Methods of identifying the patient, for example, placing the patient’s initials, medical record number, date, and time on a measuring guide placed proximately to the wound and included in the photo
- Storage of the photos in the patient’s records and who will have access to them

(Nix, 2016)

CASE

After a few weeks of appropriate treatment, Mrs. Olivera, a patient with a pressure ulcer, remains in the hospital. The nurse manager reviews the nursing documentation, specifically the patient’s weekly wound measurements, for evidence that the wound is healing. The nurse manager detects a large variance between the patient’s wound measurements. On admission, Mrs. Olivera’s wound measured 4 cm x 6 cm x 3 cm (length x width x depth). A week later, the patient’s wound was documented to measure 1.5 x 2.5 x 1, indicating the wound had decreased in size dramatically. The third week the wound was documented as 5.5 x 3.5 x 2.5, indicating that the wound had worsened dramatically.

Such changes don’t make sense to the nurse manager. In questioning the staff about these measurement differences, the nurse manager discovers that for the second week’s measurements, the nurse reversed the measuring device and measured in inches rather than centimeters. For the third week, another nurse documented the width as the length and the length as the width.
At the next staff meeting, the nurse manager brings a wound model so that the nurses can practice wound measurement. The manager reviews that length is a head-to-toe or 12 o’clock–to–6 o’clock measurement, and that width is a side-to-side or 9 o’clock–to–3 o’clock measurement. She also emphasizes the need to use metric measurements. As a result, Mrs. Olivera’s wound is now consistently measured, demonstrating that the facility’s care of the patient is helping to heal the wound.

### POTENTIAL COMPLICATIONS ASSOCIATED WITH PRESSURE ULCERS

- Heterotopic bone formation (presence of bone in soft tissue where bone does not normally exist)
- Fistula
- Abscess
- Osteomyelitis
- Bacteremia/sepsis
- Cellulitis
- Squamous cell carcinoma (Marjolin’s ulcer, an chronic ulcer that undergoes malignant transformation)
- Significantly higher risk for postoperative septicemia, pneumonia, stroke, urinary tract infection, and acute renal failure
- Higher risk of postoperative mortality in patients who have a pressure ulcer preoperatively

### Minimizing the Recurrence of Ulcers

Achieving a closed wound is just the beginning of the effort to prevent an ulcer from recurring. Clinicians must emphasize and reemphasize to patients and caregivers that measures to promote healing and prevent recurrence are lifelong. Recurrence rates for adults have been reported as high as 56%, and 21% develop a new ulcer at a different site (WOCN, 2016a). Patients with spinal cord injury have a pressure ulcer rate of 17% to 33% but have a recurrence rate from 31% to 79%.

The most common factors associated with recurrence are related to a lack of compliance with offloading the pressure area and maintaining a healthy lifestyle, such as stopping smoking, maintaining a normal weight, and controlling blood sugars if diabetic. Psychosocial problems (e.g., unemployment, low level of education, drug or alcohol abuse) have also been reported to increase the risk for pressure ulcer recurrence.
Clinicians must initiate and continue preventive education wherever an at-risk patient enters the healthcare system using interactive, individualized patient education. Telemedicine technology can be used to assess and teach patients who cannot easily come to a clinic or office.

Clinicians should teach the following preventive measures to patients and caregivers:

- **Perform a regular inspection of the skin**, especially over bony prominences, using a mirror or even cell phones or digital cameras if necessary, to identify signs of pressure as evidence by changes in the skin:
  - Color, such as a reddish or purplish hue
  - Temperature (warmer or cooler) compared to the surrounding skin
  - Texture, such as bogginess or induration

- **If skin changes are present**, offload pressure to the area and recheck in 15 minutes; continue to monitor the skin until the skin change resolves, and notify a healthcare professional if it does not resolve.

- **Follow appropriate skin care regimens:**
  - Keep the skin clean and dry.
  - Use a mild soap and warm (not hot) water.
  - Apply skin moisturizers such as petrolatum after bathing and when the skin is dry.

- **For bed- and chair-bound patients:**
  - Use measures to **reduce friction/shearing**, such as lifting instead of dragging across the bed, and/or wearing clothing such as long-sleeved pajamas and socks.
  - Routinely **turn, reposition, and use pressure-redistributing devices** if confined to a bed and/or chair.
  - **Avoid** the use of rings, foam cut outs, or donut-type devices.

- **Maintain adequate nutrition and fluid intake**; monitor for weight loss, poor appetite, or gastrointestinal changes that interfere with eating; and promptly report changes in health and nutritional problems to healthcare providers. (WOCN, 2016a)

**AVOIDABLE VERSUS UNAVOIDABLE PRESSURE ULCERS**

Pressure ulcers are a global health concern because, for the most part, they are a costly, preventable complication. But are all pressure ulcers preventable or avoidable? In the past, clinicians have argued that pressure ulcers are not avoidable when the patient is too sick to be
turned; when there are more vital organs to worry about than the skin; or when it is too difficult, expensive, or there is not enough staff to implement all preventative measures.

Yet as early as 2000, the U.S. Department of Health and Human Services stated that reducing pressure ulcer incidence is an objective for all healthcare providers. In 2008, the Centers for Medicare and Medicaid Services (CMS) determined that hospital-acquired conditions could be reasonably prevented with evidence-based guidelines. In support of this determination, CMS stopped reimbursing hospitals for the treatment and care of pressure ulcers that were not present on admission.

In 2014, NPUAP held a consensus conference on avoidable versus unavoidable pressure ulcers. The following is a summary of the consensus reached:

- Most pressure ulcers are avoidable.
- Not all pressure ulcers are avoidable.
- There are situations that render pressure ulcer development unavoidable, including hemodynamic instability that is worsened with physical movement and inability to maintain nutrition and hydration status and the presence of an advance directive prohibiting artificial nutrition/hydration.
- Pressure redistribution surfaces cannot replace turning and repositioning.
- If enough pressure is removed from the external body, the skin cannot always survive.

The definition of avoidable and unavoidable pressure ulcers was revised to state that:

- An **avoidable pressure ulcer** is one that can develop when the provider did not do one or more of the following:
  - Evaluate the patient’s clinical condition and pressure ulcer risk factors
  - Define and implement interventions consistent with patient needs, patient goals, and recognized standards of practice
  - Monitor and evaluate the impact of the interventions
  - Revise the interventions as appropriate

- An **unavoidable pressure ulcer** can develop even when a [healthcare] provider does all of the above. Not all pressure ulcers are avoidable, because there are patient situations where pressure cannot be relieved and perfusion cannot be improved.

- However, the determination regarding avoidability is made after the fact, when the processes of care can be evaluated. It cannot be predetermined that an unavoidable pressure ulcer will develop.
Consensus was also reached on the following clinical issues:

- There are some patients in whom pressure ulcer development is unavoidable. Conditions were identified that may lead to unavoidable pressure ulcers (e.g., hemodynamic instability and impaired perfusion); however, these conditions do not make pressure ulcers inevitable. The duty to provide care remains.

- There are situations and conditions that limit preventive interventions.

- Skin failure at the end of life is not the same as pressure ulcers. Unavoidable ulcers and deep tissue injuries may also occur at the end of life, with skin failure, and following cardiac/respiratory arrest.
  
  (Edsberg et al., 2014; WOCN, 2016b)

Thus, the topics discussed in this course—risk assessment, prevention, management, reevaluation, and documentation—are the very factors used to determine if all that can be done for the patient has in fact been done to prevent a pressure ulcer.

**PRESSURE ULCERS AT END OF LIFE**

Skin changes or unusual wounds can occur at the end of life and may include deep tissue injury, pressure ulcers, or ischemic/mottled wounds. Due to the underlying etiologies, these wounds are generally thought to be unavoidable. For patients at the end of life, it is important to determine the goals of the patient and caregiver(s). Some may wish to achieve healing of the ulcer, whereas others may desire only palliative care, including reducing pain, odor, drainage, bleeding, and infection, and simplifying dressing changes for comfort. The patient and family will need to be educated as to realistic expectations for wound healing.

An example of skin changes at the end of life is the Kennedy terminal ulcer. This was first described in 1989. It is located on the sacrococcygeal area. It appears as a purple, red, blue, or black discoloration of the skin with a butterfly or pear shape that has irregular borders. It has a sudden onset, develops rapidly into a full-thickness wound despite appropriate care, and may precede death in days to weeks (WOCN, 2016a).
CONCLUSION

Pressure ulcers are a life-threatening problem among vulnerable individuals, including those who are bed- or chair-bound and those who are critically ill. Nearly all pressure ulcers are considered preventable, and this requires a full commitment by the healthcare facility and individual clinicians so that a pressure ulcer will not occur.

There are many factors that contribute to the formation of a pressure ulcer, including comorbidities, incontinence, poor nutrition, and advanced age, but the most significant risk factor is immobility. Patients who are dependent on others for repositioning are at greatest risk of developing a pressure ulcer, for nonhealing of an ulcer should it occur, and for the recurrence of an ulcer.

Pressure ulcers can be prevented through both an outside approach, which includes minimizing pressure through regular repositioning, using a support surface, and managing incontinence, and an inside approach, which includes managing nutrition and hydration to support health and healing.

Treating a pressure ulcer that has developed involves these same activities, together with treating the wound itself, frequently reassessing the wound, and reducing the factors that inhibit wound healing. Pressure reduction measures are the most important. Further strategies for pressure ulcer treatment include cleansing the wound, managing wound infections, debriding the pressure ulcer of devitalized or necrotic tissue, and utilizing appropriate dressings. By carrying out these strategies, caregivers provide the wound with the environment it needs to heal.

Finally, healthcare professionals, patients, and caregivers must be vigilant about monitoring for ulcer recurrence. Failing to protect the development of pressure ulcers or to care for existing ulcers puts all patients and the healthcare system in jeopardy for what is often a costly but avoidable complication.

RESOURCES

Braden Scale
http://bradenscale.com

Braden-Q Scale (for pediatric population)

Frequently asked questions about maggot debridement therapy
http://www.bterfoundation.org/faq_MDT

Medical maggots
http://www.monarchlabs.com/mdt
Norton Scale

Pressure Ulcer Scale for Healing (PUSH)

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ACCREDITATION INFORMATION FOR WILD IRIS MEDICAL EDUCATION
1. The current focus on pressure ulcer prevention programs has most likely been in response to which recent issue faced by healthcare facilities?
   a. A damaged reputation due to high rates of pressure ulcers
   b. Lawsuits against the facility and its staff
   c. Loss of funds from governmental programs for treating pressure ulcers
   d. Increased length of stay for patients

2. A patient’s risk for developing pressure ulcers is assessed in order to:
   a. Comply with a legal requirement.
   b. Complete the Braden scale.
   c. Initiate preventive interventions.
   d. Determine the level of care needed for older adults.

3. Which risk factor is most likely to result in a heel pressure ulcer?
   a. An ICU stay
   b. A fractured hip
   c. Obesity
   d. Smoking

4. Skin tears occur more frequently in older adult patients due to a:
   a. Decrease in skin temperature.
   b. Flattening of the epidermal-dermal junction.
   c. Loss of protective immune system mechanisms.
   d. Decrease in cell size.

5. Regardless of the healthcare setting, a patient’s risk of developing pressure ulcers should be assessed:
   a. At each shift change.
   b. At entry into that healthcare setting.
   c. Every 24 to 48 hours.
   d. Only if a pressure ulcer develops.
6. A male patient who is admitted with congestive heart failure reports that he spends all day at home in his recliner, even sleeping in it. Which area of the patient’s body is checked first for possible skin issues and pressure ulcer risk?
   a. The ears
   b. The heels
   c. The sacrum
   d. The trochanters

7. Which patient risk factor is most likely to result in the development of a pressure ulcer?
   a. Incontinence
   b. Friction
   c. Immobility
   d. Nutrition status

8. Keeping the patient’s head of the bed at or below 30 degrees prevents skin damage due to:
   a. Shearing.
   b. Fecal incontinence.
   c. Urinary incontinence.
   d. Immobility.

9. A patient who is slouched down in the chair is repositioned more upright by the clinician in order to reduce pressure on the patient’s:
   a. Sacrum.
   b. Heels.
   c. Ischia.
   d. Trochanter.

10. The most important feature of a support surface is its ability to:
    a. Support a patient’s weight.
    b. Reduce friction.
    c. Redistribute pressure.
    d. Alert the staff when the patient moves.
11. In selecting a support surface for the bedridden patient, which is the clinician’s first consideration?
   a. The patient’s condition
   b. The availability of the support surface product
   c. The cost of the support surface product
   d. The availability of someone to turn the patient

12. Preventing incontinence-associated dermatitis is **best** accomplished by:
   a. Placing a urinary catheter in the patient.
   b. Scrubbing the patient’s skin with soap and water.
   c. Placing several underpads under the patient.
   d. Cleaning the patient’s skin with perineal cleansers.

13. In a patient diagnosed with functional incontinence, a referral to which specialty would be most beneficial in providing measures to reduce this incontinence?
   a. Respiratory therapist
   b. Nurse practitioner
   c. Occupational therapist
   d. Acupuncturist

14. The patient is admitted to ICU on a ventilator with orders to keep the head of the bed at 45 degrees to prevent pneumonia. Which emerging therapy could provide protection from pressure ulcer formation at the sacrum?
   a. Foam dressing placed on the sacrum
   b. Hydrocolloid placed on the sacrum
   c. Floating the heels to support the legs
   d. Asking the doctor to lower the head of the bed

15. According to the 2016 definition of pressure injuries, they occur due to intense pressure or pressure along with:
   a. Moisture.
   b. Friction.
   c. Malnutrition.
   d. Shear.
16. While readjusting the patient’s oxygen tubing, the nurse notices a full-thickness lesion behind the ear caused by pressure from the tubing. The nurse stages this lesion as:
   a. Deep tissue pressure injury.
   b. Stage 1.
   c. Stage 2.
   d. Stage 3.

17. A pressure injury is classified as stage 4 when there is visible:
   a. Slough.
   b. Blanching.
   c. Bone.
   d. Subcutaneous fat.

18. A patient with a history of a closed stage 4 pressure injury at the coccyx is readmitted with a pressure injury at the same location. The nurse documents this ulcer as:
   a. Unstageable.
   b. Stage 1.
   c. Stage 2.
   d. Stage 4.

19. The therapist finds a blood-filled blister on the patient’s heel. Suspecting a deep tissue pressure injury, the therapist’s first action is to:
   a. Notify the physician.
   b. Document the assessment.
   c. Relieve pressure off the heel.
   d. Wrap a gauze dressing over the blister.

20. Can tap water be used to clean a pressure ulcer?
   a. Yes, if the wound is not necrotic.
   b. Only if the patient can get into the shower.
   c. Yes, because the wound is not sterile.
   d. No, because only sterile cleansers can be used.

21. Which sign or symptom may indicate a **systemic** infection associated with a pressure ulcer?
   a. Friable granulation tissue
   b. Necrotic tissue
   c. Lack of signs of healing
   d. Fever and malaise
22. When collecting a wound culture with a swab, the clinician is careful to culture only the:
   a. Wound exudate.
   b. Devitalized surface tissue.
   c. Healthy-looking tissue.
   d. Periwound skin.

23. The contraindication to debridement of dry stable eschar is:
   a. The ulcer is on an ischemic limb.
   b. The patient is over 60 years of age.
   c. The patient has been admitted to hospice.
   d. The wound is infected.

24. In a patient with an unstageable pressure ulcer completely covered with eschar for which the goal is complete debridement as soon as possible, which type of debridement should the nurse ask the primary physician for?
   a. Mechanical
   b. Sharp
   c. Autolytic
   d. Enzymatic

25. When the wound is draining heavily, which dressing would be the best choice for absorption?
   a. Hydrocolloid
   b. Alginate
   c. Hydrogel
   d. Gauze

26. When reviewing an order for wound care to apply a hydrogel to the wound bed and then fill the wound with a hydrofiber, the nurse questions the order because:
   a. They both add moisture to the wound.
   b. They both absorb moisture from the wound.
   c. They are physically incompatible.
   d. One adds moisture and the other absorbs moisture.
27. When a wound has not decreased in size in two weeks, the nurse suspects critical colonization. The wound has a moderate amount of drainage. Which antimicrobial dressing does the nurse recommend?
   a. Honey-impregnated hydrocolloid
   b. Silver gel
   c. Impregnated gauze
   d. Negative-pressure wound therapy

28. A hydrocolloid dressing would be appropriate to use on which wound?
   a. Stage 3 pressure injury
   b. Heavily draining wound
   c. Infected wound
   d. Wound needing autolytic debridement

29. Which factor is likely responsible for improved wound healing after treatment is begun for a patient’s poor circulation?
   a. Reduced tension on the wound
   b. Greater tissue oxygenation
   c. Decreased blood sugar level
   d. More frequent dressing changes

30. When documenting the location of undermining in a wound, which descriptor might be used?
   a. “Anterior to posterior”
   b. “From left to right”
   c. “Medial to lateral”
   d. “From 10 o’clock to 5 o’clock”

31. A patient’s pressure ulcer dressing requires changing every eight hours due to the large amount of drainage. Which information needs to be documented with every dressing change?
   a. Length and width of wound
   b. Depth of wound
   c. Wound bed appearance
   d. Estimate of surface area
32. In a patient who developed a reportable pressure ulcer while hospitalized, it was later determined that the pressure ulcer was avoidable because:
   a. Interventions to prevent a pressure ulcer were not monitored.
   b. A risk assessment was done.
   c. The patient refused to be turned.
   d. The physician documented on admission that a pressure ulcer was likely unavoidable.