# Pressure Injuries and Skin Care

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- Read the enclosed course.
- Complete the questions at the end of the course.
- Return your completed Evaluation to NetCE by mail or fax, or complete online at www.NetCE.com. (If you are a Florida nurse, please return the included Answer Sheet/Evaluation.) Your postmark or facsimile date will be used as your completion date.
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### *Faculty*

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Ms. Mamou has worked in various rehabilitation settings and has first-hand experience of how pressure ulcers impact patients' recovery and quality of life. She has held positions as staff nurse, unit coordinator, educator, and director of nursing in home health care. She has been involved in developing and implementing several staff education programs in a variety of settings. She was most recently employed as a wound ostomy and continence nurse at East Alabama Medical Center in Opelika, Alabama.

### *Faculty Disclosure*

Contributing faculty, Maryam Mamou, BSN, RN, CRRN, CWOCN, has disclosed no relevant financial relationship with any product manufacturer or service provider mentioned.

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The division planner and director have disclosed no relevant financial relationship with any product manufacturer or service provider mentioned.

### *Audience*

This course is designed for nurses in all practice settings, particularly those caring for patients at high risk for developing pressure injuries.

### *Accreditations & Approvals*

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### Course Objective

The purpose of this course is to provide nurses with the information necessary to accurately identify, treat, and manage skin breakdown (pressure injury), thereby improving patient outcomes and quality of life.

### Learning Objectives

*Upon completion of this course, you should be able to:*

1. List the key structures and functions of the skin.
2. Describe skin changes throughout the life span.
3. Identify causative factors contributing to pressure injury occurrence.
4. Accurately identify each stage of pressure injury development.
5. Identify risk factors leading to the development of pressure injuries.
6. Outline characteristics of a validated and reliable pressure injury risk assessment tool.
7. Complete thorough skin and pain assessments.
8. Outline an individualized program of skin care, including nutritional support, documentation, and patient education.


Sections marked with this symbol include evidence-based practice recommendations. The level of evidence and/or strength of recommendation, as provided by the evidence-based source, are also included so you may determine the validity or relevance of the information. These sections may be used in conjunction with the course material for better application to your daily practice.

## INTRODUCTION

A complete skin assessment and accurate documentation of the assessment findings are critical elements of the nurse's role in providing care for patients with pressure injuries. In order to perform a thorough assessment, nurses should have a working knowledge of the general characteristics of the skin, its functions, and the changes that occur in the skin throughout an individual's life span.

Each patient deemed at risk for skin breakdown or with evidence of breakdown should have an individualized program of skin care, including nutritional support and patient and family education, among other elements. Ongoing evaluation and documentation of the skincare program and whether it is meeting its goals is necessary.

## GENERAL CHARACTERISTICS OF SKIN

Skin is the largest organ in the body. In the average person it covers approximately 3,000 square inches [1]. In total, it weighs around six pounds, or up to 15% of the total adult body weight. Intact skin is dry, supple, and has a pH ranging from 4 to 6. It varies in thickness from 0.5 mm in the tympanic membrane to 6 mm on the soles of the feet and the palms of the hands. Frequent bathing and episodes of incontinence remove naturally occurring oils from the skin [2]. However, as an organ, the skin is able to withstand limited mechanical and chemical assaults.

### SKIN STRUCTURES

Human skin has two primary layers: the epidermis (outer layer) and the dermis (inner layer). The basement membrane separates the two layers. Beneath the dermis is the hypodermis, which is a layer of connective tissue also referred to as the subcutaneous tissue.

#### Epidermis

The epidermis is a thin layer that regenerates itself every four to six weeks. It contains no blood vessels and receives its blood supply from the inner (dermis) layer. Nerve fibers are located throughout the epidermis. It is divided into five layers—presented in order from the outermost layer inward: stratum corneum, stratum lucidum, stratum granulosum, stratum spinosum, and stratum basale.

The stratum corneum is composed of dead keratinized cells and is constantly being sloughed off and renewed from below [2]. It has an acid mantle, an oily layer with reduced pH, provided by sebum, the substance secreted by the sebaceous glands onto the skin surface via the hair follicles.

The stratum lucidum, also known as the clear layer, is found in areas where the epidermis is thicker, like the palms of the hands and the soles of the feet [1]. It lies directly below the stratum corneum. The next layer, the stratum granulosum, is composed of one to five layers. It is believed to help with keratin formation.

The stratum spinosum is referred to as the "prickly layer" because of the spine-like shape of the cells [2]. In this layer, skin cells begin to flatten as they are migrating toward the skin surface. The stratum basale, also known as the stratum germinativum, is the innermost layer of the epidermis. It is composed of a single layer of constantly dividing cells that form new cells. These new cells migrate to the stratum corneum [1]. Cellular migration usually takes 28 days, but this rate is affected by aging and chemotherapy.

Rete pegs and rete ridges are interlocking structures that extend down from the epidermis into the dermis. These finger-shaped downward projections on the epidermis interlock with upward projections from the dermis. Rete pegs and ridges ensure that all the skin layers move together.

The epidermis contains many specialized cells that affect patient health and appearance. The cells of the skin that provide immune protection (dendritic or Langerhans cells) are found in the stratum granulosum and the stratum spinosum. Melanocytes are found only in the epidermis and are responsible for differences in skin color. The number of melanocytes is approximately the same in normal skin regardless of skin color, but the amount of the pigment melanin produced varies from person to person and from one area of skin on the body to another.

### Basement Membrane

The basement membrane's main function is to anchor the epidermis to the dermis. It contains several protein substances, including collagen, and is the layer that is affected in blister formation [1].

### Dermis

The dermis is the most important part of the skin and is often referred to as the "true skin" [3]. It is the thickest layer of the skin, varying in thickness from 0.2 mm to 4 mm. The reticular dermis anchors the skin to the subcutaneous tissue and contains sweat glands, hair follicles, nerves, and blood vessels [1]. The dermis also contains the sebaceous glands, which secrete sebum, a substance rich in oil that lubricates the skin.

The major proteins found in the dermis are collagen and elastin [1]. Collagen gives skin its tensile strength, while elastin provides the skin with elastic recoil. This characteristic prevents the skin from being permanently reshaped. The dermis is divided into two areas: the papillary dermis, which contains capillaries for skin nourishment, and the reticular layer, which is comprised of thick collagen fibers. The dermis also contains Meissner and Vater-Pacini corpuscles, the receptors that sense pain and pressure.

### Subcutaneous Tissue

Beneath the dermis lies subcutaneous tissue, which attaches the skin to the underlying structures. Subcutaneous tissue contains adipose tissue, connective tissue, blood vessels, lymphatics, and nerve endings. It is the adipose tissue that provides protection from pressure and shear. Elderly patients who may have inadequate subcutaneous tissue are at high risk for deep tissue injury due to pressure and shear [2].

### Muscle and Fascia

Muscle and fascia are highly vascularized tissue that is most sensitive to ischemia. Pressure damage usually originates here [2]. The skin receives its blood supply from vessels that originate in the muscle tissue.

## FUNCTIONS OF THE SKIN

The skin protects against mechanical and chemical trauma, pathogens, dehydration, and malignancy [2]. One of the most important functions of the skin is acting as a physical barrier to micro-organisms, protecting the body against infection. The acid mantle present in the epidermis also retards the growth of micro-organisms.

The skin immune system provides protection as well [1]. Macrophages found in the dermis are phagocytic cells that provide defense against pathogens for the skin and for open wounds. These macrophages also promote wound healing.

Mast cells are present in the skin and are the primary cells involved in allergic reactions. They also help protect against parasites.

The skin maintains heat regulation by the process of vasodilation and vasoconstriction, sweating and shivering [2]. Fluid evaporating from the skin allows for cooling to occur. The amount of sweat excreted can range from 100 mL to 2 liters in one hour [2]. As a result, the skin plays an important role in electrolyte balance and hydration.

Nerve endings in the skin provide information about the external environment and protection. Some areas of the skin are more sensitive than others (e.g., the fingertips are more sensitive than the back). Any loss of sensation increases the chances of injury.

The skin is also involved in the metabolism of certain vitamins. Specifically, the effect of ultraviolet B light on sterols in the skin causes synthesis of vitamin D. Certain drugs and some toxic substances (e.g., pesticides) can also be absorbed directly through the skin and into circulation.

Finally, skin provides for expression and body image [2]. Skin plays a vital role in self-esteem and social communication. Skin characteristics have an impact on how an individual communicates both verbally and nonverbally, and how the other person reacts to that individual. It also provides significant social cues regarding health and vitality.

## SKIN THROUGHOUT THE LIFE SPAN

### Fetal and Neonatal Skin

Fetal skin appears to have increased amounts of hyaluronic acid, which is associated with fetal scarless healing. Studies indicate that intrauterine surgery done late in the second trimester or early in the third trimester usually results in no scars [2].

Neonatal skin is more permeable due to the immature stratum corneum. During the first two weeks of life, topical administration can equal intravenous (IV) administration in terms of absorption [2]. Because infants have thinner skin and nails, epidermal stripping can occur easily.

### Adult Skin

Adult skin shows a gradual increase in epidermal turnover time and decreasing dermal thickness. In young adults, epidermal turnover is around 21 days; by 35 years of age, this time doubles [2]. In addition, melanocytes decrease 6% to 8% each decade after 30 years of age. This loss of skin melanocytes is thought to increase the risk of skin cancer [1].

### Elderly Skin

In elderly individuals, there is a 50% reduction in the cell turnover rate in the stratum corneum (outer most layer) and a 20% reduction in dermal thickness. Elderly patients experience an overall reduction in dermal vascularization and associated drop in blood flow to the skin. The collagen bundles in the dermis shrink, causing permanent wrinkles to develop [2].

Rete ridges and pegs flatten, resulting in decreased adhesion between the skin layers. The area of contact between the epidermis and the dermis is reduced by 50% [4]. There is increased capillary fragility; slight pressure can cause bruising. A decrease in subcutaneous tissue causes a reduction in thermal insulation and increases the risk of shear/pressure injury. Reduced activity of sweat glands and sebaceous glands can lead to dry skin.

Elderly individuals experience a drop in the number of Langerhans cells, a 50% decrease in the number of mast cells, and up to a 50% decrease in the function of the remaining cells. As a result, there is an increased risk of skin cancer and fungal and other infections [1].

Other age-related changes include decreased absorption, reduction in the skin's ability to synthesize vitamin D, and significantly marked reduction in the ability of the skin to sense pressure, heat, and cold. Decreased cellular competence and activity leads to a reduction in cell repair and the increased possibility of nonhealing wounds [2].

## PRESSURE INJURIES

In 2016, the National Pressure Advisory Panel (NPUAP), now the National Pressure Injury Advisory Panel (NPIAP), released updated definitions for pressure ulcers and staging classification [5; 6]. In this revision, the term "pressure injury" replaced "pressure ulcer," to alleviate confusion between injury to intact skin and open ulcers. According to the NPIAP, a pressure injury is localized damage to skin and/or underlying soft tissue and usually occurs over a bony prominence. It is the result of prolonged pressure or pressure combined with shear and/or friction. A pressure injury can present as intact skin or an open ulcer. Patients at risk for pressure injury (e.g., immobile patients) are also at risk for friction and shear damage. The tolerance of soft tissue for pressure and shear also may be affected by microclimate, nutrition, perfusion, comorbidities, and condition of the soft tissue [6]. The term "pressure injury" will be used throughout the remainder of this course.

Pressure injuries usually occur over a bony prominence such as the sacrum, the ischial tuberosity, the trochanter, and the heels, but they can occur anywhere on the body. In some cases, pressure injuries will develop around a tracheostomy tube or under a cast, splint, or cervical collar [1]. The most common locations for pressure injuries are the sacrum and the heels because there is less soft tissue present between the bone and the skin in these areas. An estimated 95% of pressure injuries occur on the lower body; of these, about 65% develop in the pelvic area and 30% in the lower extremities [7]. There is a two to six times greater mortality risk with pressure injury development. Many factors impact the level and extent of tissue trauma (***Table 1***) [8].

**FACTORS CONTRIBUTING TO THE FORMATION OF PRESSURE INJURIES**

| **Extrinsic Factors** |
|---|
| Undue, prolonged pressure |
| Shear |
| Friction |
| Moisture |
| Abnormal posture |
| **Intrinsic Factors** |
| Altered consciousness |
| Decreased or absent sensations |
| Nutritional factors (under- or over-nourished) |
| Anemia |
| Edema |
| Atherosclerosis |
| Aged-related changes |
| Acute illness |
| Sleep |
| Medications |
| Cardiovascular changes |
| Emotional stress |

*Source: [8]* *Table 1*

### PRESSURE AND SHEAR

Pressure that results in the development of injuries is defined as compression of soft tissues between two rigid surfaces. For example, blood vessels, muscle, subcutaneous fat, or skin may be compressed between a bone and an external surface, such as a bed or chair. The end result is ischemia and necrosis. All the tissues between the two points of pressure are affected, but the tissue closest to the bony prominence suffers the greatest damage. It is important to note that low-intensity pressure over a long period of time can create tissue damage, just as high-intensity pressure over a short period of time can result in damage [2]. Application of high pressure for shorter duration not only causes tissue necrosis due to blockage of capillaries but also produces pressure effect on the larger vessels, causing thrombosis (usually venous). Hence, the deleterious effect of high pressure for short duration is much more than that of low pressure for a longer duration.

This has been proven by the observation that when the high pressure is relieved, ischemia persists due to effects on the adjacent larger vessels; upon relief of low pressure, the normal hyperemic response compensates for the temporary ischemia and the tissue does not undergo degeneration [8].

Pressure injury pathogenesis has still not been clearly defined. Most reports indicate a "bottom-up" progression of tissue damage [2]. Muscle is more sensitive to pressure damage than skin because it is the most metabolically active layer and is at the greatest risk for ischemic injury [8].

The capillary level is the end point of circulation. From the capillaries, oxygen and nutrients diffuse into the tissues, and carbon dioxide and waste products are removed. A collapsed capillary bed is nonfunctioning and useless to the tissues. The minimal amount of pressure required to collapse a capillary is referred to as the capillary closing pressure [1]. Studies have shown that an average of 32 mm Hg will collapse the arterial side of the capillary circulation, and 18 mm Hg of pressure will collapse the venous end. However, these values cannot be accepted as universal; capillary pressures vary among persons, sites, and times [2]. Furthermore, the studies that elicited these values were done on healthy adult males, not debilitated or elderly patients. Other studies have shown that the functional capillary pressure, the pressure needed to the keep the capillary bed open, is around 17 mm Hg. Extended pressure resulting in capillary collapse will cause tissue damage.

Shear is the result of gravity pushing down on the body and resistance (friction) between the patient and a surface, such as the bed or the chair, holding the skin in place [2]. For example, when the head of the bed is raised (e.g., high Fowler position), gravity facilitates forward slide, pulling the body down toward the foot of the bed. The skin on the patient's lower back and gluteal area resists the motion and is held in place by the bed's surface while the bones and tissues beneath the area begin to slide. This causes puckering of the skin, stretching and angulation of small vessels, impedance of blood flow, and traction on subcutaneous tissue and muscle. Left unchecked, the net effect may result in ischemic injury to tissues at the fascia layer. When the head of the bed is elevated more than 30 degrees, shear force occurs over the sacrum and coccyx. Shear injury is not usually visible at the skin level, but shear is responsible for much of the damage associated with initiation of pressure injuries [4]. The areas of the body most vulnerable to shearing forces are shoulder blades, elbows, sacrum, ischial tuberosities, and heels. Signs of shear injury include irregular deep lesions, undermining, and tunneling.

### Prevention of Pressure and Shearing

There are several steps that may prevent the damage resulting from pressure and shear. If possible, limit the head of the bed elevation to 30 degrees or less. If the head must be elevated, the patient's knees may be bent ("gatched") with his or her feet flat on the bed. Using lift sheets to reposition patients is also recommended. Support surfaces are often utilized, and a low-resistance, breathable, and waterproof surface helps to eliminate friction. Foam surfaces lock the patient into place and reduce sliding. However, foam is not an appropriate surface to use if maceration (damage due to moisture trapped against the skin) is a problem [2].

When the patient is in a chair in sitting position, he or she should place feet flat on the floor and the back should be in alignment with the back of the chair. Consider using wheelchair or chair cushions that are higher in the front than the back for patients who tend to slide out of their chairs.

## FRICTION

Friction occurs when one surface moves across another surface, such as when a patient's skin slides across a bed sheet. This can result in the "sanding away" of the epidermal layer and upper part of the dermis, resulting in abrasions [2; 8]. Friction injuries often present as erythema and tenderness followed by skin loss. Friction damage can be seen under restraints, braces, and on the elbows, or with repetitive rubbing or repetitive cleansing. Patients with uncontrollable movements or spasticity are

also at high risk for friction injury, often referred to as "sheet burn." Friction injury occurs more frequently when the skin is fragile or macerated, and tissues subjected to friction are more susceptible to pressure injury damage, infection, and deeper ulceration [4; 8].

### Prevention of Friction

As with pressure and shear, there are steps to minimize friction in at-risk patients. The most common involve measures to prevent the patient sliding down in bed (e.g., use of knee gatch on bed). All skin care measures should be gentle, no scrubbing or aggressive rubbing, and heel and elbow protectors should be utilized. Cornstarch may help to reduce the impact of friction.

## MOISTURE

Moisture weakens the resilience of the epidermis to external forces. Maceration causes softening of the connective tissue, and a macerated epidermis erodes more easily. Overhydrated skin has decreased tensile strength. Skin can appear "water-logged," with areas of denuded skin and fissure formation. Shear and friction are increased when there is a moderate amount of moisture present, but it has been reported that shear and friction decrease in the presence of high levels of moisture. The role moisture plays in pressure injury development is an area of on-going research [9; 10; 11; 12].

Major sources of moisture are incontinence, wound drainage, tube leakage, and sweating. Urinary and fecal incontinence expose the skin to excessive amounts of moisture and chemical irritation. There is a higher risk for skin breakdown with fecal incontinence than urinary incontinence because of the pathogens in stool.

### Prevention of Excessive Moisture

Research has shown that when properly assessed and treated, urinary incontinence can be corrected in about 30% of nursing home residents [13]. Depending on the severity of the incontinence, the patient may be initiated in a toileting program. This consists of prompted voiding; specifically, the patient is taken to the bathroom at regular intervals and instructed to use the bathroom. When this is not feasible (e.g., if a patient is unable to respond to instructions), the patient should be checked for incontinence every two to three hours and repositioned every two hours, with skin checks. Moisture barrier creams/lotions offer good protection for patients with incontinence. A folded, clean pillowcase between skin folds may also be used for moisture absorption.

For sweating, barriers are contraindicated, because they retain moisture against the skin. For patients for whom sweating is an issue, use non-caking powder or a non-occlusive moisture barrier [2].

Some patients will benefit from the use of absorptive products. All absorbent products are not equal, and their benefits must be evaluated according to the needs of the patient. Odor control, wicking properties, absorbency, comfort, and cost all must be considered.

The appropriate use of containment devices, such as condom catheters, should also be evaluated. Trauma related to incorrect application of condom catheters is common and correct sizing and application is important.

## STAGES OF BREAKDOWN

Staging is an assessment system that classifies pressure injuries based on anatomic depth of tissue damage. As noted, in the 2016 revision to the NPIAP staging system, the term "pressure injury" replaced "pressure ulcer," to alleviate confusion between injury to intact skin (stages 1 and deep tissue injury) and open ulcers (stages 2–4 and unstageable pressure injury). At that time, NPIAP also updated the definitions of pressure injury stages (***Table 2***) and included the following changes [6]:

- Arabic numbers replaced Roman numerals in stages 1–4.
- The term "suspected" was removed from the deep tissue injury diagnostic label.
- Two additional pressure injury definitions (Medical Device-Related Pressure Injury and Mucosal Membrane Pressure Injury) were added.

| NPIAP PRESSURE INJURY STAGES | |
|---|---|
| **Stage** | **Definition** |
| Stage 1 | Intact skin with non-blanchable redness of a localized area, usually over a bony prominence. Area may present with changes in sensation, temperature, or firmness, even before visual changes are noted. Darkly pigmented skin may not have visible blanching, but its color may differ from the surrounding areas. |
| Stage 2 | Partial thickness loss of dermis presenting as a shallow open injury with a red/pink wound bed, without slough. May also present as an intact or open/ruptured serum-filled blister. |
| Stage 3 | Full thickness tissue loss. Subcutaneous fat may be visible, but bone, tendon, or muscle is not exposed. Slough may be present but does not obscure the depth of tissue loss. May include undermining and tunneling. |
| Stage 4 | Full thickness tissue loss with exposed bone, tendon, or muscle. Slough or eschar may be present on some parts of the wound bed. Often include undermining and tunneling. |
| Unstageable pressure injury | Full thickness tissue loss in which the base of the injury is covered by slough (yellow, tan, gray, green, or brown) and/or eschar (tan, brown, or black) in the wound bed. |
| Deep tissue pressure injury | Persistent non-blanchable, deep red, purple, or maroon area of discolored, intact or non-intact skin or blood-filled blister. The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer, or cooler as compared to adjacent tissue. |
| Medical device-related pressure injury | Describes the cause of a pressure injury resulting from and taking shape of a medical device. Use staging system to classify. |
| Mucosal membrane pressure injury | Injury found on mucous membranes in a location in which a medical device was used. Cannot be staged. |
| *Source: [6]* | *Table 2* |

Staging of a pressure injury can only occur after all necrotic tissue has been removed and it is possible to see the injury bed [1]. If this is not possible, the injury will be classified as unstageable. Pressure injury staging is not used to indicate pressure injury healing; a pressure injury should never be "down staged" or reverse staged (e.g., a pressure injury that is healing does not go from a stage 4 to a stage 3).

In pressure injury healing there is no regrowth of lost muscle, subcutaneous fat, or dermis; instead, the wound is filled in with scar tissue. Therefore, reverse staging does not accurately reflect the physiologic changes occurring in the pressure injury. When a stage 4 injury has healed, it should be classified as a healed stage 4 pressure injury [4].

Stage 2 pressure injuries have a healing time that ranges from 8.7 to 38 days. Stage 3 and stage 4 pressure injuries can take up to 69 days to heal. Healing rates are lower for stage 3 and stage 4 injuries than for stage 2 injuries in all healthcare settings [6]. Irreversible tissue damage can happen in as little as two hours in a patient with low tolerance; however, the injury may not become apparent for two to five days.

**Stage 1**

Stage 1 pressure injury presents as persistent redness in intact skin. If the area is pressed, it will not lighten in color (non-blanchable) [14]. It usually occurs in a localized area over a bony prominence, and this area can be painful, firm, soft, and warmer or cooler than the surrounding tissue [6]. This area of redness has a clear but possibly irregular boundary [14]. In darker skin tones, blanching may not be visible and the color may differ from the surrounding area [6]. In these instances, it is important to look for the other signs of pressure injury, such as pain, change in temperature, and changes in skin texture.

### Stage 2

Stage 2 pressure injury presents as shallow, open wounds with partial loss of the dermis. The wound bed is pink/red and without slough. A stage 2 pressure injury may also present as a serous fluid-filled blister [6]. Fat and deeper tissues are not visible, and slough and eschar are not present. These injuries are most commonly seen on the sacrum due to moisture and shear, and on the heel due to shear [6]. Skin tears, tape burns, incontinence-associated dermatitis, maceration, or excoriation of the skin should not be classified as stage 2 pressure injuries [4].

### Stage 3

Stage 3 is full thickness tissue loss. Subcutaneous fat may be visible and rolled wound edges are often present, but bone, tendon, and muscle are not exposed. There may be slough in the wound, but it does not obscure observation of the wound bed; if slough or eschar obscures the observation, this is an unstageable pressure injury. Tunneling and undermining may be present [6]. It is important to remember that the depth of stage 3 pressure injuries will differ from one location to another. For example, the bridge of the nose, ear, occiput, and malleolus do not have a subcutaneous layer, and in these areas a stage 3 pressure injury can be shallow [6].

### Stage 4

Stage 4 injuries are characterized by full thickness tissue loss with exposed bone, tendon, or muscle. These injuries often include undermining and tunneling, and rolled wound edges are often seen [6]. Slough and eschar may be present in part of the wound bed; however, if slough or eschar obscures the observation, this is an unstageable pressure injury [14]. In some cases, stage 4 pressure injuries can affect supporting structures and may lead to osteomyelitis. As with stage 3 injuries, the depth of the injury will vary by anatomical location.

### Unstageable Pressure Injury

A wound that is unstageable is defined as having full thickness tissue loss in which the base of the injury is covered by slough (yellow, tan, gray, green, or brown) and/or eschar (tan, brown, or black) [6]. Until the base of the wound can be visualized, the wound will remain unstageable. A necrotic wound cannot be staged until the necrotic tissue has been debrided, and it is then that a stage 3 or stage 4 injury will be revealed [6]. It is also important to remember that it is clinically inaccurate to stage a granulating wound if it is the first assessment, as visualizing the depth of the actual pressure sore is not possible [4]. In addition, if stable eschar on an ischemic limb or the heel(s) is present, it should not be removed [6].

### Deep Tissue Pressure Injury

Deep tissue pressure injury, previously suspected deep tissue injury, is a pressure-related injury, much like a bruise, that is characterized by persistent non-blanchable, deep red, maroon, purple discoloration or epidermal separation revealing a dark wound bed or blood-filled blister. Deep tissue pressure injuries can present on either intact or non-intact skin. This type of injury is caused by intense and/or prolonged pressure and/or shear. Deep tissue pressure injury may resolve without tissue loss or may rapidly change to reveal the extent of the tissue injury. 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). The NPIAP does not recommend using deep pressure tissue injury to describe vascular, traumatic, neuropathic, or dermatologic conditions [6].

Color is the key to differentiating between deep tissue injury and a stage 1 pressure injury. Purple or maroon areas indicate deep tissue injury; non-blanchable redness is characteristic of stage 1 injuries. Deep tissue injury can become a stage 3 or a stage 4 pressure injury even with optimal care [6]. In general, the most common areas of involvement are the heels and sacrum. In some patients, particularly those who are debilitated, deep tissue injury can develop rapidly [14].

### Medical Device-Related Pressure Injury

Medical device-related pressure injuries describe injuries or ulcers that result from the use of devices designed and applied for diagnostic or therapeutic purposes. The injury is generally in the shape or pattern of the device and should be staged using the staging system [6].

### Mucosal Membrane Pressure Injury

Mucosal membrane pressure injury is found on the mucous membranes. This type of injury is typically attributed to use of a medical device on a mucous membrane, and due to the nature of this type of tissue, these injuries cannot be staged.

## PRESSURE INJURY RISK ASSESSMENT

Identifying patients at risk for pressure injuries is vitally important as it allows for preventative measures to be initiated. Elements of prevention include identifying individuals at risk for developing pressure injuries, maintaining skin integrity, treating the underlying causes of the injury, relieving pressure, assessing the total state of the patient to correct any deficiencies, and patient/family education.

### MAJOR RISK FACTORS IN PRESSURE INJURY DEVELOPMENT

#### Decreased Mobility

Immobility is possibly the greatest risk factor for pressure injury development [4]. According to the United Spinal Association, up to 80% of patients with spinal-cord injuries will develop pressure injuries during their lifetime and 30% will have more than one pressure injury [15]. Patients who have lost the ability to ambulate, either for physical or cognitive reasons, will commonly develop pressure injuries while chair- or bedridden. The prevention of injuries in these patients is a vital aspect of ensuring an optimal quality of life.

#### Contractures

Untreated contractures often lead to pressure injury development. Contracted limbs, usually caused by continued hypertonic muscle or tendon stress, can exert pressure on surrounding tissues and adjacent areas. Contracture of a leg or foot can result in pressure injury development in that extremity, because it exerts more pressure on the support surface than a normal extremity.

#### Decreased Sensation

The sensory receptors, cortex, and motor neurons/muscles act as a sort of "pressure injury prevention system." These sensations induce individuals to move or shift position when an uncomfortable sensation is experienced. Injury or disease to any component of this system results in a loss of these protective reflexes. Therefore, patients who cannot feel discomfort or cannot sense ischemia are at high risk for pressure injury development.

#### Perfusion Status

Adequate circulation is needed to maintain tissue health by delivering oxygen and nutrients to the cells and removing waste products. Edema reduces tissue perfusion by increasing the distance between the cells and the capillary network. Normal, healthy tissue (in a person with normal sensation and movement) can tolerate short periods of ischemia because tissues require intermittent rather than continuous blood flow [2]. However, extended periods of ischemia can result in tissue damage and, with regard to skin, can lead to pressure injuries.

#### Hypotension

Low arterial blood pressure (hypotension), defined as systolic blood pressures less than 100 mm Hg and diastolic pressures less than 60 mm Hg, has been linked to increased risk for pressure injury development. In response to hypotension, the body redirects blood flow to the vital internal organs at the expense of the peripheral vascular system, which serves the skin. As the perfusion level drops so does the skin's ability to tolerate external pressure. Capillaries subsequently close at lower levels of interface pressure, and there is an increased risk of damage due to ischemia [1].

### Hydration

Normal skin hydration is provided by an intact stratum corneum and sebum secretion. Factors that can decrease skin hydration are overly vigorous or frequent washing, low environmental humidity, and aging. The removal of sebum by frequent cleansing or bathing can cause dehydration. It is important to use moisturizing lotion, particularly immediately after bathing to moisten skin.

### Cognition

Loss of cognition is also associated with increased risk for pressure injuries. Impaired mental status leads to a lack of awareness of discomfort or pressure and may be associated with incontinence. The ability to respond appropriately or to inform others of the need for assistance is often lost completely.

### Stress

Stress is a primitive response to injury or anticipated injury. Research has shown that during periods of stress, blood vessels in the peripheral tissues constrict. In a study designed to mimic the body's response to stress, healthy subjects were given an infusion of exogenous epinephrine [1]. The increased levels of epinephrine decreased the levels of subcutaneous tissue oxygen by 45%. Other studies have shown that psychologic stress has a negative impact on healing [1].

### Depression

The National Institute of Mental Health estimates that 8.4% of adults in the United States are suffering from depression, and major depression is the leading cause of disability worldwide [16]. Depression is particularly under-recognized in the elderly. Depressed patients have little interest in self-care and nutrition, both of which may predispose an individual to pressure injuries [4].

### Age

Patients older than 65 years of age experience pressure injuries most frequently [1]. With aging, the skin becomes more fragile. The skin layers adhere less securely to each other and often appear paper thin and almost transparent. There is also evidence of increased dryness, decreased vascularization, and increased vascular fragility.

In elderly individuals, there is a decrease in surface barrier function. The ability of the soft tissue to evenly distribute the mechanical load without compromising blood flow is impaired. There is less subcutaneous tissue to cushion boney prominences. This, in addition to decreased sensory perception, makes elderly skin more vulnerable to pressure, shear, and friction [2]. Research has shown that, in the geriatric population, blood flow in the area of the ischial tuberosity while sitting on an unpadded surface is lower than in younger adults [4].

Although much less common, children can also develop pressure injuries. Most commonly, these injuries develop in the occipital region in infants and toddlers and on the sacrum in young children [1].

### Obesity

In the United States, an estimated 42.5% of adults 20 years of age and older are obese and 9.0% are morbidly obese [17]. Obesity is defined as a body mass index (BMI) of 30 or greater; severe or morbid obesity is defined as a BMI greater than 40 [17].

Factors that contribute to pressure injury development in obese individuals include decreased blood supply in adipose tissue, difficulty in turning and repositioning, moisture within skin folds, incontinence, skin-to-skin friction, immobility, and poor nutrition. Obese patients are particularly at risk for "unusual" pressure injuries resulting from pressure within skin folds. Obese patients may have large panniculi ("aprons"), weighing up to 50 pounds.

The abdominal panniculus must be regularly repositioned in order to prevent pressure injury. This may be accomplished by placing the patient in the side-lying position and lifting the panniculus away from the underlying skin surface, which allows air to the area and simultaneously relieves pressure.

Tubes or catheters can also cause pressure by burrowing into skin folds. Poorly fitting beds, chairs, or wheelchairs may also be a source of pressure [18].

**Nutrition**

Low body weight and impaired nutrition are also concerns. Weight less than 119 pounds or a BMI less than 20 are indicators of increased risk for pressure injury development [19].

Recent weight loss, decreased nutritional intake, inadequate dietary protein, and impaired ability to feed oneself have been identified as risk factors for pressure injury development. An estimated 50% of elderly patients admitted to the hospital have suboptimal protein nutrition [19]. When there is a sustained deficit of protein as an energy source, skin and soft tissues become more vulnerable to injury. Low protein levels also result in decreased resistance to infection. Older adults also have increased incidence of low calorie intake and low levels of zinc and vitamin B12.

Vitamin A, C, and E deficiencies have been associated with pressure injury formation. Vitamin A works in the body to maintain epithelial integrity and is involved in collagen synthesis. It also plays a role in protection against infection. A deficiency of vitamin A can inhibit collagen synthesis, delay re-epithelialization, and decrease cellular cohesion. Vitamin C is also involved in collagen synthesis, immune function, and wound repair. A deficiency of vitamin C can result in capillary fragility. Vitamin E deficiency often decreases the immune function of the skin.

**Diabetes**

It is estimated that 11.3% of the U.S. population has diabetes [20]. Alone, diabetes increases the risk for pressure injury development by 56% [19]. However, approximately 27% of diabetics in the United States are 65 years of age or older, which compounds the risks [21].

Elevated blood sugar levels characteristic of diabetes result in decreased phagocytic ability of neutrophils and diminished wound strength. Patients with diabetes are more prone to infection, and wound healing is slower in this population than in patients without diabetes. Hyperglycemia can also result in protein-energy malnutrition, dehydration, and alteration in microcirculation [1]. Peripheral neuropathy, a common complication associated with diabetes, results in decreased sensation, an established risk factor for pressure injuries.

**Smoking**

Nicotine impedes blood flow to the tissues in two ways: it is a potent vasoconstrictor, and it increases the adhesiveness of platelets, resulting in clot formation. Carbon monoxide contained in cigarette smoke prevents oxygen from attaching to the hemoglobin molecule. This significantly reduces the amount of oxygen circulating in the blood stream. The same reaction occurs to some extent in people exposed to secondhand smoke. Studies have shown that cigarette smoking is associated with a higher incidence of pressure injury development in spinal cord-injury patients [22]. Patients who smoke also have a higher rate of recurrence of pressure injuries [4].

**Medications**

Several medications can affect skin integrity. Normal skin flora can be altered by antibacterials, oral steroids, and hormones. Additionally, analgesics, antihistamines, nonsteroidal anti-inflammatory medications, and chemotherapy can alter inflammatory reactions. Of these, corticosteroids have been studied the most extensively. Corticosteroids interfere with collagen synthesis and epidermal regeneration at a dose of 40 – 60 mg per day [2].

### Other Risk Factors

Areas of advanced pressure injuries that have healed are more likely to have recurrent breakdown. Therefore, documentation of history of a healed injury and its stage, if known, is important. Several other conditions can interfere with systemic and peripheral oxygenations and nutrition, resulting in pressure injuries. These conditions include:

- Respiratory problems
- Atherosclerosis
- Coronary artery disease
- Peripheral vascular disease
- Congestive heart failure
- Malignancies
- Human immunodeficiency virus/ acquired immune deficiency syndrome
- Anemia
- End-stage renal disease
- Thyroid disease
- Terminal illness
- Patient refusal of some aspects of care and treatment

## RISK ASSESSMENT

No step is more important in preventing pressure injuries than understanding a patient's risk. Risk assessment is used to identify:

- Populations at risk
- Level of risk
- Type of risk

A risk assessment is a way of attaching numbers and specifics to identified risk factors. An informal risk assessment cannot take the place of a formal risk assessment, such as the one conducted using the Braden Scale. Research shows that without formal risk assessment, clinicians tend to intervene consistently only at the highest levels of risk [23]. In some studies, repositioning or turning, an important part of pressure injury prevention, was prescribed for fewer than 50% of the patients at mild-to-moderate risk for pressure injury development [4].


When conducting a pressure injury risk assessment, the National Pressure Ulcer Advisory Panel, the European Pressure Ulcer Advisory Panel, and the Pan Pacific Pressure Injury Alliance recommend using a structured approach, including a comprehensive skin assessment, supplementing use of a risk assessment tool with assessment of additional risk factors, and interpreting the assessment outcomes using clinical judgment.

(https://www.internationalguideline.com/static/pdfs/Quick_Reference_Guide-10Mar2019.pdf. Last accessed May 9, 2022.)

**Level of Evidence**: Good Practice Statement (The recommendation is not supported by a body of evidence but considered to be significant for clinical practice.)

### The Braden Scale

The Braden Scale was developed in 1987 by Barbara Braden and Nancy Bergstrom [23]. Since then, it has undergone testing in several clinical settings, and its validity has been established by expert opinion. It is considered one of the most reliable tools for identifying patients at risk for pressure injury development, and it is the most widely used. The Braden Scale scores factors that contribute to prolonged pressure and factors that result in diminished tissue tolerance for pressure [23]. There are six items scored in the assessment [23]:

- Sensory perception
- Moisture
- Activity
- Mobility
- Nutrition
- Friction and shear

Each item is scored on a scale between 1 and 4 with the exception of friction and shear, which is scored between 1 and 3. The lower the score, the more severe the impairment or problem in that area. Therefore, the lower the score, the higher the patient's risk for pressure injury development.

| THE NORTON SCALE FOR PREDICTING PRESSURE INJURY RISK | | | | | |
|---|---|---|---|---|---|
| **Score** | **Physical Condition** | **Mental Condition** | **Activity** | **Mobility** | **Incontinent** |
| 4 | Good | Alert | Ambulant | Full | Not |
| 3 | Fair | Apathetic | Walk-help | Slightly limited | Occasional |
| 2 | Poor | Confused | Chair-bound | Very limited | Usually-urine |
| 1 | Very bad | Stupor | Stupor | Immobile | Doubly |

*Source: [24]* *Table 3*

Various studies have shown cut-off scores from 16 to 18 as being at risk [2]. Although cut-off scores vary, usually a score of 13–14 is considered moderate risk, 10–12 indicates high risk, and 9 or less is very high risk.

The Braden Scale should be used for assessment on admission to a care facility or after return from a hospital. Research shows that a repeat assessment done 48 hours to 72 hours after admission further defines pressure injury risk. In nursing home populations, the majority of pressure injuries develop during the first two weeks following admission [1]. In addition, most facilities set their own policies regarding reassessment frequency (e.g., quarterly). However, it is important to note that any change in a patient's condition warrants reassessment.

Braden Scale assessment is completed by licensed personnel familiar with the patient and is shared with all staff caring for the patient; good communication is essential to ensure a meaningful assessment [4]. Licensed and unlicensed staff must have a basic knowledge of Braden scores and how it directs patient care. Accuracy of scoring is very important to determining the appropriate intervention.

### The Norton Scale

The Norton Scale was developed in the 1960s and is used to assess the risk for pressure injury in adults (***Table 3***). The five items in the assessment are scored from 1 to 4, with 1 indicating a low level of functioning and 4 indicating the highest level of functioning. A score of 14 or less generally indicates the patient is at risk [24].

The Norton Scale should be used in conjunction with the clinical assessment [24].

## SKIN AND PAIN ASSESSMENTS

Admission assessment is the foundation for effective prevention and initiation of a management program. All special garments, including shoes, heel and elbow protectors, orthotic devices, restraints, and protective wear, should be removed during a skin inspection. If immobilizers or splints are being used, the physician should be consulted to ensure that they may be safely removed. If they cannot be removed, this should be documented in the patient's record.

It is also important to incorporate a holistic assessment, evaluating the meaning and significance of skin breakdown and wound development to the patient and his or her caregiver. Does the patient view the injury as a sign of vulnerability, a loss of independence, or an unavoidable consequence of aging?

There are several goals of completing a skin assessment. Foremost, it is imperative to identify and assess areas of impending or actual skin breakdown and patients at risk for future skin injuries and immediately begin appropriate management interventions. For patients at high risk for pressure injury development, a systemic skin assessment should be conducted at least daily and findings should be documented.

## ELEMENTS OF A BASIC SKIN ASSESSMENT

A basic skin assessment includes evaluation of the temperature, color, moisture, turgor, and integrity of the skin. The skin's response to pressure indicates its condition. Pressure to soft tissue interrupts the blood flow to that area and results in pallor to the overlying skin. This pallor indicates tissue ischemia. When the pressure stops, the skin should quickly return to its normal color as blood flow returns [25]. In general, when pressure is relieved from an area, redness will resolve within 30 minutes if there is no tissue damage. Therefore, it is important to recheck areas of redness 30 minutes after pressure is relieved and to document findings.

All aspects of the assessment should be explained to the patient. Many people are shy about exposing their body to strangers, even to clinicians. Conduct the exam in a warm and private room with good lighting. It is vital not to rush or overlook part of the assessment, even if the patient is restless.

Although a head-to-toe assessment is often used, a toe-to-head assessment may result in less likelihood of missing areas of potential or actual breakdown, considering that a thorough inspection of the feet and heels is often overlooked. When completing a toe-to-head skin assessment, start with the tips of the toes, between the toes, soles of the feet, back and sides of the heels, and inner and outer areas of both ankles. Continue up the following assessment sites:

- Right and left lower legs
- Right and left knees' inner and outer surfaces
- Right and left thighs
- Right and left ischial tuberosity
- Right and left hip
- Right and left iliac crest
- Sacrum
- Coccyx
- Lower, mid, and upper back
- Right and left shoulders
- Right and left ears (particularly redness under oxygen tubing)
- Back of the head

## ASSESSING AND DOCUMENTING A PRESSURE INJURY

Documentation of a pressure injury should include location, stage (per NPIAP definitions), wound description (e.g., size, color, drainage), and pain level. Wound size should always be recorded in centimeters. The length is the longest head-to-toe measurement, while the width is the longest hip-to-hip measurement. The best practice recommendation is to measure the wound at the point of greatest length and the point of greatest width. Wound depth is measured by gently inserting a pre-moistened, sterile cotton swab into the deepest part of the wound. The measurement from the tip of the applicator to the level of the skin surface is recorded as the depth [4].

Undermining and/or tunneling should also be recorded in centimeters. Undermining is defined as tissue destruction underlying the intact skin along the wound margins, meaning the wound margins have separated from the wound. Using the face of the clock as a reference for location, with the patient's head representing 12 o'clock, measure the extent of the undermining clockwise. For example, undermining along the right and bottom borders may be recorded as extending 1.5 cm from 2 o'clock to 7 o'clock [26].

Tunneling refers to channeling that extends from any part of the wound and may pass through subcutaneous tissue and muscle. It may result in dead space and abscess formation. The depth of the tunnel should be measured with a sterile cotton swab and recorded. The direction of the tunnel should be documented using the clock method (e.g., 4 cm at 5 o'clock). If there is more than one sinus tract/tunnel, number each one clockwise [4].

It is also vital to assess and document the appearance of the wound bed. If the wound bed has a mixture of tissue in it, this should be documented by an approximate percentage (e.g., the wound base is 75% granulation tissue and 25% slough). Granulation results in "beefy" red tissue with a shiny, moist granular appearance, while necrotic tissue is gray, brown, black, and moist. Eschars are typically gray to black and dry or leathery in appearance [26]. Slough tissue is yellow/white to gray in color. It may be stringy or thick and appear as a layer over the wound bed [26]. Epithelial tissue will often begin to grow in from the edges over the wound surface. This tissue is generally pink and shiny. As a quick reference color guide, red is associated with normal healing, yellow indicates slough or dead tissue, and black is necrosis [4].

Wound drainage is another important aspect of pressure injury assessment. The amount should be noted (scant, moderate, or copious). The color and consistency of the drainage may be serous (clear or light yellow in color, thin, watery), sanguineous (red, thin), serosanguineous (pink to light red, thin, watery), or purulent (creamy yellow, green, white, or tan, thick, opaque). The presence of any associated odor should also be documented. A non-infected wound produces little or no odor. The impact of wound odor can be quite devastating to the patient and his or her family.

The area up to 4 cm from the edge of the wound circumferentially should be assessed. Describe its characteristics, particularly color and integrity. Circumferential redness up to 2 cm is indicative of cellulitis [1]. The skin around the pressure injury should be palpated to determine if it is soft or indurated. Indurated (hard) tissue, even in the absence of redness, is an indication of infection.

## ASSESSING PAIN

Pressure injuries can cause considerable pain and suffering. Pressure injury pain has been described as ranging from sore to excruciating. In one study of patients with stage 2–4 pressure injuries, 74% of patients rated their pain as mild, discomforting, or distressing; 19% rated their pain as horrible or excruciating [27]. Pain and odor control are a major concern for patients, and studies have shown that patients rank pain control as more important than healing [4]. The level of pressure injury pain depends both on the stage of the injury and on manipulation of the area (e.g., if a dressing change is done at the time of assessment). The majority of patients report pressure injury pain at rest as well as with dressing changes. Pressure injury pain may be due to tissue trauma from sustained loads, inflammation, damaged nerve endings, infection, procedures such as debridement, and dressing changes [27].

The gold criterion for assessing pain intensity is self-reporting and the utilization of standard pain intensity instruments. Two of the most widely used pain assessment scales are the numeric pain intensity scale and the Wong-Baker Faces Pain Rating Scale [28]. The numeric pain intensity scale consists of ratings from 0 (no pain) to 10 (worst possible pain). This scale can be used for pain assessment with adults and children older than 7 years of age [29]. Visual presentation of the numeric pain intensity scale is helpful with hearing impaired patients, and the scale has been translated into many languages.

The Wong-Baker Faces Pain Rating Scale consists of six faces ranging from a happy smiling face (no pain), to a crying, frowning face (worst pain). The patient is asked to choose the face that best reflects his or her pain. The Faces Pain Rating Scale is the preferred scale for use with children and may also be used with the geriatric population. It can also be used with cognitively impaired patients and those for whom English is a second language.

After the initial pain assessment has been completed, reassessment should be done at regular intervals. Pain intensity should be rated by the patient, not a healthcare professional. The following questions may be used to help determine patients' pain levels:

- What kind of pain are you experiencing?
- What word(s) would you use to best describe it (e.g., burning, aching, shooting)?
- What makes the pain better?
- What makes it worse?
- Where is the pain located?
- Does the pain radiate?
- Would you describe your pain as none, mild, moderate, severe, or excruciating?
- How would you rate your pain on a scale of 0 to 10, with 0 representing no pain and 10 being the worst imaginable pain?
- What is the pain intensity at its worst, best, and now?
- Is the pain better or worse at any particular time of the day or night?
- When does it start and when does it stop?
- Pain Management

The goal of pain management in the patient with pressure injury is to eliminate the cause of pain and to provide analgesia. There are several interventions and practice modifications that can prevent or manage pressure injury-associated pain.

Skin care and assessments should be performed at a time of day when the patient is less fatigued [14]. All procedures should be thoroughly explained before they are performed. If a patient has questions, this should be addressed, and healthcare professionals should be encouraging and provide positive reinforcement. It is important to avoid trauma (shearing and tear injuries) to fragile skin during transferring, positioning, or holding a patient. If necessary, adjunctive medications may be administered to improve sleep and reduce anxiety, which can contribute to experiences of pain.

Dressing changes are often very painful. An analgesic may be administered 30 minutes before dressing changes, and if possible, the number of daily dressing changes should be kept to a minimum. Tape should always be avoided on fragile skin. If patients are able, they should be allowed to remove their own dressings or set the pace of dressing changes. All patients should be assessed for pain before, during, and after dressing changes, and these findings must be documented [4].


The National Pressure Ulcer Advisory Panel, the European Pressure Ulcer Advisory Panel, and the Pan Pacific Pressure Injury Alliance recommend clinicians consider applying a topical opioid to manage acute pressure injury pain, if required and when there are no contraindications.

(https://www.internationalguideline.com/static/pdfs/Quick_Reference_Guide-10Mar2019.pdf. Last accessed May 9, 2022.)

**Level of Evidence**: B1 (The recommendation is supported by level 1 studies of moderate or low quality providing direct evidence or level 2 studies of high or moderate quality providing direct evidence)

Physical therapy and occupational therapy may be helpful to decrease contractures and muscle spasm. Of course, ensuring proper seating and positioning can improve pain scores as well as decreasing the risk for further pressure injuries.

## INDIVIDUALIZED PROGRAM OF SKIN CARE

One of the most important steps to prevent pressure injuries is physically repositioning the patient frequently. Repositioning should be done every one to two hours, depending on the patient's condition [2].

## POSITIONING IN BED

Every time the patient is repositioned, look for areas of redness and make sure that the new position does not put weight on these areas. Avoid massaging reddened areas over bony prominences [14]. Donut-shaped supports or ring cushions that encircle the ischemic areas should not be used as they can reduce blood flow to an even wider area of tissue. To the degree that the patient is able, encourage activity. Even a few steps done frequently will help. It is important to maintain current activity level, mobility, and range of motion. When repositioning the patient in bed, it is essential to avoid the 90-degree side-lying position. This position puts intense pressure directly over the trochanter. Instead, use the 30-degree lateral position, utilizing a pillow or foam wedge to maintain the position [14]. Keeping the head of the bed at 30-degrees or less (if medically feasible) will help prevent shear. Place a pillow between the patient's knees or ankles to minimize pressure where one limb lies on top of the other. Lifting devices, such as an overhead trapeze or bed linen, are helpful when moving patients. It is important to minimize dragging during transfers and position changes. Minimize environmental factors leading to skin drying, such as low humidity (less than 40%) and exposure to cold [4]. Posting an individualized turning schedule in patient rooms can be helpful to healthcare professionals and patients.

Heel injuries are especially painful and are among the most difficult to heal. Heel pressure injuries can develop infection and, in extreme cases, may lead to amputation of the foot. To prevent the development of pressure injuries on the heels, place a pillow under the calf to float the heels off the bed. There are also devices available that eliminate pressure on heels and prevent foot drop (e.g., suspension boots). Current guidelines state that heels are to be kept off the bed [2; 30].

## POSITIONING WHILE IN CHAIR

Pressure injuries are a particular concern for patients who spend a significant amount of time in chairs. A patient is more likely to develop pressure injuries from sitting than from reclining, as sitting puts the patient's weight on the relatively small surface areas of the buttocks, thighs, and soles of the feet. Much of this weight is focused over the small area of tissue covering the ischial tuberosities. It is important for patients who sit in a chair to regularly change position. A dependent patient must have his/her position changed in a chair at least every hour. Patients who are able to move themselves should shift their weight (even slightly) every 15 minutes.

A patient should be properly positioned in a chair for postural alignment, distribution of weight, balance, and stability. Patients should sit with their back erect and against the back of the chair, thighs parallel to the floor, knees comfortably parted, and arms horizontal and supported by the arms of the chair. This position distributes weight evenly over the available body surface area. Slouching can cause shearing and friction and places undue pressure on the sacrum and coccyx. Feet should be kept flat on the floor to protect the heels from pressure and distribute the weight of the legs over the largest available surface area. The thighs and arms should remain parallel to ensure that weight is evenly distributed instead of being focused on the ischial tuberosities and elbows. Parting the knees will prevent the knees and ankles from rubbing together. If a patient uses a footstool, it is vital that his or her knees are not above hip level, because this shifts the weight from the back of the thighs to the ischial tuberosities. This same problem can occur if the chair is too short for the patient.

EVIDENCE-BASED PRACTICE RECOMMENDATION

The National Pressure Ulcer Advisory Panel, the European Pressure Ulcer Advisory Panel, and the Pan Pacific Pressure Injury Alliance recommend using a pressure redistribution cushion for preventing pressure injuries in people at high risk who are seated in a chair/wheelchair for prolonged periods, particularly if the individual is unable to perform pressure-relieving maneuvers.

(https://www.internationalguideline.com/static/pdfs/Quick_Reference_Guide-10Mar2019.pdf. Last accessed May 9, 2022.)

**Level of Evidence:** B1 (The recommendation is supported by level 1 studies of moderate or low quality providing direct evidence or level 2 studies of high or moderate quality providing direct evidence)

## CLEANSING AND BATHING

Maintaining skin cleanliness and moisturizing frequently can protect skin integrity. The skin should be cleaned with water and a gentle soap, preferably a pH-balanced cleanser. Alkaline products remove skin lipids, which increases water loss and weakens the barrier function of the skin [14]. Avoid hot water for bathing and scrubbing or using harsh cleaning agents. A soft cloth should be used to pat rather than rub the skin dry. Thromboembolic deterrent (TED) stockings should be removed when bathing, and the nurse or physician should be notified of any redness, discoloration, or skin breakdown.

It is important to individualize the frequency of skin cleansing based on the patient's age, skin texture, and dryness or excessive oiliness of the skin. A daily bath may not be needed for all patients.

## MOISTURIZING THE SKIN

The epidermis is about 30% water, but through a process called trans-epidermal water loss, skin can lose its natural moisture. Without sufficient moisture, skin can become dry, brittle, and vulnerable to breakdown [2]. Therefore, products should be used to keep the skin supple.

Emollients, such as mineral oil, petrolatum, and lanolin, penetrate into the stratum corneum to increase the lipid component and add softness to the skin. In addition, the oil film on the skin surface prevents water loss and helps to rehydrate the stratum corneum [14].

Moisture barriers such as dimethicone also help to prevent water loss and to retain lipids and water within the skin cells. These products maintain the "brick and mortar" configuration of the skin by replacing lost "mortar" [2].

Humectants, such as glycerin, urea, and Lac-Hydrin, increase the water content of the stratum corneum by pulling water from the environment. Normal hydration of the skin cells maintains normal cell shape and cell function. All moisturizers should be applied to clean, slightly moist skin. Special attention should be paid to bony prominences, heels, ears, and the back of the head.

## BOWEL AND BLADDER MANAGEMENT

### Urinary and Fecal Incontinence

According to the National Association for Continence, approximately 25 million Americans have transient or chronic incontinence. It is estimated that more than 90% of patients with urinary incontinence fail to seek medical intervention or treatment [31].

At least half of all nursing home residents experience urinary incontinence [31]. For patients who are cooperative and aware of bladder filling, a toilet program should be instituted, including planned voiding every two hours. For patients who are uncooperative or unaware of bladder filling, consider the use of absorptive products or condom catheters for men. It is important to use diapers and underpads that wick moisture away from patients' skin. These patients should be checked for incontinence every two hours. Incontinent patients should be cleaned as soon as possible after soiling using specialized incontinence skin cleansers or soaps.

For patients with fecal incontinence and severe diarrhea, all potential causative factors should be explored and addressed. A rectal pouch may be useful for these patients. In cases of chronic incontinence, an every-other-day suppository or enema may be considered. In addition, barrier ointments help protect the skin from incontinent episodes. If used, apply a thick coat of ointment, wipe off the soiled top layer, and apply another layer. Do not clean off the paste to skin level when bathing or cleaning.

## SUPPORT SURFACES

There is a vast array of support surfaces and seating options available, but as helpful as these devices may be, they are no substitute for attentive care. Patients still require individualized turning schedules regardless of the equipment used.

Most support surfaces reduce pressure by conforming to the contours of the body so pressure is redistributed over a larger area rather than concentrated in one location [2]. There are many support options, including mattresses, overlays, and cushions.

### Mattresses and Overlays

Most pressure relief mattresses use some form of foam, gel, or water to cushion the patient. Water mattresses and some air mattresses evenly distribute pressure under the patient. Low-air-loss and high-air-loss mattresses are specialized support devices that pass air over the patient's skin and promote evaporation [2].

The most common mattress overlays are foam, air, and gel. Foam overlays should be at least 3 inches thick for the average patient; even thicker is better. Two-inch foam overlays may add comfort, but they are not suitable for patients at risk for pressure injuries. Standard egg-crate mattresses are used for comfort only [2]. All support surfaces, regardless of the medium, function best with less linen between the patient and the surface. If a patient's weight completely compresses a mattress overlay, it is not effective. To make sure that a mattress is not "bottoming out," slide one hand between the mattress overlay and the mattress. If the patient's body can be felt through the overlay, it should be replaced [9].

The weight limit for most support surfaces is about 350 lbs. Special low-air-loss mattresses are available for patients who weigh more than 350 lbs.

An important factor in air-filled overlays is inflation; they may not be effective in preventing pressure injuries if they are over-inflated, under-inflated, or punctured. Therefore, inflation must be checked daily.

Patients must be comfortable and able to sleep on the support surface. Some surfaces produce noise that may not be tolerable for some patients.

### Cushions

Products designed to help prevent pressure injuries while sitting fall into two broad categories: those that relieve pressure and those that make repositioning easier.

Seat cushions may be used to distribute weight over the largest possible surface area. These are generally made of foam, gel, air, or a combination [2]. Wheelchair cushions for short-term use are foam, air, water, or gel. The goal of these products is to improve weight distribution cost effectively. Gel and air cushions have been shown to be the most effective [14]. Wheelchair-bound patients who require long-term solutions need cushions that fit the wheelchair, support seating stability, provide high-level pressure reduction, and reduce shear. All cushions should be checked and repaired or replaced on a regular basis.

## PATIENT/FAMILY EDUCATION

A vital component of a pressure injury prevention program is education. If possible, pressure injury prevention should not be a passive process for the patient and his/her family members. Rather, it should be a dialogue in which the patient or family feels comfortable asking questions and discussing problems. Patients should have as much control as possible in the plan of care. Empowerment is very important in maintaining the patient's physical and emotional well-being. The plan of care should be explained thoroughly to cognitively aware patients and their family.

At the same time, it is vital to evaluate the patient's/family's existing knowledge regarding pressure and pressure injuries. Healthcare professionals should show patients what they can do to facilitate pressure relief (e.g., how to make small position changes while in the chair). If possible, it is often beneficial to teach patients how to do simple range-of-motion exercises. Take time to train the patient as often as is appropriate; not everyone will absorb the information the first time it is heard [4]. It is important not to let noncompliance or a bad attitude from the patient or family discourage the teaching process. The subject should be approached as often as is reasonable. Include the family members and caregivers in the instructions. As well as assisting with care, they can encourage compliance. All efforts at patient and family/caregiver education should be documented, along with the patient's response (both verbal and behavioral).

## STAFF EDUCATION

Education of caregivers is also a key factor in the prevention of pressure injuries and in the successful management of existing pressure injuries. All healthcare personnel providing care to the patient must appreciate the role that they play in pressure injury prevention. Materials should be prepared to meet the educational levels of different members of the interdisciplinary team [32]. Certified nursing assistants (CNAs) are an essential part of the nursing team, and their education regarding pressure injury prevention and pressure injury healing should not be neglected. Programs specifically geared towards CNAs may be developed and implemented.

## NUTRITIONAL SUPPORT

Nutrition is important for maintaining skin integrity. A strong correlation exists between poor nutrition and pressure injury development [19]. Despite this fact, nutrition is often overlooked during treatment. It is of vital importance to address the nutritional needs of every individual with pressure injuries [33].

Malnutrition is defined as undernutrition or overnutrition caused by a deficit or excess of nutrients in the diet. Undernutrition occurs because intake is inadequate or the individual is unable to absorb nutrients. Overnutrition is most commonly seen in obesity. Patients with nutritional compromise should receive nutritional support, with the possible exception of patients in the end of life. Evaluation of hydration status is also an integral part of the overall nutritional picture.

### Nutritional Assessment

Weight is the cornerstone in the diagnosis of malnutrition [2]. An unplanned weight loss of more than 10% in the last six months indicates a serious nutritional compromise. Signs of malnutrition include:

- Loss of subcutaneous tissue
- Muscle wasting
- Generalized edema
- Dry, pluckable hair
- Dry, flaky, itchy skin
- Cracks in the mucous membranes
- Delayed wound healing/failure to granulate

Food and fluid intake should be continuously assessed. Pay attention to food preferences and tolerances; it is beneficial to optimize the eating environment by individualizing meal times and patterns as much as possible. Culture and religion often play a significant part in food choices and attitudes toward eating. It is often necessary to consider an interdisciplinary assessment of chewing and swallowing ability and dental problems.

Malnutrition is common in elderly individuals. Older people produce less saliva, which makes swallowing more difficult. Smell and taste diminish with age, and medication can affect taste buds, causing food to become less appealing. Patients' ability to self-feed should also be monitored. The use of finger foods, adaptive utensils, and feeding assistance should be considered if necessary.

### Interventions to Promote Nutrition

For patients with inadequate nutrition, strategies must be employed to increase oral intake. The preferred route of nutritional support is oral; whenever possible, the gastrointestinal tract should be used for feeding. It is the easiest and most comfortable way to provide supplementation, and it is also the least expensive and most convenient way. Patients must have diets prescribed with protein and caloric content sufficient to meet metabolic needs. The diet should consider the patient's preferences and special needs (e.g., mechanical soft diets) [4]. Daily multivitamin supplementation may need to be implemented. Mouth care should be performed prior to eating. Additionally, toileting and hand washing should be offered prior to meals.

Provide an environment conducive to eating. Position the patient properly; an upright position is preferred. Make sure the food is at the right temperature for the patient. Do not rush eating, particularly if the patient is elderly and requires more time to be oriented. Many patients benefit from the inclusion of snacks high in calories and protein in the diet (e.g., a peanut butter sandwich with milk). Consider adding powdered milk to yogurt and pudding to maximize caloric intake and protein levels. Commercial nutritional supplements, such as breakfast shakes, are also a common adjunct.

It is vital to maintain patient control as far as medically feasible. Some patients may not like ice in their water, others may prefer soup lukewarm. Patient preferences should be accommodated as much as possible.

Remind the patient to chew food thoroughly. If necessary, liquids may be offered between bites; some patients require this to help swallow their food.

Keeping patients hydrated is vitally important, and healthcare professionals should take all available opportunities to improve patients' hydration if it is medically indicated. Patients at risk of becoming dehydrated should be listed on assignment/report sheets as a reminder to monitor these patients. Fluids should be scheduled between meals at least three times a day. Patient preferences for fluids (e.g., straws, temperature, ice) should be observed and noted. Refill water pitchers frequently and keep them within reach of patients, especially those with restricted mobility. Patients should be offered something to drink at every interaction. Ambulatory patients should be provided with a water bottle. As with nutrition and positioning, it is necessary to educate patients/families about the importance of hydration. When, despite these measures, patients are unable to consume adequate levels of water or nutrients, tube feeding or parenteral feeding should be considered. Patient and family preferences and the overall goals of treatment guide these decisions [19].

## EVALUATION OF THE SKIN PROGRAM

Patients at risk for skin breakdown should have a daily inspection at every interaction, including during bathing, dressing, and repositioning. Every time the patient is repositioned, the skin surfaces should be checked. This will help determine if the turning schedule is appropriate for the patient or if it should be modified. Particularly, patients should be assessed to determine if episodes of incontinence are being adequately controlled. Differential diagnosis for fecal incontinence includes infection (e.g., *Clostridium difficile*), impaction, and dietary deficits. Ongoing evaluation of interventions in use is essential to ensure that they are effective.

Assessment is a team effort and should include all members of the interdisciplinary team, including physicians, nurses and nurse assistants, physical therapists, occupational therapists, dieticians, and social workers. If an intervention is determined to be ineffective, it should be modified or changed completely. Possible modifications of a skincare plan include physical therapy to assess current level of mobility, changing seating surfaces, and correcting inappropriate body alignment when sitting.

## DOCUMENTATION

Documentation of skin assessments provides information for those involved in the patient's care; it is a communication tool between the disciplines. To determine if a pressure injury is improving, documentation of the various states of the injury is necessary. This allows for evidence that the injury has improved [9]. Therefore, observations and interventions should be presented clearly and concisely. Another purpose of documentation is for a legal record of the assessment, interventions, and outcomes [7]. The individualized interventions for skin care should be documented, with specific details regarding who provided care, how often, what supplies and equipment are needed, and how the care should be undertaken. This information should be readily available to all of the patient's caretakers.

There are several tips to facilitate the complete documentation of pressure injuries. A good rule for documentation is to keep a record of the initial evaluation, interventions, patient's response, and any follow-up. All changes or complications identified should be noted. It is important to write clearly so anyone reading the chart will understand the language and the terms used.

Efforts to educate patients and/or families should be documented, including instructions given and responses from the patient/family. If a patient refuses or is unwilling to engage in certain interventions, this should become part of the documentation.

## CONCLUSION

A thorough, holistic assessment of each patient at admission, with factual, concise documentation of findings, is a clear starting point for treating and/or preventing pressure injuries. Daily skin assessments for high-risk patients and informal assessment with every patient contact are recommended to ensure optimal patient care. A reliable tool, such as the Braden Scale, should be utilized to identify patients at high risk for skin breakdown, and the NPIAP guidelines should be used to stage skin breakdown appropriately. The establishment of goals consistent with the values and lifestyle of the patient and his/her family can facilitate greater patient involvement in care and adherence to prescribed interventions. A team approach in deciding appropriate individualized interventions for each patient has proven advantages. Team members should be aware of their roles in implementing the plan of care. Ongoing assessment of the interventions in place and modification/change of the plan of care as needed is the final step in implementing an individualized skincare plan. Of course, this should be supported by timely, accurate documentation.

**Implicit Bias in Health Care**

The role of implicit biases on healthcare outcomes has become a concern, as there is some evidence that implicit biases contribute to health disparities, professionals' attitudes toward and interactions with patients, quality of care, diagnoses, and treatment decisions. This may produce differences in help-seeking, diagnoses, and ultimately treatments and interventions. Implicit biases may also unwittingly produce professional behaviors, attitudes, and interactions that reduce patients' trust and comfort with their provider, leading to earlier termination of visits and/or reduced adherence and follow-up. Disadvantaged groups are marginalized in the healthcare system and vulnerable on multiple levels; health professionals' implicit biases can further exacerbate these existing disadvantages.

Interventions or strategies designed to reduce implicit bias may be categorized as change-based or control-based. Change-based interventions focus on reducing or changing cognitive associations underlying implicit biases. These interventions might include challenging stereotypes. Conversely, control-based interventions involve reducing the effects of the implicit bias on the individual's behaviors. These strategies include increasing awareness of biased thoughts and responses. The two types of interventions are not mutually exclusive and may be used synergistically.

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## *Evidence-Based Practice Recommendations Citation*

National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel, Pan Pacific Pressure Injury Alliance. *Prevention and Treatment of Pressure Ulcers: Clinical Practice Guideline*. 3rd ed. Washington, DC: National Pressure Ulcer Advisory Panel; 2019. Available at https://www.internationalguideline.com/static/pdfs/Quick_Reference_Guide-10Mar2019.pdf. Last accessed May 9, 2022.