

## Definition of A Pressure Ulcer and Its Effect

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Pressure ulcer (also known as bedsore, decubitus, and pressure sore) is a damaged skin in certain areas of a human body that is caused by resting in a bed in a supine position without moving for an extensive period. What we don't know is the detail breakdown of how the pressure ulcer injures skin. Bedsores can happen to a person at any age resting in bed for a very long time; however, majority of bedsore's patients are individuals age 65 and older. There are many reasons what leads to bedsores but the principal reason is individuals who are over 50 years of age recognized that skin thickness is thinning, lack of physical activity, lack of nutrition, becomes more sensitive that breaks sooner and takes longer to heal than younger individuals. It is estimated that there are approximately 3 million individuals in the United States who are experiencing pressure ulcers every year.

There are really four elements that results to a pressure ulcer, they are:

1. Pressure
2. Heat
3. Moisture (Sweat)
4. No Air Flow

SCENARIO: A patient rests stationary in bed in a supine position (Face upward) without movement for a very long time. A long time can be more than 4 hours.

### 1. Pressure

Pressure is the continuous physical force or gravity exerted on or against an object by something in contact with another object. In this scenario mentioned above, gravity is pushing a human body mass down on to a bed forcing a body weight on a mattress. The force is distributed throughout a human body but the majority of a weight absorbs forces are upper back, lower back (hip), and heels.

While a human body is resting in bed, a force remains constant until a body is lifted off from a mattress. During that time when a body does not move, the pressure is already applied forces on skin surface of a body and travels to an interior body like under skin (Subcutaneous), muscle tissues, nerve tissues, capillaries (Branches of tiniest veins), and bones causing discomfort and pain to a patient. As a mattress is pushing force back to a body, and at the same time, gravity is pushing down to a human body, bones are absorbing weight and applying pressing onto muscle tissues, nerve tissues, veins and capillaries like a sandwich. Capillaries are the first reaction that cannot tolerate force for so long will begin to suffocate (cutting of oxygen) and clod blood.

## 2. Heat

Heat is a temperature that is generated by kinetic energy (work) to produce from warmth to hotness. There are many types of heat (heat transformation, heat radiation, and heat transfer). In this case a human body always performing kinetic energy in order to keep a core temperature (Interior body) of  $37^{\circ}$  Celsius ( $98.6^{\circ}$  Fahrenheit). The skin is an exterior surface body where a skin temperature is cooler than interior body. The normal skin temperature is ranged from  $32^{\circ}$  to  $34^{\circ}$  Celsius ( $89.6^{\circ}$  to  $93.2^{\circ}$  Fahrenheit). A human heart acts like a motor and a regulator that controls pumping of blood flow, therefore, a heart performs kinetic energy and generates heat in a body. Muscles also perform work that radiates heat. When a certain muscle contracts, it pumps blood to move forward, circulate throughout a body, and returns back to a heart. As we now know that a basic body generates heat, a certain surface area of back is heating especially when there is no space between a mattress and a surface back. When a body does not move for an extensive period, heat increases over time to high  $50^{\circ}$  Celsius ( $122^{\circ}$  Fahrenheit), heat is stimulated in a specific area of muscle tissues, nerve tissues, and capillaries. Heat is radiated and cannot cool down without convection or ventilation, nerves send signal to brain alerting a discomfort or pain and retrieve to its destination to deliver an effect; muscle tissues also feel irritations. This is where a redness of the skin surface begins to appear and a burning sensation causing discomfort and possibly pain.

## 3. Moisture

Moisture is a liquid, in this case water, form in a group of tiny drops located in air, substance, or surface. A human body contains water to keep organs, muscles, nerves, blood, and skin functioning to survive. A human body has sweat glands (sudoriferous) that contains three types of glands; 1) Sebaceous glands that moisturizes skin also known as oily glands that contain a complex mixture of fats and waxes, 2) Eccrine glands are a skin temperature acts like a regulator or better yet a thermostat that contains mostly water to maintain skin surface cool, and 3) Apocrine glands are the odor factor that contains a milky sweat that is in organic materials; when broken down by bacteria on the surface of the skin, is the chief cause of body odor.

The sweat is a transparent colorless acidic fluid with a peculiar odor. It contains some fatty acids and mineral matter. It is also called perspiration. In short, the function of a sweat gland is to keep skin cool.

## 4. Air Flow

Air is the invisible gaseous substance surrounding the earth atmosphere containing mainly a mixture of nitrogen and oxygen. A human body needs air to breathe as well as skin surface to survive. An air flow is a current in an atmosphere that circulates oxygen and nitrogen by a natural invisible force (wind) or by an artificial air flow such like air conditioner. The stronger the wind intensity, the cooler the air (depending on an environment). Not only air flow is vital for breathing but also for cooling. Air flow cools most surface body to feel comfortable and dry.

## Conclusion

When a patient rests in bed in a supine position without rotating for an extensive period, pressure is initially generated between a mattress and back of body. While there is no cavity for skin surface, heat is generated by natural body temperature and while there is no cavity for heat to escape, temperature rises to a high level that back of human body begins to sweat. During that stage areas of sweating skin tissue begin to soften and eventually break open. While broken skins are opened, moisture falls into muscle tissues and a patient will feel a burning sensation.

If not detected on time, pressure, heat, moisture can continue to dig deeper into a body dissolving tissues and all the way down to a bone. A huge hole is created causing life threatening situation and eventually a person's life is terminated.

There are four stages of pressure ulcers that are defined by the National and International Pressure Ulcer Advisory Panels:

1. Stage 1/Category 1     **Non-blanchable erythema**  
Intact skin with non-blanchable redness of a localized area usually over a bony prominence. Darkly pigmented skin may not have visible blanching; its color may differ from the surrounding area. The area may be painful, firm, soft, warmer or cooler as compared to adjacent tissue. Category I may be difficult to detect in individuals with dark skin tones. May indicate "at risk" persons.
2. Stage 2/Category 2     **Partial thickness**  
Partial thickness loss of dermis presenting as a shallow open ulcer with a red pink wound bed, without slough. May also present as an intact or open/ruptured serum-filled or sero-sanguinous filled blister. Presents as a shiny or dry shallow ulcer without slough or bruising\*. This category should not be used to describe skin tears, tape burns, incontinence associated dermatitis, maceration or excoriation.  
\*Bruising indicates deep tissue injury.
3. Stage 3/Category 3     **Full thickness skin loss**  
Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon or muscles are *not* exposed. Slough may be present but does not obscure the depth of tissue loss. *May* include undermining and tunneling. The depth of a Category/Stage III pressure ulcer varies by anatomical location. The bridge of the nose, ear, occiput and malleolus do not have (adipose) subcutaneous tissue and Category/Stage III ulcers can be shallow. In contrast, areas of significant adiposity can develop extremely deep Category/Stage III pressure ulcers. Bone/tendon is not visible or directly palpable.
4. Stage 4/Category 4     **Full thickness tissue loss**  
Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present. Often includes undermining and tunneling. The depth of a Category/Stage IV pressure ulcer varies by anatomical location. The bridge of the nose, ear, occiput and malleolus do not have (adipose) subcutaneous tissue and these ulcers can be shallow. Category/Stage IV ulcers can extend into muscle and/or supporting structures (e.g., fascia, tendon or joint capsule) making osteomyelitis or osteitis likely to occur. Exposed bone/muscle is visible or directly palpable.

There is virtually a fifth stage that only applies in the United States:

5. Stage 5 **Unstageable/Unclassified: Full thickness skin or tissue loss – depth unknown**  
Full thickness tissue loss in which actual depth of the ulcer is completely obscured by slough (yellow, tan, gray, green or brown) and/or eschar (tan, brown or black) in the wound bed. Until enough slough and/or eschar are removed to expose the base of the wound, the true depth cannot be determined; but it will be either a Category/Stage III or IV. Stable (dry, adherent, intact without erythema or fluctuance) eschar on the heels serves as “the body’s natural (biological) cover” and should not be removed.

**Suspected Deep Tissue Injury – depth unknown**

Purple or maroon localized area of discolored intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or *shear*. The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer or cooler as compared to adjacent tissue. Deep tissue injury may be difficult to detect in individuals with dark skin tones. Evolution may include a thin blister over a dark wound bed. The wound may further evolve and become covered by thin eschar. Evolution may be rapid exposing additional layers of tissue even with optimal treatment.