A NATIONAL EPIDEMIC

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Photos in course can be viewed in Full Color online at www.nursece.com

A very special Thank You to Dr. Thomas of Medetec for generously allowing us access to his comprehensive library of wound images.

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At the end of this course you should be able to:
1. Describe the four phases of the healing cycle and the important characteristics of each phase.
2. Differentiate between colonized or contaminated, critically colonized, and infected wounds.
3. Outline the characteristics of an infected wound.
4. Differentiate between the types of wounds and risk factors involved in prevention.
5. Outline a complete assessment of the patient with skin assessment emphasized.
6. Explain how to accurately measure the length, width, and depth of a wound.
7. Choose the type of dressing that will promote moist wound healing.
(Note: A glossary of terms is listed at the end of the course to enhance your learning experience).

Introduction
The process of trying to understand wound healing traces back to ancient times and has continued to be investigated. Interest grew in the 1900s, and, by 1960, it was understood that wound healing time could be decreased up to 50% if appropriate settings are created. Continuing from that time, there has been an ongoing expansion to not only understand the vast array of intrinsic and extrinsic factors of wound healing, but also the intracellular, extracellular, molecular, and biochemical processes and interactions that facilitate healing.

In the United States, chronic wounds affect around 6.5 million patients. It is claimed that an excess of $25 billion is spent annually on treatment of chronic wounds and the burden is growing rapidly due to increasing health care costs, an aging population and a sharp rise in the incidence of diabetes and obesity worldwide. A number of evidenced-based practices have been shown to be effective in reducing the occurrence of pressure ulcers, but these practices are not used systematically in all hospitals.

A wound is defined as an opening in the skin as the result of trauma, pressure or surgery. The importance of advanced wound care is the assessment of the physical, financial and social issues that encompass the wound dynamic. Each wound and patient is different in their needs and how they heal. As with all health care today, evidence-based care needs to include a plan that has the patient in mind. The wound does not heal itself; the person heals the wound. As portrayed by Jean Watson: “Society needs the caring professions, and nursing in particular, to help to restore humanity and nourish the human heart and soul in an age of technology, loneliness, rapid change, and stresses, an age without moral or ethical wisdom, as to how to serve humanity.”

Wound healing is a continuation, communication and collaboration of care. The 3 C’s need to start from the time the patient is admitted with the wound, and continues until the wound is healed. All disciplines are communicating, interacting with the patient as well as caregivers to assure the plan of care is understood and accepted. Jean Watson states: “Unknowns can also lead to illness; the unknown can only be known by experience and may require inner searching to find meaning.” The healing comes from the person and knowledge of disease process, healing becomes difficult when the person is left unknowing or unsure of how the wound is progressing or what the plan of care is. Though many patients do want healing to occur, there are those patients that feel continued illness allows him/her to get the attention needed. It is very important to assess the wound and the person each time the person is seen. This assures the patient of quality care for which the patient has control.

Basic Types of Wounds
Abrasions – Abrasions are made when the skin is rubbed or scraped off. Rope burns, rug burns, and skinned knees or elbows are common examples of abrasions. This kind of wound can become infected quite easily because dirt and germs are usually embedded in the tissues.

Incisions – Incisions, commonly called cuts, are wounds made by sharp cutting instruments such as knives, razors, scalpels and broken glass. Incisions tend to bleed freely because the blood vessels are cut cleanly and without ragged edges. There is little damage to the surrounding tissues. Of all classes of wounds, incisions are the least likely to become infected, since the free flow of blood washes out many of the microorganisms that cause infection.

Lacerations – These wounds are torn, rather than cut. They have ragged, irregular edges and masses of torn tissue underneath. These wounds are usually made by blunt, rather than sharp, objects. A wound made by a dull knife, for instance, is more likely to be a laceration than an incision. Bomb fragments often cause laceration. Many of the wounds caused by accidents with machinery are lacerations; they are often complicated by crushing of the tissues as well. Lacerations are frequently contaminated with dirt, grease, or other material that is ground into the tissue; they are therefore likely to become infected.

Punctures – Punctures are caused by objects that penetrate into the tissues while leaving a small surface opening. Wounds made by nails, needles, wire, and bullets are usually punctures. As a rule, small
puncture wounds do not bleed freely; however, large puncture wounds may cause severe internal bleeding. The possibility of infection is great in all puncture wounds, especially if the penetrating object has tetanus bacteria on it. To prevent anaerobic infection is great in all puncture wounds, ever, large puncture wounds may cause infection.

Healing Cycle

Wound healing is an intricate, complex and dynamic process in which the skin (or another organ-tissue) repairs itself after injury. It is a series of events that occurs from the time of injury and continues with the wound closing. The importance of the body completing this process is to prevent infection and repair the area of damage. The science of wound healing has set aside this action into phases. Although different, the main actions often overlap from one phase to the next. The difference from a chronic wound and acute wound is the length of time from opening to closing. The causes for increased healing can be related to comorbidities, infection, and improper care of the healing tissue.

A recent query for “phases of wound healing” in PubMed retrieved 1011 records. Under the search query, “wound healing and repair,” 1 article was identified in PubMed in 1899. In 1989, there were 101 articles and in 2011 there were 1600 related articles. As our understanding of wound healing progresses, further phases and subphases may well be delineated. Therefore, it is important to understand what the body is doing as the wound progresses from through the phases.

Phase 1 - Hemostasis Phase

Just like when damage has occurred during a natural disaster, it takes a team, with specific jobs to rebuild the community. So too, with wound healing.

First responders, with specialized skills take care of the most crucial situations, sealing off dangerous areas. In wound healing, damaged blood vessels must be sealed. In the healing cycle, platelets are the cells which act as the “first responders” sealing off the damaged blood vessels. The fibrin clot is used to create the foundation for cells to move across. The many reactions of hemostasis are as follows:

• Invasion of normal bacteria from the skin into the wound, causing the body to produce white blood cells.
• Fibrinolysis - the breakdown of the fibrin clot to further cell migration and move to the next phase of wound healing

Phase 2 - Inflammatory Phase

In the wound healing analogy the next job to be done once the “dangerous areas are sealed” is to clean up the debris. This is a job for the ‘clean-up crew’. These non-skilled laborers in a wound are the neutrophils or PMN’s (polymorphonucleocytes).

The inflammatory response causes the blood vessels to become leaky releasing plasma and PMN’s into the surrounding tissue. The neutrophils “eat” debris and harmful foreign particles such as bacteria, and dead or dying cells. This provides the first line of defense against infection. They are aided by local mast cells.

As fibrin is broken down as part of this ‘clean-up’, the degradation products attract the next cell involved. The task of rebuilding a community is complex and requires someone to direct this activity like a military commander. The cell which acts as “commander in charge” in wound healing is the macrophage. Macrophages are able to eat bacteria and provide a second line of defense. This phase is noted with increased warmth, redness and edema. This is not to be confused with the first signs of infection.

To identify infection is to know the signs and symptoms. Pain is an important factor along with warmth, redness, erythema, edema, changes in drainage and in wound measurement to name a few. During this time of wound healing the following are taking place:

• Increased fluid into the area with the breakdown of the fibrin clot, the increased permeability of the vessels and activation of the complement system.
• The complement system continues the destruction of bacteria by working with the white cells.
• The release of cytokines that increase the repair process by increasing cell proliferation, migration, matrix synthesis, and inflammatory response.

Phase 3 - Proliferation/Repair Phase

In the wound healing analogy once the site has been cleared of debris, under the direction of the commander, builders move in to construct the new community. Other team members can now install new infrastructure The fibroblasts that secrete the collagen frame further dermal regeneration. In this phase of wound healing there is formation of granulation tissue and filling in of the wound bed, from the base to the top. During this phase the surgical patient is at a high risk of dehiscence. The following is happening during this time of wound healing:

• There is decreased tensile strength related to formation of Type III collagen by Fibroblasts.
• Increase need for protein for the growth factors and angiogenic factors. Angiogenesis is the formation of new capillaries and repair of injured capillaries.
• Formation of the extracellular matrix that is used by the granulation tissue to move from one side of the wound edges to the other side.
• Epithelialization is the movement of cells across the extracellular matrix
• Wound contraction is movement of the wound edges closer with the use of fibroblasts and myofibroblasts.

Phase 4 - Remodeling/Maturation Phase

Once the basic structure of the community is completed interior structure may begin. So too in wound repair, the healing process involves remodeling. In this phase the wound is moving to finish closure and rebuilding of tissue inside of the wound bed. This phase can take up to 1 year to complete and wound will remain only 70% to 80% as strong as the original tissue.

• There is a replacement of granulation tissue, made up of fibroblasts and myofibroblasts to replace with collagen tissue and increase tensile strength
• Scar formation that is neither vascular nor cellular, that is made up of collagen and used to increase tensile strength.
• Remodeling, when completed, will increase the tensile strength to only 70%–80% that of the original tissue.

Although various categories of wound healing have been described, the ultimate outcome of any healing process is repair of a tissue defect.

Key Points

The definition of acute wound and chronic wound has changed many times over the years of research. Recent research defines acute as progressing in an orderly, rapid, uncomplicated, and organized fashion. Chronic would be the opposite including the following: increase chance of infection, build up of bioburden, and drain on economy and patient quality of life. To understand each phase and be aware of changes that must occur is to decrease the cost of healing and increase the quality of
life for the patient.

**Phase 1** is important to stop the body from continually bleeding and bring in the white cells to fight bacteria that have entered through the outside skin. It is important to maintain homeostasis and start the continuum of wound healing.

**Phase 2** is a continuation and the start of the inflammatory phase. This is where the white cells control the number of bacteria in the wound. In this phase the wound must be observed for differences between normal signs and symptoms of this phase and signs and symptoms of infection. The increase in pain, a noted fever, and increase in the size or no changes in the size of the wound, would indicate an infection.

**Phase 3** is important because this is where the wound continues to fill-in and begins true healing. There is movement from the base of the wound to the top. There is a filling in with granulation tissue and collagen matrix to complete the healing process. There is an increase in protein need during this phase to help with the building of the matrix.

**Phase 4** is completing the healing cycle with scar formation and the exchange of fibroblasts for myofibroblasts. The importance in this phase is regrowth, increasing tensile strength and completion of wound healing.

### Identification of Infected Wounds

Our skin has many microorganisms present and the skin is considered colonized by natural flora. When the skin is broken and a wound is present, the microorganisms can then enter to deeper areas of tissue and start multiplying. It is the progression from colonized to infected that must be monitored by patient, caregiver and nurses with each dressing change. When the wound is critically colonized or infected, then often there is a need to address the problem and bring the wound back to the colonized level. The control of microorganisms is done by use of dressings and antibiotics. When there is definite indication of deep tissue infection the standard of care is to do a culture of the wound bed.

**Colonized** is a movement of bacteria into the wound bed with some microorganisms starting to multiply, without overt signs of infection.

- At this time the wound bed is not infected nor is the normal wound healing interrupted.

- One-way to think of this: The city people are happily living together without one person being stronger than another.

**Critically colonized** is an increase in the number of microorganisms and the body will respond by progressing back to the immune phase. The microbes in the wound are growing faster than they’re dying, delaying healing. This type of wound lacks clinical signs of infection, despite supporting a bacteria level close to the maximum level the patient can tolerate. The patient’s immune defenses are simply not strong enough to prevent the wound moving from one stage to the next.

“In essence, the critically colonized stage is the calm before the storm. By recognizing trouble now, you can initiate appropriate treatment before the balance is tipped further and deeper tissue infection occurs”—Connie Sarvis, RN, CON(C), CWD, IIWCC, MN, FCCWS

There is no need for oral antibiotic as much as use of an antimicrobial dressing to help support the continuation of wound healing. One of the indications there is infection present is the lack of wound progression.

The mnemonic **NERDS** by Baranoski & Ayello, 2012 explains the best the signs and symptoms to monitor:

- **N** = nonhealing wound
- **E** = exudative wound or change in the exudate coming from the wound by amount and color
- **R** = red and bleeding wounds or a change in the tissue in the wound bed, where the wound bed bleeds easily
- **D** = debris found in the wound bed, or necrotic tissue
- **S** = smell/odor—emanates from the wound that is not related to the type of dressing being used. When these symptoms occur, the wound is a local infection and the patient is NOT symptomatic

An **infected wound** is present when the number of microorganisms causes tissue damage and often a systemic reaction by the body.

The systemic reactions include an increase in skin temperature as well as body temperature.

The mnemonic **STONES** by Baranoski & Ayello, 2012 is as follows:

- **S** = size is bigger
- **T** = temperature increase in the patient and area surrounding the wound
- **O** = osteomyelitis; that is, you can probe to the bone; exposed bone or can feel bone in the wound
- **N** = new areas of breakdown
- **E** = exudate, erythema, edema present surrounding the wound and coming from the wound
- **S** = smell that can not be associated with the dressing

When there is a systemic or deep tissue infection, then the wound must be addressed with antibiotics therapy and can also include anti-microbial dressing.

At this time a culture needs to be done to the wound bed to assure a proper antibiotic is being used to control the bacteria present.

Cultures should be done on cleaned wound beds only and in a Z-pattern being sure to cover the whole wound bed. Once an infected wound has been identified, a detailed assessment must be completed to determine the extent of problem, and get to the depth of the issue.

### Wound Assessment

The first assessment needs to include a full head to toe assessment including how the patient views the wound and views his/her quality of life. Questions such as:

- “What is your plan for the future?”
- “How do you feel about your wound or what you view as important at this time?”
- “What do you see as the priority to your treatment at this time?”

Many professionals forget the patient assessment when assessing the wound.

Direct wound assessment is important to indicate progression of the wound, detrition of the wound, and support for the dressings being used. The visual assessment and verbal subjective history from the patient, as well as full assessment of the wound will assist with a positive outcome and will aid in the diagnosis of the type of wound. It is important to understand, that wounds can be caused by pressure (most common), venous/arterial Insufficiency, surgery, trauma, and diabetes.
Pressure Ulcers

Pressure ulcer is defined by the National Pressure Ulcer Advisory Panel (NPUAP), 2009 an injury related to pressure caused by a bony prominence or combination of shear. A new cause is from a medical device. Medical device could include oxygen tubing, catheters, and casts. The damage is caused by a lack of oxygen and blood flow. When oxygen and blood flow are stopped from an area of tissue there is death of cells and breakdown will occur if pressure is not relieved. That is why off-loading is very important for the prevention and cure of pressure ulcers.

Pressure ulcers are a significant cause of increased mortality and morbidity, physical disfigurement, and prolonged hospitalizations and are one of the most costly preventable problems for long-term care residents. Each year, more than 2.5 million people in the United States develop pressure ulcers. The average cost of pressure ulcer treatment is $40,381, and chronic wound care costs in the United States is $20 to $25 billion annually. In acute care settings in the United States, the incidence of decubitus ulcers is 0.4% to 38%; within long-term care it is 2.2% to 23.9%, and in home care, it is 0% to 17%. Similarly, there is wide variation in prevalence: 10% to 18% in acute care, 2.3% to 28% in long-term care, and 0% to 29% in home care. There is a much higher rate in intensive care units because of immuno-compromised individuals, with 8% to 40% of ICU patients developing pressure ulcers.

People who are immobile are at highest risk of developing pressure ulcers. The Braden Scale for Predicting Pressure Ulcer Risk is the assessment tool most often used in home healthcare, nursing homes and hospitals. With the Braden Scale the patient is assessed for the following six areas: sensory/cognitive perception, moisture, activity, mobility, nutrition, and friction and shear will be discussed in detail.

Risk Factors

Anyone with limited mobility is at risk of developing pressure ulcers. Immobility may be due to:
- Generally poor health or weakness
- Paralysis
- Injury/illness that requires bed rest or wheelchair use
- Sedation
- Recovery after surgery
- Coma

Additional Risk Factors

Age. The skin of older adults is generally more fragile, thinner, less elastic and drier than the skin of younger adults. Also, new skin cells are usually generated more slowly. All of these conditions of the skin make it more vulnerable to damage.

Lack of sensory perception. Spinal cord injuries, neurological disorders and other conditions can result in a loss of sensation. An inability to feel pain or discomfort can result in not being aware of bedsores or the need to change position.

Weight loss. This is common during prolonged illnesses, and muscle atrophy and wasting are common in people living with paralysis. The loss of fat and muscle results in less cushioning between bones and a bed or wheelchair.

Poor nutrition and hydration. An adequate amount of fluids, calories, protein, vitamins and minerals in the daily diet are important for maintaining healthy skin and preventing the breakdown of tissues.

Urinary or fecal incontinence. Problems with bladder control can greatly increase the risk of pressure sores because the skin may frequently be moist, making it more likely to break down. Bacteria from fecal matter can cause serious local infections and lead to life-threatening infections affecting the body in general.

Excess moisture or dryness. Skin that is moist from sweat or excessively dry is more likely to be injured in general and increases the friction between the skin and clothing or bedding.

Medical conditions affecting circulation. Because certain health problems, such as diabetes and vascular disease, affect circulation, parts of the body may not receive adequate blood flow, increasing the risk of tissue damage.

Smoking. Smoking impairs circulation and reduces the amount of oxygen in the blood. Therefore, smokers tend to develop more severe wounds, and their wounds heal more slowly.

Decreased mental awareness. People whose mental awareness is lessened by disease, trauma or medications are often less able to take the actions needed to prevent or care for pressure sores.

Muscle spasms. People who have muscle spasms or other involuntary muscle movement may have an increased risk of pressure sores from frequent friction or shearing.

Causes

Pressure ulcers are likely caused by three different tissue forces:

1. Pressure, or the compression of tissues and/or destruction of muscle cells. In most cases, this compression is caused by the force of bone against a surface, as when a patient remains in a single decubitus position for a lengthy period. After an extended amount of time with decreased tissue perfusion, ischemia occurs and can lead to tissue necrosis if left untreated. Pressure can also be exerted by external devices, such as medical devices, braces, wheelchairs, etc.

2. Shearing, a force created when the skin of a patient stays in one place as the deep fascia and skeletal muscle slide down with gravity, can also cause the pinching off of blood vessels which may lead to ischemia and tissue necrosis. Friction is related to shear but is considered less important in causing pressure ulcers.

3. Microclimate, the temperature and moisture of the skin in contact with the surface of the bed or wheelchair. Moisture on the skin causes the skin to lose the dry outer layer and reduces the tolerance of the skin for pressure and shear. The situation may be aggravated by other conditions such as excess moisture from incontinence, perspiration, or exudate. Over time, this excess moisture may cause the bonds between epithelial cells to weaken, thus resulting in the maceration of the epidermis. Temperature is also a very important factor.

Pathophysiology of Pressure Ulcers

Pressure ulcers may be caused by inadequate blood supply and resulting reperfusion injury when blood re-enters tissue. A simple example of a mild pressure sore may be experienced by healthy individuals while sitting in the same position for extended periods of time: the dull ache experienced is indicative of impeded blood flow to affected areas. Within two hours, a shortage of blood supply (ischemia) may lead to tissue damage and cell death. The sore will initially start as a red, painful area. The other process of pressure ulcer development is seen when pressure is high enough to damage the cell membrane of muscle cells. This is the deep tissue injury form of pressure ulcers and begins as purple intact skin.
Staging of Wounds

A pressure wound that is not off-loaded will not heal properly. A venous stasis wound that is not compressed to rid the area of extra fluid will continue to not move through the healing cycle and can even increase in number and size. An arterial wound that lacks blood flow, does not have enough oxygen to promote proper wound healing. With this in mind, the stages of wounds are as follows:

- **Stage 1** (partial thickness) is defined as a reddened area or non-blanchable erythema over a bony prominence. This area can be painful, firm, soft, warmer or cooler as compared to surrounding tissue. This damage can be difficult to assess in dark skin individuals. The first interventions to put in place would include the following: turn and reposition every two hours, appropriate chair cushion with position changing, protection with moisture barrier.

- **Stage 2** (partial thickness) is the removal of the first two layers of tissues from the epidermis and includes the dermis. This includes a fluid or serosanguineous filled blister. Most often without slough or bruising and as a shiny or dry shallow ulcer. This wound will heal by epithelialization and will need protection from moisture and pressure relief.

- **Stage 3** (full thickness) is defined as progressing to subcutaneous fat layer. There is NO visualization of bone, tendon or muscle. Wounds that progress this far, even when healed, remains as Stage 3 wounds. These wounds will qualify for specialized mattresses to assure proper off-loading if located NOT on the legs or below or neck or above. The wounds may have slough, tunnels and undermining.

- **Stage 4** (full thickness) is defined as damage to tissue that has proceeded to expose the bone. Slough, eschar, tunnels and undermining may be present. When bone is present there is increased risk of osteomyelitis. These wounds often need surgical intervention. The patient needs to be monitored for nutritional needs, support surface needs and assure proper dressings are applied.

- **Deep tissue Injury** is a wound located over a bony prominence that has progressed to deep in the tissues. This wound is maroon, purple, dark in color or blood filled blister. The tissue is damaged through many layers of skin and can breakdown quickly. The damage is related to lack of oxygen and blood flow to the area for long periods of time. The intervention must include pressure relief and protection from moisture. This wound does not heal and continued support will be needed to include teaching of patients and caregivers.

- **Unstageable** wounds are covered with slough or eschar and the base of the wound is not visible. A wound that has 60 to 100 percent full thickness tissue loss is considered unstageable. Before the wound can start to heal the tissue needs debridement, including surgical, to assure a wound bed that can support proper wound healing. Wounds with stable black eschar on heals and feet, do not need debridement and need to remain dry, off-loaded and protected from moisture that could cause increased infection.

Staging Other Types of Wounds

**Arterial Insufficiency** wounds are serious in nature and difficult to heal. A thorough health history is needed and noted problems with skin, pain and patient history should be included. These wounds located on lower legs and feet, are often caused by trauma or infection. Arterial wounds are normally pale in color, have distinctive borders, pale gray or yellow in the base. Often these wounds are deep, showing tendons, bones, fascia, muscles and joint structures in the wound. With ischemia present, the wound cannot heal or complete healing. These wounds can lead to gangrene or tissue necrosis. Testing
needs to be complete with the assessment to include the following: capillary refill, bringing the leg to 45 degree equals ischemia, loss of hair on legs and feet, and thickening of nails. Often these patients need to have follow-up studies done, to assess the possibility of increasing blood flow to the area.

The following are three examples of arterial insufficiency wounds:

1. Partial thickness—the first two layers of skin—will not common in arterial wounds.

2. Full thickness - below the first two layers of skin, including down to bone.

3. Unable to assess or give a thickness related to eschar - unable to visualize the wound bed.

• Venous insufficiency is related to the inability of the venous system to return blood back to the heart. The superficial veins communicate with the deep veins via perforator veins. If you imagine the two legs of the letter “H”, the perforator vein is the connection between the two legs of the letter “H”. That “connection” is the part that perforates the muscle fascia and connects the deep veins to the superficial veins. With this said, incompetent perforators, decrease muscle strength and enlarged veins are the reasons for the insufficient venous return. There is also an increase chance of infection and skin breakdown. The slightest amount of injury to the skin and/or increased pressure on the surface of the skin will create a wound that will not heal appropriately. These wounds below are located on the pretibial and medial supra-areolar areas of the ankle. In doing a physical assessment it is noted that the legs have a hemosiderin appearance, edema, varicose veins, and lipodermatosclerosis. In assessing these ulcers it is important to assess the lymphatic and arterial systems as well. In order to heal these ulcers, compression is the gold standard and should not be used unless it will not affect the arterial system.

The following are three examples of venous insufficiency wounds:

1. Partial thickness is the first two layers of skin and heal by epithelialization.

2. Full thickness is past the first two layers of skin and can go to the bone. This thickness would heal by granulation.

3. Cannot assess the extent of the wound because wound base unobservable.

• Diabetic Foot Ulcers are the more serious and can lead to the increase chance of amputation. Most often causes of open areas are from improper shoes, walking barefoot, and accidents. The risks include the following: loss of blood flow to the feet, neuropathy, and uncontrolled blood sugar. Diabetics often have feet deformities including Charcot foot, which is the widening of the foot including misshaping from the breakdown of bones. It is very important to teach these patients to never go barefoot and check feet on a daily basis. Must be aware that diabetic patients can become septic with infection easily. Diabetics rarely run a fever but will have increased blood sugar readings if there is infection. An exposed bone will often equal osteomyelitis and should not mean amputation.

The following are three examples of diabetic foot ulcers:

1. Partial thickness is the first two layers of skin and heals by epithelialization.

2. Full thickness is beyond the first two layers of skin and can go to the bone. Vigilant care, hyperbaric oxygen therapy and antibiotics are a must with exposed bone.

3. Unable to assess wound related to non-viable tissue present and cannot visualize the base of the wound.
• Traumatic wounds are best defined as wounds that occur as a result of cuts, burns, abrasions, motor vehicle accidents, gunshot, or animal bites. Some trauma wounds are simple lacerations and will heal by primary intention depending on location and type. Skin tears would be considered simple lacerations, unless not able to reuse the flap, and then becomes a chronic wound. Extensive lacerations need debridement and sometimes multiple debridement, to reach tissue that is healthy. Wounds not closed after six hours need to heal by secondary or tertiary intention. These surgical incisions because of extrinsic and intrinsic causes will need to heal by secondary or tertiary intention. When assessing a surgical wound, there needs to be a full assessment of the patient and reason for the surgery as well as the comorbidities of the patient. The assessment of the incision line assures that the incision has healed properly from the base of the surgical line to the surface of the skin. If the surgical line dehisced, it will be a full thickness wound since most surgery involves all layers of the skin. Partial thickness wounds, would only include the first two layers of skin.

The following are three examples of traumatic wounds:

1. Partial thickness is just loss of the first two layers of skin.

2. Full thickness is the loss of all layers of skin to include bone.

3. Unable to assess the depth of the wound base related to the amount of non-viable tissue.

• Surgical Wounds are described as wounds that have not healed by primary intention. These surgical incisions because of extrinsic and intrinsic causes will need to heal by secondary or tertiary intention. When assessing a surgical wound, there needs to be a full assessment of the patient and reason for the surgery as well as the comorbidities of the patient. The assessment of the incision line assures that the incision has healed properly from the base of the surgical line to the surface of the skin. If the surgical line dehisced, it will be a full thickness wound since most surgery involves all layers of the skin. Partial thickness wounds, would only include the first two layers of skin.

The following are two examples of surgical wounds:

1. Full thickness surgical wound.

2. Incision that has dehisced and runs along under the suture lines. Unable to assess depth related to the non-viable tissue present.

Key Points

The most common types of ulcers include: Pressure ulcers, venous insufficiency, diabetic ulcers, arterial ulcers and surgical wounds. Atypical wounds, though not common, do often occur. These wounds are related to uncommon location, appearance, and do not respond to conventional therapy. These factors are important when deciding what is best for the patient and healing the wound.

• Pressure wounds are located over bony pressure areas and are stage related to the depth of the wound bed. Stages include the following:
  - Stage 1 - reddened area that does not go away.
  - Stage 2 - first 2 layers of skin, superficial in nature.

Stage 3 - down to the fascia of the wound bed.

Stage 4 - down to the bone and including the bone; Non-stagable is related to not visualizing the wound base because of necrotic tissue. Deep tissue injury is pressure-related injury to subcutaneous tissues UNDER intact skin that has potential for rapid deterioration.

Non-stagable - is related to not visualizing the wound base because of necrotic tissue. Deep tissue injury is pressure-related injury to subcutaneous tissues UNDER intact skin that has potential for rapid deterioration.

• Leg wounds can be venous insufficiency, arterial insufficiency or both. Venous insufficiency wounds that are located between the knee and the ankle, have a lot of drainage, ruddy in color, not painful and irregular in shape. Arterial insufficiency wounds are located from the ankle to the foot and have little to no drainage, pale granulation, painful, and round in shape.

With the venous insufficiency compression is the only way to increase healing and three to four layer compression is the gold standard. Before doing compression there must be arterial studies done to assure that there is good blood flow. With arterial wounds, there needs to be medical intervention to increase arterial flow or the wounds will not heal.

• Diabetic wounds are the hardest and most difficult wounds to heal. There are many problems with healing diabetic wounds and they are as follows: possible arterial insufficiency, neuropathy, uncontrolled blood sugars, increased infection rate, and slow wound healing. These patients need teaching related to the signs and symptoms of infection for diabetics, importance of blood sugar control and arterial studies. All comorbidities need to be addressed along with the wound and diabetes.

• Traumatic wounds are the result of injury to the area, not to be confused with skin tears. Traumatic wounds can be complicated by comorbidities but not caused by them. For example: a diabetic has a stab wound, it will heal more slowly as a result of uncontrolled blood sugar. A traumatic wound can be the result of: gunshot, stabbing, burns, motor vehicle accidents, abrasions, and animal bites to name a few. These patients have the wound
and the emotional problems as well. These patients need emotional support as well as the physical support of healing the wound. These wounds are either full thickness or partial thickness.

- Surgical wounds are the result of an incision that did not heal correctly. This healing is complicated by infection or comorbidities. The total assessment of the wound for undermining and tunneling is important to assure that under the incision no pockets or open areas will be left when healing. Most surgical wounds are best for Negative Pressure Wound Therapy (NPWT). These wounds are either full thickness or partial thickness.

**Measuring and Assessing Wounds**

The importance of measuring and assessing wounds is the need to document progress of healing, or lack of progress. Wounds need to be measured weekly and inform physicians of any changes noted. The assessments must contain the following information: type, anatomic location, age, size, shape, stage, sinus tract, tunneling, undermining, fistula, exudate, sepsis, surrounding skin, maceration, edges, epithelialization, necrotic tissue, tissue inside of the wound bed, and pain assessment. The need to do a complete assessment is stressed by the government so that a written plan of care is supported by the assessment.

When assessing the patient with or without a wound it is important to understand the patient’s risk of developing a pressure ulcer. With many changes in government regulations, it has become important for hospitals, skilled nursing home facilities, home care agencies and transitional care companies to specifically and thoroughly document wound healing progression.

**The Braden Scale**

The Braden Scale is the best way to assess the patient and the potential risks of developing a pressure ulcer. It is a summary rating scale made up of six subscales.

As a tool for accurately predicting a patient’s risk for a pressure wound, the following six subscales are scored:

- Sensory Perception
- Activity
- Mobility
- Skin Moisture
- Nutrition
- Friction and Shear

**Subscale definitions and guidelines are as follows:**

**Sensory Perception** - This is the person’s ability to not only know his/her whereabouts but also the ability to feel his/her position or pain in the area.

A score of 1 = Completely limited by answering these questions:
- Does the patient shift weight when sitting too long?
- Does the patient show any emotion related to pain?

A score of 2 = Very limited
- Does the patient only respond to painful stimuli by moaning or becoming restless?
- Does the patient only feel ½ of his/her body?

A score of 3 = Slightly limited
- Responds to verbal commands but cannot respond to discomfort or the need to turn?
- Has some sensory impairment that limits ability to feel in one or more extremities.

A score of 4 = No impairment
- No problems with being aware of pain or discomfort of body parts.

**Mobility** - is the patient’s ability to move self in bed or change positions.

A score of 1 = patient is immobile, unable to move self in bed.

A score of 2 = patient is limited in ability to move self, does need help repositioning and turning self.

A score of 3 = patient makes frequent body changes on own without help or assistance, but are only slight changes.

A score of 4 = patient makes all body changes without problems or assistance.

**Nutrition** - is the ability of the person to take in food and nutrients as a part of the daily diet. Able to not only take in enough for daily needs but healing needs also.

A score of 1 = patient is unable to eat or take in any nutrition at this time. If patient is NPO for more than 5 days or on IV fluids.

A score of 2 = patient is unable to take in more than ½ of the nutrients needed for daily calories. The patient is on a liquid diet or receiving tube feedings.

A score of 3 = patient is able to eat more than ½ of meal and eats most of the protein needed to heal body. Is receiving TPN or tube feedings that meet nutritional needs.

A score of 4 = patient has no problems taking in the calories and nutrients needed for metabolism or healing needs.

**Friction and Shear** - is the patient’s ability to move self in bed, keeping self from sliding or decreasing the potential of harm related to sliding down in bed.

A score of 1 = patient is not able to move himself/herself up in bed. Once sliding down in bed, needs maximum help getting back up. Contractions, spasticity, or agitation leads to constant friction and increased breakdown in skin. Patient is in restraints or other means of keeping him/her from moving freely.

A score of 2 = patient requires some assistance and can keep position in chair or bed most of the time.

A score of 3 = patient has no problems with friction or shear. No problems getting around.

By scoring these correctly the interventions of keeping the patient from breakdown will be appropriate to help assure no skin breakdown or limited skin breakdown.

For more information go to www.bradenscale.com
Scoring
Scored from 1-4 (1 for low level of functioning and 4 for the highest level or no impairment). Total scores range from 6-23 (one subscale is scored with values of 1-3, only).

The subscales measure functional capabilities of the patient that contribute to either higher intensity and duration of pressure, or lower tissue tolerance for pressure. A lower Braden Scale Score indicates lower levels of functioning and, therefore, higher levels of risk for pressure ulcer development.

Each functional category in a subscale is rated on a scale of 1 to 4 (excluding the ‘friction and shear’ category that is rated on a 1-3 scale). This combines for a possible total of 23 points, with a higher score meaning a lower risk of developing a pressure ulcer and vice-versa. A score of 23 means there is no risk for developing a pressure ulcer while the lowest possible score of 6 points represents the severest risk for developing a pressure ulcer.

The Braden Scale assessment score scale:
• Very High Risk: Total Score 9 or less
• High Risk: Total Score 10-12
• Moderate Risk: Total Score 13-14
• Mild Risk: Total Score 15-18
• No Risk: Total Score 19-23

Anatomic - Wound location
Note the exact location of the wound, not the general locations such as hip or buttock.

Include the following information for wound location:
• Superior - above a wound or anatomic location
• Inferior - below a wound or anatomic location
• Lateral - outside part of the body
• Medial - toward the middle part of the body
• Anterior - front part of the body
• Posterior - back part of the body.

Measuring Wounds
Be sure to include the shape of the wound. Measure in centimeters and not inches. It is important to be consistent in the method in which wounds are measured each time.

The most common method of measurement is the Clock Method in which the wound is considered as a face of clock. The position of the wound is based on standard anatomical positioning of the patient (arms down by the side, palms facing anteriorly, with thumbs facing away from the body), the head being 12:00, the feet at 6:00. Note: on the foot, the heels are at 12:00 and the toes are at 6:00.

• Length – head to toe to include time on the clock. If not at the exact 12:00 and 6:00 parts of the clock. Example: The wound length is measured from 1:00 to 7:00 and is 5cm.

• Width – side to side to include time on the clock if not at the exact 3:00 and 9:00 parts of the clock. Example: The wound width measured at 4:00 to 10:00 is 10cm

• Depth – Distance from the skin’s surface to the bottom of the wound.

Undermining – Located right under the wound edges and is an indication of shear, pulling at the wound bed. Measuring and record the measurements at each time of the clock. Example at 12:00-3cm, at 3:00 2cm, at 6:00-3cm, and finally at 9:00-1cm.

Assess Drainage
To assess the amount of drainage is to look at the dressing and assess the amount of drainage on the dressing. A rule of thumb is: ¼ or less means small or scant, ½ to ¼ is medium and ½ or greater would be large. An increase in drainage could be one sign of infection but must have all criteria as listed in the section on signs and symptoms of infection.

• Serosanguineous is a combination of blood and serous drainage. The drainage would be thin watery, pale red or pink in color.
• Serous is clear fluid.
• Sanguineous is bloody flow.
• Purulent is drainage that is thin or thick and color sometimes yellow or brown. Could be related to type of dressing being used. Wound is in the inflammatory stage of wound healing, or an indication of infection. If there is a concern of infection, then silver could be used for a short period of time.

Assessment of Wound Bed
These tissue types and amounts need to be noted in the wound assessment and needs to add up to 100%. Example: Black Eschar 10%, Yellow Slough 90%.

• Granulation tissue in a wound is the indication of good healthy tissue. The tissue is red in color and will continue to move upward.
• Hypergranulation tissue is red to pink in color and often rises above the wound bed. It appears bumpy and not as the smooth granulation tissue. This is an indication the cells have too much fluid and the dressing is not pulling the fluid from the wound bed.
• Slough tissue is yellow, fibrous, necrotic tissue that is non-viable. This tissue can sometimes be loose and easily removed or adheres to wound bed and need to be debrided. Slough tissue is a collection of fibrin, bacteria, dead cells, and wound fluid.
• Black eschar is black or brown tissue that is hard and non-viable. This can be yellow slough that has dried out or tissue that has lost the blood supply.
to remain healthy. This tissue will inhibit wound closure. The removal of this tissue is needed in most wound locations, except areas on the feet.

The feet are often the first to lose blood supply and debridement will only create a deep wound that will be difficult to heal. The eschar when intact and hard can be covered with a dry dressing or use of an agent that will promote dryness and anti-infecting qualities. The idea is to continue to keep the area dry and intact until healing has completed and the eschar comes off as a scab.

**Assessment of Wound Edges**

- **Attached edges** are normal and indicate the presence of wound healing. The cells will continue across to form wound contraction.

- **Non-Attached wound edges** could indicate the wound bed is surrounding bone; wound that has rolled or epibole, or a wound that is not healing properly. To promote wound healing surgical debridement will be needed.

- **Wound edges that are not distinct** could indicate that the wound bed is at the same level as the edges and epithelialization is occurring.

- **Calloused wound edges** are an indication that there is rubbing or pressure close to the wound and the body is trying to protect the area. To assure good wound healing the edges need debridement or the edges will not allow the wound to close.

- **Rolled or epibole edges** often indicate that the wound has been kept dry and the edges are seeking moisture to finish wound healing. These edges need to be surgically re-opened so that the granulation tissue can continue to move across the wound bed and create a epithelized wound.

- **A wound edge that is macerated** has white soggy edges. This dressing is not controlling the drainage and if not controlled the edges will breakdown to promote increase in wound size.

**Surrounding Tissue Assessment**

- **Hemosiderin staining** - Chronic venous stasis changes the skin texture and elasticity that results in a brownish discoloration of the lower legs. This staining occurs when the pressure in the veins causes the red blood cells to break. When the red blood cells break, they leak out hemoglobin. Hemoglobin contains iron which leaks out into the tissue and stains the skin. This eventually will lead to a venous stasis ulcer.

  The skin around the ankle area can no longer adapt to the swelling and breaks open and seeps, leading to a painful venous stasis ulcer.

  - **Erythema** - Warmth, increase in pain, and increase in drainage could be indication of infection. Erythema is also present with the application and removal of 3 to 4 layer compression dressing.

  - **Induration** - Indicates that the edges of wound have extra fluid around them. This could be related to fluid collection or further breakdown of the edges. This is an indication that the wound has back-tracked to phase 1, the inflammatory phase. This could be related to a new trauma or the wound is critically colonized. A silver dressing for 14 days can help to move the wound back to healing. Then return to a regular dressing that will continue the healing process. Silver dressings should not be the only type used throughout the healing process.

  - **Scar tissue** - May be slightly lighter to light pink surrounding, indicating past wounds that have healed recently or quite some time ago. This would indicate a need for teaching and interventions to prevent future breakdown. Scar tissue is only 85% as strong as the original tissue.

**Patient Assessment**

Assessment of the whole person is as important as the wound assessment. It is Jean Watson that states often in her theory that nursing is assessment of the whole person. Jean Watson stated in her Theory of Caring, “The unity of human mind-body-soul as inseparable one whole”. Evidence based-care is based on quality care and including the patient into the creation of care plan for patient centered care”. The Braden’s score uses some of this information to determine at-risk patients. It is important that the nurse doing the scoring, understands the importance of each section and how the scoring will help with prevention.

**Age** is not a specific scoring on the Braden assessment, but age affects wound healing in several ways: decrease in metabolism, decrease in blood flow, decrease in pain perception, and changes in skin composition. The elderly often have fewer amounts of fat cells, decrease in skin elasticity and decrease in blood flow (especially in the lower legs). The decrease in fat cells creates an increased chance of pressure ulcer and suspected deep tissue injury. The decrease in skin elasticity creates an increase chance of skin tears and trauma wounds. With decrease in pain perception, many patients have the inability to realize when touching hot objects or when running into objects. The decrease in blood flow increases the chance of venous and arterial insufficiency wounds. These patients must be encouraged to remain as active as possible, wear support hose and eat a well-balanced diet. Age is also an indication of how quickly the wound will heal.

**Mobility** is an important part of the Braden scale and needs to be documented accurately. Braden assesses mobility as: activity-degree of physical activity is the patient always in bed, confined to chair, walk occasionally or walks frequently. Then Braden includes: mobility-how well the patient to move completely immobile, very limited, slightly limited. Finally assessment for friction and shear to include problem, potential problem and no apparent problem. The assessment is important to assure the proper interventions are in place. A patient with venous insufficiency needs to be assessed for ability to walk put legs up and exercise legs on a daily basis. Physical therapy referral will be important for helping to teach families, work with patients and assure doing what will accurately help the patient to heal.

**Nutritional status** – Nutrition is an underassessed, yet important factor in wound healing that is included on the Braden scale. The assessment needs to include intake ratings such as: very poor, probably inadequate, adequate and excellent. The nurses need to look at how the patient has been taking food in by IV or TPN and if NPO for how long; what is being done to assure proper nutrition during that time. Many nurses assume an over weight or obese patient is not in need of nutritional support. Regardless of weight, a patient that is not nutritionally sound will not heal and will become very weak. The most accurate way to assure good wound healing is to know the protein level.

Labs need to include the following: HBA1C-to test blood glucose levels over
past 3 months, CBC—to test H & H to ensure enough blood cells to carry oxygen to the wound and check white cell count to assess for chance of infection. CMP-to give protein level, albumin level and assure kidney function. The protein and albumin are important to assure that the wound has the essential elements to allow it to move through the phases. There is not one phase of wound healing that the wound will not need protein to complete healing.

Comorbidities are important in the assessment to assure that the whole picture of health is considered in the healing or not healing cycle. A diabetic’s blood sugars must be addressed, since an increase from normal would indicate an increase of stress on the body, if that stress is infection, mental or physical. Uncontrolled blood pressure or chronic heart failure causes increased fluid in the legs and decreased healing. A patient with a diagnosis of pneumonia, upper respiratory infection, and urinary tract infection for example are prone to have slower wound healing, since the body is working on healing the general infection and not able to work on healing the wound. All this information needs to be taken into the assessment to assure a true picture of the patient is recorded. There needs to be an assessment of the medications, since some medications interfere with wound healing.

Assessment of Bowel and Bladder is important and addressed in the Braden scale. The importance to note is incontinence, even that incontinence is temporary. A patient with C. difficile is going to have a strong increase in breakdown, than a patient who is incontinent of bowel and bladder. Diarrhea, especially C. difficile, is extremely harsh to the skin.

Mental state and acceptance of the wound address the stress that wound healing can have on the patient. The more stress and anxiety the patient feels, the more the wound decreases in the healing process. When a patient faces stress, it is a normal body response to go into fight or flight mode. Increased blood sugar pulls oxygen away from the legs and arms, and increases mental alertness. This will decrease important needs the wound has to move through the stages of healing. Depression and stress are elements that need to be monitored to assure homeostasis and proper healing.

Pain needs to be addressed at all times of dealing with the wound assessment and each visit. An increase in pain would be an indication of infection. Pain with the dressing change would indicate the need to have medication. An increase of change in the pain of the wound needs to be addressed and then an increase in temperature needs a call to the physician immediately.

Assessment of medications is important, since many medications can interfere with wound healing and others promote oxygenation to enhance wound healing. By knowing the effect of medication on the body, can either increase wound healing or decrease wound healing, depending on the drug interactions. It is important to know what the drugs do in the body and how that will affect the healing process. The following medications need to be looked at closely for the following reasons: steroids and anti-inflammatories interfere with the immune response, anticoagulant decrease the body’s ability to produce fibrinogen, vasodilators increase blood flow, vasoconstrictors will decrease wound healing, antiseptics inhibit wound healing by decrease collagen formation, and vitamin C is used in collagen formation.

Key Points
It is very important to do a thorough assessment of the wound and patient on admission, then throughout the wound healing process. Wounds are as complex and different as the patient. The wound does not heal the patient, but the patient heals the wound. Use the autonomic location when describing the wounds location. Measuring the wound needs to include the following: tunnels, undermining, depth, width, and length. When describing include location by use of time on the clock. Drainage needs to be described to include amount and type. Need to describe wound edges, pain, and shape of wound.

The wound assessment is not complete without a picture of the patient and history of the wound. This would include: comorbidities, medications, age, level of mobility, pain, mental status, nutritional, and spiritual status. The head to toe assessment assures knowing the patient thoroughly and patient then becomes a more than just a wound.

Braden Scale - though difficult to use and understand by many nurses, is one of the most used of the assessment scales.

Wound Dressing Choices
After a proper assessment of the wound and patient a dressing can be chosen to promote true moist wound healing. With each dressing change, the wound needs re-assessment to be sure the wound is healing. Moist wound healing has been the standard of care since 1996. Since today’s market is and should be evidenced-based wound care, the importance of choosing the proper dressing becomes increasingly important.

The treatment decision must be based on the following acronym MEASURES.

M = Minimize trauma
E = Eliminate dead space
A = Assess and Manage exudate
S = Support the tissue defenses
U = Use of nontoxic wound cleansers,
R = Remove infection, debris, and necrotic tissue,
E = Environment to assure moisture dressing and control of outside environment to wound,
S = Surrounding tissue is supported with decrease in chance of continued breakdown.

There are many products in the market today that will promote wound healing through the many phases. Dressings are listed in categories by type and action. Using generic terms assure when the patient is discharged, the next agency or extended care facility will use the proper dressing. This list only contains many used on a regular basis. There are as many dressing available for use as there are wound care patients.

Transparent Film: These dressing are passive. The dressing is used related its ability to see through and are made out of a polyurethane membrane. The product is made to adhere to surrounding tissue and not the wound bed itself. This product does not have the ability to absorb and are semipermeable to gases. This makes the dressing good for autolytic debridement and protect from friction. These dressings are to be removed when the wound fluid can be seen coming from under the dressing.

- Transparent film dressings need to be used with caution on aged skin.
- They are not recommended on infants and children.
- Used on dry to minimal moist wounds only.
- These dressing make excellent secondary dressings.
- Do not use on infected wounds.
- Needs to be changed when fluid meets the edges before the fluid breaks the adhesive bond.
When removing the dressing be sure to remove by pulling toward the outside of the wound to break the seal.

Use skin protection wraps on surrounding tissue to protect the skin.

Hydrocolloids - These dressings are passive. Hydrocolloids are impermeable to vapor and gases. Hydrocolloids are made of the following chemicals: adhesive, absorbent polymers, pectin gelling agents, and sodium carboxymethylcellulose. The chemicals of the wound fluid and the chemicals of the dressing will form a soft gel. Odor may develop and this is a natural condition of the dressing and not an indication of infection.

Change dressing every 3 to 7 days. Absolutely needs to be changed before fluid reaches 1 inch of the edge of the dressing.

Unless indicated on the product label, not to be used on infected wounds.

If the wounds have tunnels, undermining or sinus tracking the dressing is not to be used. Does not absorb fluid in these area or fill space.

Can cut to fit any wound size or shape.

These dressings can be used as primary or secondary dressings.

When removing, peel back an end then roll the rest of the dressing off. Do not pull it off.

Please use skin prep on the peri-wound area.

Sometime putting paper tape around the edges will help to hold the dressing down.

Foam Dressing - These dressings are passive and are used as the top dressing for absorbency. The dressing allows water vapor and gases to penetrate, causing the “wicking” (this is the action of pulling the fluid away from the wound bed) of fluid from the wound bed into the dressing. This decreases maceration of the wound edges. The dressing can be used with all types of wounds, either alone or in combination of another dressing. Foams should never be used alone on wounds with black eschar. Intact eschar located on feet or heels require some type of debridement. The foam dressing can be used to cover chemical debridement dressings. These dressing come in many different size, shapes, and combinations. Some come with silver, adhesive border and no border. The choice needs to depend on the need of the patient and wound at the time in healing.

Check package insert on type of wound the foam can be used on. Not all are appropriate for infected wounds.

It is appropriate to keep in place from 3 to 7 days depending on the amount of drainage of the wound.

Removal is usually trauma free, especially on if using bordered dressing.

Most of the foam dressings can be cut to size.

Skin prep should always be used on the peri-wound skin to protect from the adhesive and drainage.

Non-adhesive dressing will need a way to secure in place. To include tape or rolled gauze

It is important to assure the correct side of the dressing is being place next to the wound.

Alginates - These dressing are passive. Often used in many different kinds of wounds to promote moist wound environment. Alginates are made of seaweed and are easily broken down by the body. These dressing possess the ability to absorb up to 30 times the dressings weight in fluid. Because of the sodium atoms in the dressing, the dressing reacts to the wound fluid to create a gel and create a moist wound healing environment. This dressing is used on different types of wounds and is contraindicated for dry eschar, surgical implantations and third degree burns. It comes in plain and silver treated types.

These are easy application and removal dressings.

This dressing is good for both undermining and tunneling wounds.

Requires a secondary dressing such as: ABD or foam dressing

The fiber can be flushed with saline and is easily removed

These dressing can be used in combination of debridement topical or other products to encourage autolytic debridement.

Can be used on infected wounds, with or without the silver included

Cost effective since can stay in place for long periods of time.

Composite Dressings - combination dressings are made up of a variety type of materials and have different ways of working with the wound and wound bed. These dressings could contain: gel, hydrocolloid, foam and bacterial materials. The package directions need to guide the use, along with the nurse’s understanding of how the dressing is to be used.

Use these dressings as other dressing carefully with fragile skin.

Composite dressings are easy to apply and remove.

These dressings can be used on all types of wounds including infected and when using topical treatments.

Can be used to help with autolytic debridement or mechanical debridement.

Alpha frequency of dressing change is related to type of wound, amount of drainage and properties of the dressing being used.

Use caution when removing from fragile skin, the adhesive to the peri-wound skin.

Collagen/Hydrogels - Are an active wound dressing, since collagen is needed for the matrix formation in the wound bed. These dressing are usually made from cowhide. Collagens can be combined with Calcium Alginates or Silvers. Collagen powders can be used on wounds that are high equating and will promote healing and moist wound environment. If the wound is dry, then a moisturizer needs to be added, such as a hydrogel. Collagens can be used with all types of wounds, thicknesses, and with infection present or not. These dressings can be changed every 1 to 7 days, depending on drainage. This dressing cannot be used alone and needs to be used in combination with a foam dressing.

Use with caution on patients with fragile skin.

Watch for allergic reactions to products used to make this dressing.

Not to be used on wound with eschar or third degree burn wounds.

The gel properties allow easy removal from the wound bed and do not create debridement.

These are dressing that create a moist wound environment and promote evidenced-based wound healing.

Can be changed daily if the wound is infected.

Antimicrobial - These dressing are a variety of type from passive to active depending the main dressing being used with. Each dressing has differing on how applied, what bacterial action and ingredients used to make the dressing. These
dressings are used on wounds that show signs of infection and stalling in progress of healing.

- Use on wounds that are infected.
- Frequency of change is dependent on the manufactures directions.
- Can be used on all types of wounds and under the use of compression type dressings.

**Contact layer dressing** are single layer dressings that are used to protect the wound bed, protect graft, protect skin substitute from the top layer of dressing being used. Often can be used under the Negative Pressure Wound Therapy to protect bone and muscle from the foam or keep the foam from adhering to the wound bed. To decrease pain with removal. These dressing are not recommended to be the primary dressing. Read package directions for the number of changes that need to be made and how to apply.

- Not to be used with dry, eschar or third degree wounds.
- These dressings are easy to apply and need a secondary dressing to adhere.
- Protect the wound above during dressing changes

**Advanced Therapies**

This category includes all those dressings, procedures and modalities that are not considered dressings but used in wound care.

- Tissue engineer skin substitutes that are used to help wounds to epithelialization - Two types are Aprigraf and Dermagraft, which are engineered from baby foreskin. These are very expensive and need protection until finish healing. These are done in doctors’ offices or wound clinics. The wound will need debridement and the skin substitutes will have stitches or staples to keep in place. A contact layer will be placed to protect the dressing and will need to be monitored for infection with each dressing change.
- Biophysical technologies - include many modalities used in all field of healthcare and include the following: Negative Pressure Wound Therapy (wound vac), Hyperbaric Oxygen Therapy, Kinetic (including whirlpool, pulsatile lavage), Electronic stimulation, Electromagnetic field, Phototherapy, and Ultrasound (high and low-frequency).

- Compression therapy - includes 3 layer and 4 layer compression. Need to be very careful with application and use of this type of therapy. Used on legs primarily for venous insufficiency and need to be sure arterial status is known before application.

**Key Points**

Dressing are important to wound healing and very often the wound needs re-evaluation to assure proper dressing fits the patient at the time and phase of healing. The patient also needs to be screened for allergies to many of the ingredients used in the dressings.

**Conclusion**

Wound healing represents the outcome of a large number of interrelated biological events that are completed over time, in response to injury and its cellular environment. The immense economic and social impact of wounds in our society calls for allocation of a higher level of research resources to understand biological mechanisms underlying the complexities noted in problem wounds.

**Glossary of Terms**

**Angiogenesis**: The process of producing blood vessels during the granulation phase of wound healing.

**Autolysis**: The process of breaking down of dead tissue or devitalized tissue with the use of enzymes.

**Bioburden**: Dead cells and fluid that collects between dressing changes and needs cleaning off the wound bed to allow healing.

**Blanching**: The reddened area that becomes white with pressure applied.

**Cellulitis**: The inflammation or infection of skin cells that cause redness, heat, pain and edema.

**Charcot**: A condition from diabetes where the bones in the feet dislocate, deform or fracture causing the bottom of the foot to have the appearance of the hull of the boat related to the arch collapsing.

**Collagen**: The protein that is the main component of many major parts of the body and wound healing.

**Contraction**: Bringing together of wound edges causing the wound size to become smaller. It is important to measure wounds to show healing or deterioration over time.

**Detrition**: The mechanical process of wearing away by friction.

**Epibole**: Non-healing wounds with closed, rolled wound edges.

**Exudate**: Fluid from the wound that can be: serous, sanguineous, or purulent.

**Fibrin**: A protein involved in the clotting process required in the granulation phase of healing.

**Fascia**: Connective tissue that covers muscle and found throughout the body.

**Fibroblast**: An important cell used in wound healing.

**Friable tissue**: The tissue that bleeds easily and can indicate infection.

**Granulation tissue**: Red healthy tissue with good flow that will continue to heal.

**Growth Factors**: Proteins that are used to bring cells to an area as well as create other proteins used in wound healing.

**Hemosiderin Staining**: A staining to lower leg to indicate venous disease. It is caused by the release of iron from disintegrate red blood cells.

**Intermittent Claudication**: Pain related to poor or compromised blood supply. The pain is acute when walking and decreases with rest. Increase in pain often happens with leg elevation.

**Ischemia**: The loss or deficiency of blood to an area.

**Lipodermatosclerosis**: is a skin and connective tissue disease that is inflammation of the fat layer of the epidermis.

**Maceration**: The whiteness and loss of intact skin around a wound as a result of dressing not able to pull or control excess fluid.

**Necrotic tissue**: Dead tissue that found in the wound bed as a result of loss of blood flow. This tissue is usually black or brown and leathery.

**Off-loading**: Taking the weight off the area in order to increase blood flow. Without off-loading suspected deep tissue injury will occur or chronic wound.

**Osteomyelitis**: Inflammation of the bone; bone infection.

**Perforator veins**: Veins that allow communication between the superficial venous system and deep venous system of the legs.
Peri-wound: Tissue surrounding the wound. This tissue needs to be assessed for warmth, color or signs of discoloration, to indicate other problems. Example: By assessing the leg surrounding the wound, can indicate venous insufficiency.

Pink tissue: Epithelial tissue can be a shiny pink or white tissue.

Slough: Yellow, stringy, dead cells that can adhere to the wound bed.

Tunneling: Destruction of tissue around the infected area; a wound that has channels extending from the central injury into the surrounding tissue, such as muscle and skin. These tunnels inhibit the wound’s healing.

Undermining: The wound is spread out underneath the skin that surrounds the visible part of the wound. The wound is bigger than what it appears at first glance.

References and Suggested Reading


