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Wound Management: Best Practices for Prevention and Care

Section 1: Introduction

The integumentary system is the largest organ of the human body, comprising 15% of total body weight. It is comprised of extracellular matrix, hair follicles, nerves, capillaries, and veins (Tabriz & Douroumis, 2022). A wound occurs anytime there has been damage or disruption to this living tissue (Nagle et al., 2023). This broad definition encompasses everything from skinned knees to surgical incisions to pressure ulcers, and well-prepared nurses understand that the treatment and nursing interventions can vary significantly between different types of wounds. For example, a healthy 24-year-old who presents to the emergency department for a one-inch superficial knife laceration to their thumb that occurred while chopping vegetables is going to require very different care from a 93-year-old with multiple chronic health conditions who has had an open pressure wound for the last six months and has been transferred from a skilled nursing facility for unrelated problems. As nurses, it is necessary to identify the different types of wounds and their signs and symptoms, understand who is at risk for complications, and be knowledgeable regarding prevention and treatment methods.

To better understand wound care, it is necessary to review the expected process for wound healing. There are four phases of wound healing. The first phase is the hemostasis phase. During this phase, which begins when the injury occurs, blood vessels constrict, and clotting factors are activated. This stops bleeding and creates a physical barrier to prevent infection. Platelets release growth factors that trigger other cells to repair the injured tissues (Open RN, 2021). The coagulation activity during this phase provides a scaffold for new tissue growth (Britto et al., 2024). The length of the hemostasis phase depends on the severity of the injury and can last up to sixty minutes. The second phase of wound healing is the inflammatory phase, where vasodilation occurs and white blood cells move

into the wound. Upon assessment, the signs of this phase may include edema, erythema, and exudate (Open RN, 2021).

The next phase, known as the proliferative phase, begins within days of the injury and includes four processes. The first subphase is epithelialization, which refers to new epidermal and granulation tissue growth. Granulation tissues include new connective tissues that contain capillaries and contribute to the next subphase, angiogenesis. This is when new capillaries develop to transport oxygen and nutrients needed for wound healing. Next, collagen formation strengthens the wound. The final subphase of the proliferative phase is called contraction. During this final phase, the wound begins to become smaller (Open RN, 2021).

The final phase of wound healing is the maturation phase. During this phase, collagen production continues and prevents wound reopening. Most wounds heal within 4-5 weeks, and collagen deposits often form a scar. Initially, the scar may be raised, firm, and red, but it will become softer, flatter, and paler (Open RN, 2021).

Wound healing is categorized into three types: primary intention, secondary intention, and tertiary intention. When a wound is closed through primary intention, it is closed through suturing, stapling, glue, or a similar technique, and the wound is able to heal beneath the closure. Primary intention is used for wounds with clean edges that can be well-approximated, like a laceration or surgical incision. When the wound edges cannot be approximated, the wound is closed via secondary intention. Secondary intention occurs when the wound is closed from the wound bed up to the epidermis through the development of granulation tissue. Pressure injuries are a type of wound that heals by secondary intention. Wounds that require healing through secondary intention are at higher risk for infection, and an aspect of an appropriate treatment plan includes preventing contamination. When a wound must remain open or is surgically reopened, it is tertiary intention wound healing. This technique may be necessary

due to severe infection. Once the infection has resolved, the wound is often later closed. When tertiary and secondary intention are used, healing is often delayed, and the amount of visible scar tissue is typically increased (Open RN, 2021).

Some wounds do not heal according to the expected process. When the normal wound healing process is disrupted or complicated, nurses and other healthcare professionals must intervene to manage these wounds and promote healing. Nurses who are knowledgeable regarding evidence-based wound care techniques are best prepared to provide care that promotes optimal outcomes.

Section 2: Types of Wounds and their Signs and Symptoms

Wounds are classified in various ways, depending on what information needs to be shared, what medical or nursing specialty is treating the wound, and what complications may be present. One basic way to classify a wound is to describe it as open or closed. An open wound occurs when an injury causes internal tissues to be exposed to the external environment. This type of wound may result from a fall, trauma, surgery, or other mechanism (Eske, 2025). Closed wounds are injuries that damage the underlying tissues, but the skin remains intact. There is no exposure of the wound to the outside environment, but closed wounds can still result in serious complications (Lake County, Indiana, 2025).

There are different types of open wounds. An abrasion, such as a scraped knee, is an open wound that occurs when the skin rubs against a rough surface. This type of injury generally does not result in much bleeding, but the wound should be sanitized to remove debris and prevent infection. A laceration is an open wound categorized as a deep opening or tear in the skin. These types of wounds generally occur because of an injury from a knife or other sharp tool. There may or may not be significant bleeding with this type of wound. An avulsion occurs when skin is

forcefully torn away from underlying tissues. Avulsions may occur because of an animal attack, motor vehicle accident, or other violent incident. A puncture wound is an open wound that occurs when there is a small hole in the soft tissue. Some puncture wounds may be more superficial, like a splinter or needle injury, while others may be deep, resulting in more damage to muscles and internal organs, such as knife or gunshot wounds. Deep puncture wounds may have significant bleeding. An incision is an open wound characterized by a clean, straight cut in the skin. This may be from a surgical instrument, a knife, or any sharp object. Incisions can cause heavy bleeding, and like puncture wounds, are more damaging the deeper they are inflicted (Eske, 2025).

There are also different types of closed wounds. Contusions, also called bruises, occur when small blood vessels under the skin rupture, leading to bleeding and discoloration under the skin. While the skin remains intact, swelling may occur, and the individual may complain of pain. Contusions often happen due to blunt impact injuries. Hematomas are caused by a mechanism similar to a contusion, but they result when larger blood vessels are injured. Hematomas can be different sizes, may cause pain and swelling, and are most often associated with more serious trauma. Sprains occur when there is a closed injury to a ligament due to overstretching or tearing. Since sprains are injuries to ligaments, they occur at joints, such as the ankle, wrist, or knee, and typically result in pain, swelling, and sometimes bruising. A strain differs from a sprain because it describes a muscle or tendon injury. Like a sprain, strains can occur because of overstretching or tearing. They may happen due to overuse or from a sudden movement. Pain, swelling, and difficulty moving the affected muscle are common symptoms of a strain. Internal injuries are closed injuries that cause damage to internal organs and tissues, despite no external signs of injury. They are most often due to blunt force trauma and can cause internal bleeding and/or impair the function of organs and internal tissues (Lake County, Indiana, 2025).

Wounds can also be categorized as simple or complex. A simple wound does not require much intervention for optimal healing, does not involve significant tissue loss, and, for the most part, does not cause severe scarring. A complex wound is difficult to treat using conventional methods, such as a simple dressing. Complex wounds can have significant impacts on patients and their families, as they can require multiple surgical procedures, extended treatments, and major loss of skin tissue, resulting in extensive scarring. Acute and chronic wounds can both be considered complex, depending on the nature of the injury and any complications that have occurred (Tabriz & Douroumis, 2022).

Wounds may be categorized according to how they occur. A mechanical injury is caused by a sharp object and/or a blunt force, such as a laceration, puncture, or abrasion. A chemical injury occurs when a corrosive chemical comes in contact with the skin, causing injury ranging from skin irritation to necrosis. Wounds can also be caused by radiation. When this occurs, the severity depends on the amount of radiation, the area of the body exposed, and the length of exposure. The symptoms of a radiation injury are not always immediately apparent and may not be evident until weeks or months after the injury. Thermal wounds include burns and freezing wounds (Tabriz & Douroumis, 2022).

Wounds can also be categorized as acute or chronic. Acute wounds resolve following a usual and expected course of healing (Nagle et al., 2023). Acute wounds usually occur suddenly, including most surgical wounds, burns, lacerations, grazes, and skin tears (Sussman, 2023). Chronic wounds, however, do not follow a usual healing course and can become stalled. A wound is categorized as chronic when there has been a lack of expected progression in three months or within the expected time frame of wound healing for the particular wound type (Nagle et al., 2023).

Chronic wound treatment contributes to more than $25 billion in healthcare spending in the United States annually (Britto et al., 2024), and the already high incidence of chronic wounds is increasing (Eriksson et al., 2022). Chronic wounds can be further categorized by their primary cause or the condition that is likely preventing healing, such as arterial, venous, infectious, pressure, radiation therapy, oncologic, systemic, nutritional, age and hormones, pharmacological, self-inflicted/psychosocial, genetic, or smoking (Nagle et al., 2023).

Wounds can be described by the volume of exudate produced. Exudate is a liquid that is produced in response to tissue damage. This fluid provides essential nutrients for cell metabolism, supports immune and growth factors, aids in the autolytic separation of non-viable cells, and facilitates the migration of cells necessary for developing new tissue. Almost all wounds have some level of exudate and can be documented as having low, moderate, or high drainage levels. Wounds that have a copious amount of exudate are at risk for complications, as the skin surrounding the wound can become macerated, or softened due to prolonged exposure to liquid. Wounds with high levels of exudate can also become malodorous or infected more easily and require more frequent dressing changes. Wounds at higher risk for excessive exudate include leg ulcers, burns, large pressure ulcers, chronically infected wounds, deep wounds, and wounds intentionally left open to facilitate healing (Tabriz & Douroumis, 2022).

Surgical wounds have their own classification system, created by the National Academy of Sciences and the National Research Council in 1964. The classification system developed by these entities is based on the potential bacterial load in the surgical field and the risk of surgical site infection. Class 1 wounds, also known as clean wounds, are not infected, do not show any signs or symptoms of inflammation, and are typically closed, though a closed drain may be used. An example of this type of wound is an inguinal hernia repair. Class 2 wounds, also known as clean-contaminated wounds, have minimal contamination and typically

involve the respiratory, genital, or urinary tracts. Class 3 wounds are contaminated wounds generally resulting from either a breach in sterile technique or contamination from the gastrointestinal tract. Class 4 wounds are called “dirty” wounds, as they are known to be infected. These are often traumatic wounds with visible purulence and obvious symptoms of infection (Herman et al., 2023).

Burns occur when tissues are exposed to a heat source, including flames, flash burns, hot objects, hot grease, scalding fluids, chemicals, and electricity (Warby & Maani, 2023). Most burns occur in the home or workplace (WHO, 2023). Many factors determine the severity of a burn, including location, temperature, duration of exposure, surface area involved, and depth. When assessing the depth of a burn, healthcare workers must evaluate the appearance, blanching to pressure, pain, and sensation (Warby & Maani, 2023).

Burns are categorized according to the burn’s type, depth, and surface area. Superficial burns typically involve only the topmost layer of skin. They usually do not form a blister and heal within a few days without scarring. Symptoms can include pain and discomfort (Sussman, 2023). Second-degree burns are partial thickness burns that affect the superficial layer of the dermis. Blisters are a common initial symptom of this type of burn. When the blister ruptures, the wound bed is red or pink and blanches when pressure is applied. Patients often complain of pain with partial-thickness burns. Minimal scarring does occur after healing, which takes about 2-3 weeks. Partial thickness burns can also be deep and involve the reticular dermis. These burns also blister, but unlike superficial partial thickness burns, the wound bed under the blister is mottled and will only sluggishly blanch with pressure, indicating compromised circulation. Deep partial thickness burns produce minimal pain. Healing is prolonged, often requires surgical intervention, and always creates scar tissue. A full-thickness burn is also known as a third-degree burn. This is the most severe type of burn and involves the epidermis, dermis, and subcutaneous tissue. Full-thickness burns have a

leathery, dry appearance, and the wound bed does not blanch. This severe burn damages nerves, which leaves the patient with no sensation or pain in the area. Full-thickness burns take months to heal and require surgical intervention (Warby & Maani, 2023). This severe injury can lead to extensive scarring, functional defects, increased healthcare costs, psychological problems, and contractures (Sussman, 2023).

Necrotizing soft tissue infections (NSTIs) are wounds that lead to aggressive and widespread death of the soft tissues (Nagle et al., 2023). This infection spreads rapidly, and early symptoms can mimic flu symptoms (Eske, 2025). NSTIs are rare and require immediate surgical intervention to avoid loss of limb or life. NSTIs have a unique classification system, as recognition and prompt response are critical for an optimal outcome. NSTIs are categorized by the layers of soft tissue affected. These categories include skin-level necrotizing cellulitis, necrotizing fasciitis in the superficial or deep tissue, and myonecrosis/necrotizing myositis, which indicates muscle tissue is affected. Symptoms of NSTIs include bullae, crepitus, gas seen on x-ray, hypotension, and visible indications of skin necrosis. Usually, however, these are later signs, and diagnosis is typically made before the appearance of these particular symptoms. More commonly, patients may develop sepsis with no known cause. Healthcare workers should assess the patient closely for discharge of grayish, semi-purulent fluid from any orifice or open area. Patients may complain of extreme pain in an area, despite a lack of visible changes. Exposure and direct visualization of these areas are necessary to understand the extent of the infection. NSTIs require prompt surgical debridement and antimicrobial treatment (Nagle et al., 2023).

Skin tears occur when a mechanical force, like shear, friction, or blunt force, affects fragile or nonelastic skin. This may result from something as simple as removing an adhesive bandage or brushing the skin against a surface. Skin tears are defined as wounds that create an opening in the epidermis and dermis, but do

not involve the subcutaneous layers. These wounds are known to bleed easily (Open RN, 2021). The prevalence of skin tears is rising as the number of older adults in the United States continues to increase. Skin tears are considered traumatic wounds and are classified based on a system developed in 2011 by the International Skin Tear Advisory Panel. A type 1 skin tear is defined as having no skin loss, which may include linear tears or skin flaps that can fully cover the wound bed. Type 2 skin tears involve partial flap loss, where only part of the skin flap can be positioned to cover the wound bed. A type 3 skin tear involves total flap loss, with no tissue flap attached, leaving an unprotected wound bed (Triplett, 2025).

Venous ulcers, or stasis ulcers (Cleveland Clinic, 2022a), are the most common type of chronic wound. There is typically an initial traumatic injury in the location that is unable to heal due to the venous insufficiency in the area and hypoxic tissues (Sussman, 2023). Venous insufficiency causes blood pooling in the veins of the lower legs, leading to fluid leaking, skin maceration, and venous ulcerations. Maceration occurs when the skin is softened and degraded due to excess fluid. These types of ulcers typically appear on the medial lower leg, and maceration causes them to have irregular edges. It is common to observe dark discoloration of the lower legs due to blood pooling. Compression dressings, as part of a multilayer dressing system, are essential to limit edema and contain the copious drainage associated with these wounds (Open RN, 2021). Venous ulcers are notorious for requiring extended time for healing, up to several months, and some never fully heal. Symptoms of venous ulcers include a shallow, irregularly shaped sore, dull ache, foul odor, itching, purulent drainage, and edema (Cleveland Clinic, 2022b).

Arterial ulcers, sometimes called ischemic ulcers (Cleveland Clinic, 2022a), are caused by a lack of circulation to the tissues. These localized areas tend to have a “punched out” appearance and are often painful due to the lack of oxygen in the

area (Open RN, 2021). The skin surrounding the wound may appear shiny, dry, stretched, and thin. Hair loss near the wound is common (Cleveland Clinic, 2022a). The wound base may appear necrotic due to cell death (Open RN, 2021). These wounds tend to start on the lower extremities, appear dark in color, can be deep, with visible muscles and tendons, have raised edges, typically do not bleed, and may not be painful due to nerve damage (Cleveland Clinic, 2022a). These wounds present an increased risk for amputation (Jais, 2023).

Diabetic ulcers, also called neuropathic ulcers, are most commonly the result of peripheral neuropathy. This condition decreases the ability of the individual to sense pain, especially in their lower extremities. These patients can develop an injury and not realize it until it has become a diabetic ulcer. In addition to the lack of pain sensation, individuals also experience compromised wound healing due to the effects of diabetes (Open RN, 2021). Diabetic foot ulcers are further categorized into stages 1-6 depending on the severity of the wound (Packer et al., 2023). Approximately 26% of individuals with lower-extremity ulcers have wounds of mixed origins (Jais, 2023).

Cellulitis is an acute bacterial infection of the skin and subcutaneous tissues. Symptoms include a warm area of poorly defined erythema that is often edematous and tender. This type of wound should be cleaned, and any necrotic tissue should be debrided. If there is pressure on the wound, pressure should be relieved. Most patients with cellulitis can be treated with oral antibiotics (Jais, 2023).

Pressure injuries typically occur over a bony prominence and are characterized by localized damage to the skin or tissue due to prolonged pressure on that area (Open RN, 2021). Pressure injuries affect an estimated 2.5 million people in the United States annually (Cleveland Clinic, 2023a). Previously, these were commonly known as pressure ulcers; however, in 2016, the National Pressure Ulcer Advisory

Panel Pressure Injury Staging System discontinued the use of this terminology, now using “pressure injury” because wounds due to pressure can occur, even when there is no ulcer observed (Open RN, 2021). Nurses may also hear these injuries called bedsores, decubitus ulcers, pressure sores, or pressure wounds. Shear forces can also contribute to pressure injuries and occur in many ways, including when the patient slides down in an inclined bed or wheelchair, or during repositioning. When shear forces affect an area, circulation is compromised, which limits oxygenation to the area, increasing risk for injury (Cleveland Clinic, 2023a).

Pressure injuries can occur on any part of the body that is exposed to continuous pressure. They are most commonly found on the ankles, back, buttocks, elbows, heels, hips, and tailbone, but can also be found on the bridge of the nose or other parts of the face due to respiratory equipment, on the ears or back of the head from oxygen cannula tubing, or in the mouth due to ill-fitting dentures or intubation. When continuous pressure is applied to an area, circulation is impaired, which can cause tissue damage in as little as two hours. These types of wounds are more likely to occur when the pressure is accompanied by moisture from sweat, urine, or stool, in addition to shear forces. Patients may complain of pain or itching at the pressure injury site (Cleveland Clinic, 2023a).

Pressure injuries are categorized into stages based on the signs and symptoms present, and describe the extent of tissue damage involved in the wound. Stage 1 pressure injuries describe a wound with intact skin with an area of non-blanchable erythema where pressure occurs (Open RN, 2021). Stage 1 pressure ulcers may feel tender. They can be warmer or cooler than the surrounding skin and may be softer or firmer (Cleveland Clinic, 2023a). Stage 2 pressure injuries involve a partial-thickness loss of skin and exposed dermis. The wound bed may appear like an intact or ruptured blister. Stage 2 pressure injuries involve full-thickness tissue loss, and fat tissue can be observed upon assessment (Open RN, 2021).

At stage 3, further wound complications may occur, including undermining, tunneling, slough, or eschar. Undermining occurs when there is erosion of tissue under the edges of the wound. This creates a pocket underneath the skin. Tunneling is similar to undermining, though the tissue erosion occurs in passageways underneath the skin that can have twists and turns, complicating the wound assessment. Slough is an inflammatory exudate, typically light yellow, soft, and moist. Eschar is dark brown or black, dead tissue that is usually dry, thick, and leathery. For wounds where the presence of eschar or slough makes a complete assessment of the wound impossible due to obstruction, the pressure injury is described as unstageable. Stage 4 pressure injuries involve full-thickness loss but are more extensive than a stage 3 injury. In stage 4 injuries, cartilage, tendon, ligament, muscle, or bone tissue can be observed. Osteomyelitis can also occur at this stage (Open RN, 2021). A deep tissue pressure injury is present when the skin is intact, but it is persistently non-blanchable and has a maroon or purple discoloration (Mondragon & Zito, 2024)

Pressure injuries can lead to complications due to wound infections such as cellulitis and septicemia. In some situations, wounds on extremities may lead to amputation of that extremity. Tunneling can damage structures deeper in the body, leading to bacterial meningitis, endocarditis, osteomyelitis, septic arthritis, and many types of group A streptococcus infections (Cleveland Clinic, 2023a). Chronic pressure wounds can be difficult to heal because increased pressure can damage new tissue growth and inhibit circulation (Nagle et al., 2023). As a result of complications, pressure injuries lead to over 24,000 deaths each year. Symptoms that may indicate the presence of a wound infection include fever, chills, increased pain, foul odor, erythema, swelling, and purulent discharge (Cleveland Clinic, 2023a).

Case Study

Mrs. Wilson, a 89-year-old female, is brought to the clinic by her son. He states his mother has had a reddened area on her sacrum for a while, but he noticed recently that it looks open. Upon further assessment, the nurse finds that Mrs. Wilson is bed-bound and, due to arthritis, has difficulty finding a comfortable position in the bed. She is incontinent and requires total care due to her severe arthritis and diagnosis of COPD.

The nurse examines Mrs. Wilson's sacrum. She observes a 2cm x 1cm open pressure injury that appears only to have extended through the epidermis. What symptoms might the nurse observe? Select all that apply.

- redness around the wound
- warmth around the wound
- copious bleeding
- the appearance of a ruptured blister
- a hematoma
- tenderness

Section 2 Personal Reflection

How do the different wound types vary? How are they similar? Why does the cause of the wound matter to the healthcare team?

Section 3: Risk Factors and Complications

Everyone experiences acute wounds, from paper cuts to skinned knees to surgical incisions. For most people, these heal in the expected time frame without

complications. For some people, however, this is not the case, and the acute wound becomes chronic. Some people are at increased risk for acquiring a wound or for experiencing wound-related complications, including impaired healing or infection.

Increased age is a risk factor for acquiring wounds and for compromised wound healing. The skin is impacted by the normal effects of aging, which can complicate wound healing. Between the ages of 30 and 70, the epidermal cell turnover rate reduces by half. This reduces the ability of the skin to act as a barrier and negatively impacts its ability to recover after an injury. Collagen production and degradation are altered with aging, leading to damaged and thinned skin. Skin elasticity also decreases with age, which increases fragility and risk for injury and infection. Oxidative stress and inefficient microcirculation also affect wound healing in older adults by contributing to tissue damage and limiting perfusion (Khalid et al., 2022). Older adults experience an altered inflammatory response, limiting their body's ability to react appropriately when a wound occurs (Open RN, 2021). While wound healing can be prolonged in healthy older adults, the quality of wound healing is not compromised. Older males are at a higher risk than older females for delayed healing of acute wounds, as evidence suggests estrogen can positively affect wound healing, while androgens can slow healing (Nagle et al., 2023). Older adults are at the highest risk for skin tears (Open RN, 2021).

Individuals experiencing obesity are at increased risk for wounds and associated complications. Obesity often contributes to limited mobility and difficulty with repositioning. It can also make it more challenging to reach the lower extremities for hygiene and nail care. Individuals with obesity often have skin folds that provide a warm, moist environment where bacteria can thrive. The skin of the folds can also become ulcerated due to skin-on-skin friction. Adipose tissue is less vascularized than the epidermis, making it more susceptible to ischemia and hypoxia. The heart also has difficulty meeting the excess oxygenation demands of

a larger body habitus, leading to heart failure, which impairs circulation (Cotterell et al., 2024). Infection, dehiscence, hematoma formation, pressure injuries, and venous injuries are all wound healing complications that commonly affect those with obesity (Open RN, 2021).

The use of certain medications can increase the risk of impaired wound healing. Corticosteroids reduce granulation tissue formation (Open RN, 2021). Chemotherapeutic drugs delay cell migration, decrease wound matrix formation, lower collagen production, impair fibroblast proliferation, and inhibit wound contraction (Nagle et al., 2023). Chemotherapy can also inhibit cellular metabolism and cell division. The immune suppression experienced with chemotherapy also increases the risk of wound infections. Some intravenous chemotherapeutic drugs can irritate veins, leading to necrotic ulcers (Giselle Bennett, 2024). Non-steroidal anti-inflammatory drugs (NSAIDS) can inhibit wound healing. As they decrease pain, they also decrease inflammation, inhibiting mechanisms necessary for wound healing. Anticoagulants can lead to necrosis, especially in females, and hematoma development, though rare. Many immunosuppressant medications inhibit various stages of wound healing. Dipeptidyl peptidase-4 inhibitors, commonly used to treat type 2 diabetes mellitus, can affect the immune system response and suppress the availability of fibroblasts. While antibiotics are necessary for wound healing when a wound is infected, they can also affect collagen cross-linking, so it is essential that antibiotics only be used when required and that the correct antibiotic is used, as they increase the risk for complicated wound healing. Wound healing is supported by colonized bacteria that exist symbiotically in open wounds. Certain antibiotics can disrupt this balance. Macrolide and tetracycline antibiotics can inhibit inflammatory actions. Gentamicin, an aminoglycoside, can delay epithelialization (Giselle Bennett, 2024).

Socioeconomic status is an indicator of risk for developing wound complications and chronic wounds. An individual's community, income, education, employment status, stress levels, mental health, and social support increase or decrease an individual's risk. These factors also influence general health, so conditions that increase risk for wounds on their own may not be sufficiently managed in an individual who lacks the resources or support necessary to optimize their health. Food insecurity also affects the risk for wound complications. Eleven percent of households in the United States report a lack of consistent access to enough food to maintain a healthy lifestyle. This also correlates with chronic diseases that increase risk for wound development, such as diabetes and obesity. Social determinants of health also significantly affect diabetic foot ulcer healing. Research has found that socioeconomic stress, environment, and psychosocial stress can impair wound healing by increasing pain levels, decreasing the needed inflammatory response to promote healing, increasing the risk of infection, and affecting critical hormone responses (Sen, 2023).

Individuals who consume a diet that lacks essential nutrients are at increased risk for wound complications (InformedHealth, 2022). Protein, iron, zinc, and vitamins A and C are necessary for wound healing. The metabolic demand increases when the body experiences a wound (Cleveland Clinic, 2023b). Protein needs can increase by as much as 250%, and caloric needs can increase by 50% (Nagle et al., 2023). High glucose levels can interfere with nutrient absorption, which can complicate healing.

Some individuals are at increased risk of experiencing specific wound-causing injuries. Unlike most injuries, women are more likely to experience a fatal burn injury than men. This higher risk is believed to stem from the increased prevalence of women who use open fire cooking or unsafe cookstoves. Children are also at increased risk for burns. Burns are the fifth most common non-fatal injury in children. Improper adult supervision and child abuse are significant

contributors to the rate of burn injuries in children. There are also regional factors that affect the risk for burn injuries. Children under age five in the WHO African Region are more than twice as likely to experience a fatal burn injury. Young boys living in low-to middle-income countries in the Eastern Mediterranean Region are almost twice as likely to experience a fatal burn injury as the same population of children in the WHO European region. Individuals in the Western Pacific Region are twenty times more likely to experience a burn requiring medical care than those in the Americas. In all countries, burn risk correlates with socioeconomic status, with those living in low and middle-income areas being at higher risk of experiencing a burn injury than those who live in high-income areas. Some occupations increase the risk of a burn injury. Poverty, overcrowding, and lack of preventative measures increase risk. When young girls have household responsibilities, such as cooking or caring for small children, the risk of burns is increased. Individuals with underlying medical conditions, those who smoke or consume alcohol, have easy access to chemicals, use kerosene as a fuel source for domestic appliances, or have inadequate safety measures for gas and electricity are at increased risk (WHO, 2023).

People who experience chronic wounds typically have a comorbid condition that affects the healing process. Individuals with poor circulation are at increased risk for poor wound healing because oxygen and nutrients cannot reach the wound, causing slower wound healing (InformedHealth, 2022). Health conditions contributing to poor circulation include hypertension, atherosclerosis, diabetes, deep vein thrombosis, pulmonary embolism, peripheral artery disease, varicose veins, Raynaud's disease, and obesity. Symptoms of poor circulation include muscle aches, "pins and needles" sensation, pale or blue skin color, numbness, chest pain, swelling, and bulging veins (Cleveland Clinic, 2021). Certain health conditions can also increase someone's risk for developing pressure injuries. These health conditions include cancer, cerebral palsy, chronic venous

insufficiency, dementia, diabetes, heart failure, kidney failure, malnutrition, peripheral artery disease, spinal cord injury, and spina bifida (Cleveland Clinic, 2023a).

Individuals who have chronic kidney disease (CKD) are at increased risk for wounds and poor wound healing. CKD affects 14.9% of the population in the United States. Females, individuals over age 65, and people who are black or Hispanic are at increased risk. CKD can disrupt epithelialization and delay granulation tissue formation. CKD also leads to chronic inflammation, low vascularization, and low cell proliferation rates. Uremia occurs with CKD, which increases the risk for complicated wound healing. Uremic pruritus increases the risk for wound development. Individuals with CKD and end-stage renal disease are at risk for developing calcific uremic arteriolopathy, also known as calciphylaxis, which occurs when the medial layer of the small blood vessels becomes calcified. While this condition is rare, it can cause necrosis of the skin and painful wounds that can easily become infected. Diabetic foot ulcers are also linked to those with end-stage renal disease. Renal replacement therapy can negatively affect wound healing, as hemodialysis leads to loss of amino acids that are necessary for wound healing. Those with end-stage renal disease are at increased risk of requiring an amputation due to poor wound healing (Sandepudi et al., 2025).

Diabetes increases the risk for chronic wounds as chronic hyperglycemia damages the blood vessels and nerves of the feet. The lack of sensation and perfusion increases risk for injury, and a lack of oxygen and nutrients can lead to impaired healing (InformedHealth, 2022). Diabetes also leads to atherosclerosis, an accumulation of plaque obstructing the arteries, limiting blood flow, and decreasing perfusion. When perfusion is compromised, oxygenation is compromised. Diabetes also reduces the immune system's effectiveness, increasing the risk for infection (Open RN, 2021). Increased blood glucose levels

suppress the inflammatory response, interfere with nutrient absorption, and cause nutrient depletion (Nagle et al., 2023). Patients with diabetes are 25% more likely to experience a foot ulcer than other patients (Jais, 2023).

Peripheral arterial disease, high plantar pressure, inadequate foot care, trauma, neuropathy, fissures, and callosities all contribute to the increased rate of foot ulcers for patients with diabetes. Patients with diabetes can experience mixed ulcers, which can include a combination of arterial, venous, furuncles, carbuncles, cellulitis, and diabetic bullae. The risk for complications rises for patients with diabetes who have comorbidities, like peripheral arterial disease or neuropathy, or who are older, smoke, have poor glycemic control, a history of prior foot ulcers or amputation, or who have ischemia of the small or large blood vessels (Jais, 2023).

Cardiovascular disease increases the risk of wounds. Venous insufficiency is a risk factor for chronic wounds and causes varicose veins. When blood collects in these areas, the legs can swell. The increased pressure further contributes to compromised circulation and poor tissue oxygenation. With venous insufficiency, even minor wounds can have difficulty healing and become a chronic problem (InformedHealth, 2022). Venous insufficiency is heritable, so family history should be considered when evaluating risk. Women who have experienced multiple gestations are at increased risk for venous insufficiency (Eriksson et al., 2022). Hypertension increases the risk for venous ulcers due to the damage inflicted on blood vessel walls, venous obstruction, often due to blood clots, and venous reflux, which occurs when venous valves become damaged. Individuals who have deep vein thrombosis, a family history of venous disease, obesity, older age, paralysis, previous injury, a sedentary lifestyle, smoking, surgery, and varicose or spider veins are at increased risk (Cleveland Clinic, 2022b). When perfusion is limited due to atherosclerosis, peripheral artery disease, or some other condition, the risk for wound development and complications increases. Not only is tissue oxygenation affected, but if the wound becomes infected, the body's ability to

deliver intravenous antibiotics to the tissues is limited due to poor circulation (Nagle et al., 2023).

The patient's lifestyle or medical circumstances can increase their risk of developing a wound or experiencing complications related to wound healing. Alcohol consumption is associated with impaired wound healing and increased incidence of infection. Smoking affects the inflammatory response, decreasing the body's ability to respond to wounds and increasing the risk of wound infection (Open RN, 2021). Nicotine in cigarette smoke impairs circulation by constricting blood vessels, decreasing oxygen delivery, and increasing platelet adhesiveness (Nagle et al., 2023). Individuals who experience mobility difficulties are at increased risk of chronic wounds due to constant pressure on areas of the body from lying in bed or sitting in a wheelchair (InformedHealth, 2022). People who are in a coma, are paralyzed, utilize a wheelchair, or wear casts, splints, or prosthetics are at increased risk for pressure injuries (Cleveland Clinic, 2023a).

Wound infections often impede wound healing (Nagle et al., 2023). Wounds become infected when bacteria enter the wound and then multiply. Infection can be localized to the wound or can become systemic, leading to sepsis, which may become life-threatening. In some cases, the infection may lead to a need for amputation of an infected limb. Nurses must be able to identify signs and symptoms of an infected wound and note any symptoms of redness, warmth, and tenderness at the wound site. Any purulent or malodorous drainage is a sign of localized infection. Symptoms that may indicate the infection has become systemic include a fever greater than 101° F (38° C), overall malaise, increased confusion, a change in level of consciousness, increased wound pain, worsening erythema or edema around the wound, and any loss of movement or function of the wounded body part (Open RN, 2021).

Surgical wound infections are the most common nosocomial infection in surgical patients, contributing to over two million nosocomial infections in the United States. It is estimated that 0.5-3% of all surgical patients will develop a surgical site infection, and 11% of ICU deaths are related to surgical site infections. These types of wounds also have a financial impact on individuals and communities, as patients with a surgical site infection typically incur over $20,000 in additional charges due to infection. This adds up to approximately $3.3 billion annually in the United States. Surgical wound infections occur within 30 days following surgery or up to one year post-operatively for implanted devices. Patient risk factors that increase the likelihood of developing a surgical site infection include advanced age, malnutrition, hypovolemia, obesity, steroid use, diabetes, immunocompromised state, smoking, trauma, certain procedure sites, extended preoperative hospitalization, inadequate preoperative skin hygiene, and existing infections at other parts of the body. To decrease risk, the healthcare team and patient will typically work to reduce modifiable risk factors prior to surgery. This may include smoking cessation, weight loss, coagulation cascade normalization, glucose control optimization, and stabilization of other coexisting medical conditions. There are risk factors that are directly related to the procedure itself that increase the risk for surgical site infections. These include abnormal fluid collection, such as a hematoma or seroma, contamination of the surgical site, equipment, or personnel, utilization of drains, presence of debris or foreign material in the surgical site, hypothermia, improper hair removal, inadequate use of prophylactic antibiotics, insufficient skin prep application, incorrect surgical preoperative scrub, prolonged surgical time, ventilation status of the operating room, history of prior infection, and prolonged perioperative inpatient admission. Implementing preoperative and operative checklists has helped decrease surgical site infection rates (Zabaglo et al., 2024).

Research has found that some acute wounds are at increased risk of becoming chronic. Wounds that have an initial depth greater than 1 cm, have increased wound exudate, have an inflammatory wound base, or are larger in surface area are more likely to resist healing and become chronic. Bacterial infection is the leading risk factor for developing a chronic wound after an acute injury. Systemically, the comorbidity of atherosclerosis had the greatest impact on the risk for acute wounds becoming chronic wounds (Wolny et al., 2024).

Different types of wound complications can affect wound healing. Common complications include the development of a hematoma, infection, or dehiscence. Hematomas can lead to infection. Dehiscence occurs when the edges of a surgical wound separate. The dehiscence may be partial, where only a portion of the wound has opened, or full, where the tissue underneath the wound is fully visible. Patients are at increased risk for wound dehiscence if they are obese, smoke, or have comorbidities that affect wound healing, such as diabetes. The location of the wound and the patient's level of physical activity can affect the risk for wound dehiscence. This complication can occur suddenly, due to coughing or straining. Abdominal wounds have an additional risk of evisceration, which is a rare complication where dehiscence occurs and the abdominal organs protrude through the incision. This is a surgical emergency and must be addressed immediately. Nurses can assess for risk of dehiscence by observing for redness around the wound site, increased drainage, increased pain, or any signs of broken sutures. Nurses must educate patients regarding post-operative care to decrease the risk of surgical complications (Open RN, 2021).

Various other factors affect wound risk. An individual's mental health can affect their risk for wounds or wound complications. A wound may be self-inflicted or worsen due to the patient's actions. Psychological stress can also impede the healing process. Genetic factors that affect wound healing include a predisposition to hypertrophic (keloid) scarring, hereditary conditions that affect wound healing,

and variations in skin elasticity, thickness, and sebaceous quality (Nagle et al., 2023). The presence of lymphatic obstruction can increase the risk of developing a wound. When lymphatic obstruction occurs, an extremity can become massively edematous, contributing to the presence of wounds (Eriksson et al., 2022).

Case Study

Based on the previous case study information and what you have learned in this section, what are Mrs. Wilson's risk factors for developing a wound? Select all that apply.

- compromised respiratory status
- compromised cardiovascular status
- arthritis diagnosis
- outpatient status
- immobility
- incontinence
- age

Section 3 Personal Reflection

How does cardiovascular disease increase the risk of developing a wound? What lifestyle factors can increase someone's risk? How does poor nutrition affect an individual's risk of developing a wound or wound complications?

Section 4: Prevention

Wound prevention is an essential aspect of nursing care. Some wounds can be prevented through nursing interventions, education, and optimizing the patient's comorbid health conditions. A thorough physical assessment and the use of risk assessment tools can help healthcare team members identify individuals at the highest risk for experiencing a wound or those at increased risk for developing wound complications. Preventing wound complications can decrease hospital length of stay, reduce healthcare costs, and improve patient outcomes.

A risk assessment is a valuable tool to predict the risk of a pressure injury for an individual patient. This can guide the healthcare team regarding preventive measures. The Braden Scale for Predicting Pressure Sore Risk, commonly referred to as the Braden scale, is the most widely used risk assessment tool (Mondragon & Zito, 2024). The Braden scale evaluates multiple factors, including perception, nutrition, mobility, sensation, and moisture, to determine a patient's risk for developing a pressure injury. This tool is typically used as part of a comprehensive patient assessment. Each element of the tool is scored on a scale of 1-4, with 1 representing "completely limited" and 4 representing "no impairment. The lower a patient's score, the higher their risk is for developing a pressure injury. A score of 15-19 indicates mild risk, a score of 13 or 14 indicates moderate risk, a score of 10-12 indicates high risk, and those with a score of 9 or less are at severe risk for developing a pressure injury. Using this tool, nurses can create a care plan that targets risk factors and decreases the patient's risk for developing a pressure injury (Open RN, 2021). Evidence suggests that healthcare worker and patient education effectively reduces the incidence of pressure injuries and improves the ability of the healthcare team, including the patient, to manage the wound effectively (Mondragon & Zito, 2024).

When risk assessment tools determine that a patient is at risk for a wound, specific interventions are necessary for wound prevention. Recommendations to prevent pressure injuries include strict adherence to a pressure-relief protocol, which provides for turning bed-bound patients every two hours, offloading pressure points, floating heels, ensuring that the wheelchair seating and bedding are most appropriate for the patient, social support, wound care, and close attention to nutritional status are required (Nagle et al., 2023). Specially designed mattresses or foam cushions may be used to prevent pressure injuries (Cleveland Clinic, 2023a). Force from friction and shear should also be reduced. Medical-grade sheepskins, alternating-pressure devices, low-air loss therapy, and continuous low-pressure supports may be used for patients at high risk for developing a pressure injury. Foam, sheepskin, or gel mattress overlays are recommended over alternating pressure mattresses for patients at high risk for pressure injury, as there is only moderate-quality evidence to support their use (Mondragon & Zito, 2024). Bedsheets and clothing should also be changed and cleaned often to prevent infection. The patient's skin should be kept clean and dry. Moisture barrier creams can protect skin from fluids like sweat, urine, and stool (Cleveland Clinic, 2023a). Skin tears can be prevented by many of the same interventions that help prevent pressure injuries. Skin tear prevention includes applying an effective moisturizer twice daily to reduce risk (Sussman, 2023).

Nurses play a vital role in the prevention of diabetic ulcers by regularly assessing their patients' feet, educating them regarding foot care, and emphasizing the necessity of wearing well-fitting shoes (Open RN, 2021). Prevention of venous ulcers starts with a comprehensive vascular assessment. Graduated compression bandages or stockings are recommended for wound prevention (Sussman, 2023).

Several interventions can be implemented to reduce the risk of burn injuries. In the home, fires should be enclosed, and the height of open flames should be limited. Home inspections are necessary to ensure electrical and gas systems are

correctly installed and working safely. Cookstoves should include safety features that prevent children from accessing them. The temperature setting on water heaters should be lowered to a safe range. Smoke detectors, fire sprinklers, and fire escape systems should be implemented in the home. Fire safety education is also an effective strategy to reduce the risk of burn injuries. Children should sleep in fire-retardant fabrics that are close-fitting. Individuals should never smoke in bed and should utilize child-resistant lighters. In some regions, there are initiatives to improve the regional burn care systems and distribution of fire-retardant aprons that can prevent burns when someone is cooking using an open flame or kerosene stove (WHO, 2023).

Following discharge instructions can decrease patients' risk and prevent postoperative surgical wound complications. The patient should be advised to move carefully and protect the skin near the wound site from being pulled. They should also avoid tensing muscles surrounding the wound. Heavy lifting should be avoided and only resumed as advised in their postoperative instructions (Open RN, 2021).

Some prevention interventions are indicated to prevent complications after a wound occurs. Tetanus prophylaxis should be considered for acute lacerations. Tetanus is caused by a bacterial infection and includes neuromuscular symptoms that can become fatal. When a wound is caused by a human or animal bite, prophylactic antibiotics are typically indicated. Medical conditions that increase risk for acquiring a wound or for wound complications should be aggressively optimized, such as management of hypertension or hyperglycemia. Physiotherapy regimens are required to maintain or improve joint motion, and splinting should be used as necessary to prevent joint contractures (Nagle et al., 2023).

Open wounds increase a patient’s risk for developing an infection. Staphylococcus is a group of bacteria usually present on the skin, but when skin integrity is

compromised, bacteria may enter the body and produce an infection. Some of these organisms, such as methicillin-resistant Staphylococcus aureus (MRSA), can be difficult to treat. Another microorganism that can infect an open wound is Clostridium tetani, which causes tetanus. C. tetani is found in soil, dust, and on the surface of metal objects. If a puncture wound is from a sharp metal object, like a nail, the nurse should ask the patient about their vaccination status. A booster may be necessary. This bacterium can lead to painful muscle spasms in the neck and jaw (Eske, 2025). When a wound becomes infected, nurses and other healthcare workers must implement strategies to ensure the infection does not spread to other patients, staff, or the surrounding environment. Interventions should also focus on not inadvertently encouraging the proliferation of antimicrobial-resistant microorganisms (Mondragon & Zito, 2024).

Case Study

Once the provider has seen Mrs. Wilson in the clinic, she is prescribed a dressing that will protect the area of the wound. What education is essential for the nurse to provide to Mrs. Wilson and her son to prevent the wound from worsening? Select all that apply.

- Be sure to reposition Mrs. Wilson at least every two hours to offload pressure from the site
- Follow all medical instructions to optimize her comorbid conditions
- Do not bathe
- Signs and symptoms of infection
- Do not use a preventative overlay on the bed that reduces pressure
- Make sure Mrs. Wilson’s clothing and bedding remain clean and dry

Given the information provided, what do you think Mrs. Wilson's Braden score is?

Section 4 Personal Reflection

How can nursing care prevent the occurrence of wounds? Why is a wound risk assessment scale a valuable tool? What instructions can the nurse provide to a post-operative patient to decrease their risk for a wound complication?

Section 5: Treatment

Wound treatment depends on the type and severity of the wound. First, the cause of the wound must be addressed. The second element of wound treatment involves wound dressings or bandages (Sussman, 2023). The universal principles of wound management include a thorough evaluation, obtaining source control, eliminating contributing factors, optimizing the wound's ability to heal and the environment, and closing the wound. Every patient is different; no treatment method will work for every wound (Nagle et al., 2023). For most wounds, however, a dressing of some sort is used. Wound dressings have multiple beneficial functions, and several different dressings are available to accommodate varying symptoms. Dressings aid healing by providing protection and moisture management through exudate absorption, reducing pain, providing compression, improving aesthetics, offloading pressure, and immobilizing the injured body part. Some products can provide negative pressure wound therapy or add cells and produce growth factors (Eriksson et al., 2022).

The treatment method for clean wounds differs from that for dirty wounds. The focus of clean wounds is closure, while the goal of dirty wounds is debridement and lowering the infectious burden. Clean wounds can be closed with a bandage, though deeper wounds may require closure with stitches or staples. If the wound is infected, it should be left open until it is fully treated (Eske, 2025). Typically,

debriding dressings are used for dirty wounds, and occlusive dressings are used for clean wounds. Wet-to-dry dressings are debriding dressings where gauze is dampened and placed on the wound base. As the dressing dries, it becomes slightly adherent to the wound bed. When the dressing is removed, necrotic debris and biofilm are removed along with it, leaving behind healthy tissue. This type of debridement is called mechanical debridement. It is recommended that this type of dressing be changed twice daily, though the frequency may be increased if needed. These dressings are used for dirty wounds that are infected or contain necrotic debris (Nagle et al., 2023).

When an open wound occurs, the first step is to establish hemostasis. Bleeding should be stopped by applying gentle pressure with a clean cloth or bandage to promote clotting. The wound should be irrigated with clean water or saline solution, and any debris should be removed. Even though an abrasion may not exhibit much bleeding, the wound should still be cleaned. The wound should then be patted dry with a clean cloth. At this step, surgical debridement may be necessary for severe wounds. When the provider is concerned about potential wound infection, a topical antibiotic ointment may be applied to prevent infection (Eske, 2025).

Lower extremity wounds can be challenging to treat. A vascular assessment is recommended for all patients who experience a nonhealing lower extremity ulcer. In addition to the typical wound assessment, pedal pulses should be palpated, and the ankle-brachial index measurement, a comparison of the upper and lower extremity blood pressure, should be documented. Compression, elevation, and exercise are recommended for venous ulcers (Bowers & Franco, 2020). The treatment of diabetic foot ulcers focuses on improving circulation, preventing and treating infection, and optimizing glycemic control. Antimicrobial dressings are often used for these wounds (Sussman, 2023). Pressure ulcer management of the lower extremities focuses on removing the pressure source from the injured area

(Bowers & Franco, 2020). The treatment of arterial ulcers is focused on improving circulation, usually through surgical interventions. When treating an arterial ulcer, it is necessary that the dressing be moist, and treatment must include removing any necrotic tissue (Open RN, 2021). When a wound becomes too dry, the tissues can become desiccated, and cell death may occur. The dryness also prevents the necessary migration of epithelial cells and matrix deposition. On the other hand, excessive moisture can inhibit the proliferation of new cells and cause the matrix components to break down (Eriksson et al., 2022). Vascular surgery may be necessary for some patients to restore circulation to the area (Open RN, 2021). At times, amputation may be necessary (Sussman, 2023).

Wound management for pressure injuries focuses on providing a clean environment, debridement as necessary, applying appropriate dressings, monitoring, and participating in adjunctive therapies, such as physical therapy. The recommended treatment for stage 1 pressure ulcers is the application of transparent film dressings as needed. Stage 2 pressure injuries should remain moist. Foam, hydrogel, hydrocolloid, and transparent films may be appropriate for this stage of pressure injury. Stage 3 and 4 pressure injury treatment varies depending on the presence of necrotic tissue. If necrotic tissue or eschar is present, the wound should be debrided to expose granulation tissue and encourage healthy skin cell proliferation (Mondragon & Zito, 2024). Offloading, or removing the source of pressure from an injury, is an essential element of pressure injury management. Redistributing weight using a specialized bed or chair device or footwear, such as offloading boots or walkers, can help redistribute weight. Options for offloading devices depend on the location and stage of a wound, but can also be affected by the patient's mobility, insurance, facility contracts, and formularies (Eriksson et al., 2022).

When a skin tear occurs, the treatment depends on the status of the upper layer of skin post-injury. If the flap of skin that has become torn can be realigned, this

should be done, followed by securing it with adhesive skin strips such as Steri-Strips and covering it with a silicone foam dressing for protection. If the skin cannot be realigned, a silicone tulle should be applied, followed by a silicone foam dressing (Sussman, 2023).

The primary goal of burn management is to prevent infection, reduce pain, and support wound healing. Most burn injuries are superficial and only those who are immunosuppressed or at risk for compromised wound healing require medical intervention. Recommended treatment for superficial burns includes applying cool, but not cold, running water to the site. Ice is not recommended as freezing temperatures can worsen the injury (Sussman, 2023). Over the years, there have been many suggested home remedies to treat burns; however, they are not evidence-based and may cause more harm to the wound site. Paste, oil, turmeric, or raw cotton should not be applied to the burn area. Blisters should not be opened intentionally (WHO, 2023). Dressings that contain silver or hydrogels are recommended. While silver-containing creams were used in the past, they were found to cause a cytotoxic substance, called mucilaginous slime, on the wound bed's surface, which prolonged wound healing. Metallic silver dressings are now used to facilitate the benefits of the application of silver for burn therapy. Deeper burns often require complex treatment, including infection prevention, surgical debridement, and skin grafting (Sussman, 2023).

Grafting is a surgical procedure used to move tissue from one area of the body or from another source to a wound, without bringing its own blood supply. Grafts can be sourced from the patient, other humans, animals, or an artificially manufactured material. Autologous skin grafts are obtained from the patient’s own skin in a healthy area. Chronic wounds that are shallow, but do not show adequate reduction in surface area (less than 30% in four weeks) may be appropriate for skin grafting. The receiving wound bed must be prepared before the graft is placed. It must be highly vascularized, have no exposed tendon or

bone, and have no present infection. Edema should be reduced, anticoagulation therapies limited, and glucose regulated to improve the likelihood of a positive outcome from the grafting procedure. Patients who smoke should also quit smoking, as this increases the risk for graft failure (Eriksson et al., 2022).

Debridement may be completed through various methods. Providers may use hydro-jet, ultrasound, pulsatile lavage, gauze abrasion, or wet-to-dry dressings. Enzymatic debridement occurs when chemicals or enzymes, such as bromelain or collagenase, that degrade the necrotic tissue, are applied to the wound. Surgical debridement is standard to ensure all dead and dying tissue is removed (Eriksson et al., 2022). Removing necrotic tissue allows the surgeon to thoroughly examine the wound, inspect underlying tissues, allow for fluid drainage, reduce pressure, and surgically create a healthy surface that can be receptive to topical wound care interventions. In this way, dirty wounds can be converted to clean wounds. Surgical debridement is typically preferred over the repetitive mechanical debridement that occurs with wet-to-dry dressings (Nagle et al., 2023). The success of debridement is measured by determining if there has been promotion of growth of healthy granulation tissue (Eriksson et al., 2022).

Some wounds may be treated with negative pressure therapy. For these wounds, a sponge-like material is placed in the wound, along with an occlusive dressing, and then connected to a suction device. This therapy can be effective and economical when used for the appropriate wound type (Nagle et al., 2023). Controlled negative pressure applied evenly to a wound can facilitate rapid granulation tissue formation, increase the rate of wound contraction, improve perfusion, remove toxic exudate, and optimize the surface biofilm of the wound. For inpatient care, larger negative pressure wound therapy devices can be used for larger wounds or those with a higher level of exudate. Outpatient devices are smaller, battery-powered, and portable. When a nurse changes a NPWT dressing,

they must remove all foam or gauze, as retained products can lead to complications and are considered an adverse event (Eriksson et al., 2022).

Cell- and tissue-based products containing cellular or acellular matrices derived from human or nonhuman sources are available for treating wounds. Healing can be enhanced using these products by replacing damaged or missing connective tissue and providing signaling to improve the rate of wound healing. These products may be beneficial for wounds that have exposed bone, tendon, or nerves, as they may stimulate the formation of granulation tissue over these fragile structures, and eventually provide a surface with which to apply skin grafts. Particulate products are typically used on uneven wound surfaces, and sheet products are used for even wound surfaces (Eriksson et al., 2022).

Healthcare workers should assume that all chronic wounds are either contaminated or infected with bacteria (Eriksson et al., 2022). When a wound infection occurs, timely and effective treatment is necessary to prevent further complications. It is important to note that most chronic wounds are colonized on the surface by bacteria, but the wound itself is not necessarily infected. A tissue biopsy is the gold standard for identifying a wound infection (Sussman, 2023). DNA identification has become the preferred method for determining a particular bacterium instead of culturing because it is more effective in identifying all bacteria in the sample. Punch biopsies may also be done to rule out specific microorganisms, like chlamydia, or to rule out malignancy (Eriksson et al., 2022). Antibiotics may be prescribed unnecessarily when a swab is used to produce a wound culture (Sussman, 2023). Antimicrobial therapy can be adjusted once culture and sensitivity results are obtained (Nagle et al., 2023).

Chronic wounds are most likely to be infected by anaerobic microorganisms. If the infection is localized, topical antimicrobials are used for treatment. If the infection is systemic, systemic antimicrobials are used in addition to topical antimicrobial

treatment. The choice of antimicrobial agent should be based on culture and sensitivity results. Antimicrobial dressings may be used in the treatment of infected wounds. The goal of these types of dressings is to reduce the bioburden of the wound. The bioburden is the number of microorganisms within the wound (Sussman, 2023).

The antimicrobial treatment prescribed depends on the microorganism infecting the wound. Wounds infected with methicillin-resistant Staphylococcus aureus (MRSA) are typically treated with mupirocin ointment. Clindamycin is recommended to treat necrotizing soft tissue infections (NSTIs), in addition to antimicrobial agents that target both gram-positive and gram-negative microorganisms. The treatment course for NSTIs is often long and complicated, as multiple debridement procedures are often necessary (Nagle et al., 2023). Iodine, though effective in treating microorganisms, has a high incidence of sensitivity reactions, making it unavailable as a treatment option for many patients. Applying hypochlorous acid effectively treats some bacteria, such as Pseudomonas, Staphylococcus aureus, and Candida albicans. Dialkylcarbamoyl chloride (DACC) coated dressings are unique because they are hydrophobic and can irreversibly bind bacteria on the wound surface to the dressing. This can help to reduce the total bioburden of the wound.

Topical antibiotics are a valuable tool for wound care as they are not absorbed into the system in large amounts. These should not be used for more than two weeks due to concerns about developing antibiotic resistance (Eriksson et al., 2022). If a wound produces excessive odor, topical metronidazole or activated charcoal dressings may be used (Britto et al., 2024). Over-the-counter antibiotics can be used, but are only recommended for short-term use. Hypersensitivity reactions to these products have increased in recent years due to overuse and prolonged exposure (Eriksson et al., 2022). When a wound involves necrotic bone segments, antibiotics cannot reach the bacteria contained in the dead bone space.

Therefore, surgical resection is required. Osteomyelitis is treated with targeted antimicrobial therapy, debridement of necrotic bone, draining and irrigation of abscessed tissue, and optimization of comorbidities (Nagle et al., 2023)

Adequate treatment of the patient's pain is necessary to facilitate favorable healing outcomes. Wound-related pain can prevent the patient from adhering to their treatment plan, as well as affect their psychological and emotional status. The patient's pain should be assessed with each healthcare encounter, and quality of life should be considered (Eriksson et al., 2022). Researchers developed the WOUND-Q scale to evaluate the quality of life for patients with chronic wounds. This tool can be used for any wound in any location. The tool asks the patient about physical mobility, social impact, their feelings, and the financial burden of the wound. It also measures wound characteristics, treatment, and satisfaction with care. The WOUND-Q tool aims to involve the patient in the assessment and gather their perspective on their own wound management (Klassen et al., 2021).

The treatment plan for pain will depend on the source of the pain. For example, if infection and inflammation contribute to the pain, those should be managed in addition to analgesic interventions. For procedural pain related to wound care, premedication may be utilized, either with topical or systemic analgesics. Nurses can also help to reduce pain by reducing anxiety associated with the procedure. Talking through the procedure and using relaxation techniques can be effective. Typically, pharmaceutical pain management starts with over-the-counter products, such as acetaminophen or NSAIDs. When these are not effective, opioids may be used. Electrical stimulation, ultrasound, and pulsed radio frequency energy have also been used to treat pain. Proper pain management can improve the rate of wound healing (Eriksson et al., 2022).

There are lesser-known wound treatments available. Therapeutic ultrasound has been explored as a treatment for wounds. Research is limited, but data suggest

that high-frequency ultrasound with penetration to the deeper tissues significantly reduces the surface area of wounds. Peri-wound electrical stimulation has also been explored to enhance the healing of wounds that have adequate granulation tissue. Research is also limited regarding this therapy. Hyperbaric oxygen therapy has been investigated for wound treatment, and evidence suggests it is beneficial in treating some wounds, such as non-healing osteomyelitis. Still, research is limited, and there is a risk for serious side effects (Mondragon & Zito, 2024). Hyperbaric therapy is also expensive and can cost more than $50,000 for a course of treatment in the United States (Eriksson et al., 2022).

During treatment, the healthcare team must determine the effectiveness and the likelihood of continued success utilizing the same methods. Research has found that if, during four weeks, using the recommended standard of care, the surface area of the wound is reduced by at least 50%, then it is likely that the same continued treatment will facilitate complete healing within twelve weeks. If there is less than a 50% reduction in surface area in four weeks, the wound is unlikely to completely heal utilizing current methods, and a change in treatment should be considered (Eriksson et al., 2022).

Healthcare workers are implementing new and creative strategies to prevent and treat wounds in at-risk populations. One intervention to improve patient outcomes targets people experiencing housing insecurity or homelessness. These individuals experience multiple significant barriers to obtaining healthcare, and accessibility is critical for appropriate wound management. A drop-in wound clinic was piloted, which increased the follow-up rate for this population, though the rate of follow-up that continued through wound closure remained relatively low (Shin et al., 2025).

Emerging technology affects wound care treatment. Advances in wound documentation and follow-up through artificial intelligence apps are being explored to improve documentation accuracy by healthcare providers and patient communication (Barakat-Johnson et al., 2022). Scientists are using artificial intelligence to train computer systems to determine wound boundaries, size, area, shape, and other characteristics (Kumar et al., 2023). Virtual wound care has been instrumental in improving outcomes and reducing patient travel time, especially during the COVID-19 pandemic (Barakat-Johnson et al., 2022). In the past decade, three-dimensional bioprinting that uses biocompatible and biodegradable polymers has been developed. The “ink” can contain antibiotic agents, antimicrobial peptides, or growth factors. Recently, the cells that promote tissue regeneration, like fibroblasts and keratinocytes, have been introduced into these polymers (Tabriz & Douroumis, 2022).

Future research includes the exploration of “smart” dressings, the use of imaging in conjunction with debridement procedures, improved precision when determining the bioburden of the wound, developing new and improved antimicrobials and antibiotics in the face of increasing resistance to currently available medications, more research regarding autologous skin grafting, and topical pain treatment that would reduce the need for systemic opioids (Eriksson et al., 2022).

Case Study

In four weeks, Mrs. Wilson and her son return to the clinic for an evaluation of the wound. Upon assessment, the wound measures 4 cm x 3cm and is approximately ½ cm deep. There is also redness and warmth around the wound. The edges are irregular. The nurse notes a mildly foul odor and purulent discharge in one area of the wound. The nurse notes a moderate amount of exudate.

What types of tests and treatment plan changes might the nurse expect during this visit? Choose all that apply.

- Introduction of an antimicrobial dressing
- Change in frequency of dressing changes
- Change in frequency of wound follow-up
- Amputation
- Tissue biopsy
- Complete blood count
- Prescription of antibiotics
- Change in Mrs. Wilson's care plan to allow for more frequent position changes
- Discontinue COPD and arthritis medications
- Prescription for a pressure-reducing gel mattress topper for Mrs. Wilson's bed

Section 5 Personal Reflection

Why is offloading pressure an important aspect of treating pressure injuries? Why is it important to establish hemostasis of an open wound before assessing it? What are the benefits of surgical debridement? After how many weeks of no improvement in wound healing should the healthcare team change the treatment plan?

Section 6: Nursing Interventions

Nurses are instrumental in wound management. Nurses can positively affect outcomes through thorough assessment, patient education, implementing preventative interventions, evidence-based wound care and culture techniques, documentation, and specialization.

Initial and ongoing wound assessments are necessary to guide treatment. These assessments should be comprehensive. The nurse should inquire about the length of time the wound has been present. Information regarding comorbidities and contributing social factors that could negatively impact the patient's ability to heal should also be assessed. Nurses should typically expect to assess a wound once per shift; however, this may vary based on concerns of the wound from the healthcare team (Nagle et al., 2023). With each dressing change, the nurse should assess the wound to determine if the wound bed appears to be vascularized, has viable tissue, and is free from signs and symptoms of infection. Dressings should be changed as scheduled, and concerns should be promptly reported to appropriate members of the healthcare team (Britto et al., 2024).

Nursing documentation must provide detailed information regarding the wound. The location of the wound should be identified. If the cause of the wound is known, that should be indicated, as well as the presence of any foreign bodies. If appropriate, the stage of the wound should be determined and documented. Measurements should be noted, including the wound's depth, length, and width. If undermining or tunneling are present, that should also be noted, as well as any exposed bone, vessels, hardware, or subcutaneous fat. Documentation should include the presence, type, and amount of exudate, which may be serous, serosanguinous, or purulent. The condition of the surrounding tissue should be documented. Signs of infection, such as warmth, odor, or purulence, should be noted. The nurse must also document a comprehensive pain assessment. A

neurovascular assessment should be documented if the wound is located on an extremity. The nurse must also communicate any abnormal findings to the provider and document that communication (Nagle et al., 2023).

A critical intervention often completed by nurses is the initial cleansing of the wound. After the initial wound assessment, the wound should be thoroughly irrigated with normal saline or sterile water to remove debris. Hydrogen peroxide should not be used as it is counterproductive for wound healing. Clinical evidence suggests a minimum of 50-100 mL of irrigation fluid per centimeter of the wound bed. This helps to maximize bacteria removal from the wound bed. Any necrotic tissue or biofilm should be removed. Biofilm can contribute to persistent inflammation and delayed wound healing. Excessive exudate can prevent wound healing and should be removed so the surrounding tissue does not become macerated (Britto et al., 2024).

Another skill a nurse may need to complete is obtaining a specimen for culture. If a swab sample is ordered, the Levine method is the most appropriate technique for obtaining the sample. First, the wound should be cleaned with water or saline, and the nurse should ensure that an antimicrobial solution is not used. Then, 1-2cm of clean wound tissue should be identified. The swab should be applied to each site and rotated for five seconds while applying gentle pressure. The pressure applied should be adequate to produce fluid from the wound. The specimen should not be obtained from areas of exudate, eschar, or necrotic tissue (Sussman, 2023). It is recommended that wound swabs only be used to monitor what flora is colonized on the wound, but not in determining antimicrobial therapy (Nagle et al., 2023).

Effective patient education can significantly impact outcomes related to wounds. Nurses should use clear language that the patient and their caregiver can understand. They should avoid using jargon or medical terminology that may be

confusing. Cultural preferences and traditions should also be considered when providing patient education. Patients and their caregivers should be encouraged to ask questions and have an opportunity to practice, especially with wound dressing changes. Written instructions should be provided in addition to didactic teaching so that they can be referred to once the patient receives care at home. Patients should be educated regarding wound care, pain management, and the safe use of pain medications. Guidance on safe levels of activity can help to reduce further injury. Patients should be advised on recognizing the signs and symptoms of infection and when to seek medical care. They should be able to verbalize the purpose of their medications and wound care instructions (Sen, 2023).

Nurses can help promote healthy wound healing by educating patients about the nutrition they need. Since protein helps to repair tissues, patients should be advised to make sure they eat plenty of protein, and that they eat the protein component of each meal first, so they do not become too full before the protein is consumed. Nurses can encourage patients to add nuts to meals or snacks and drink milk to elevate protein intake. Other snacks with increased protein include Greek yogurt, peanut butter, and cottage cheese. Protein shakes can also help boost protein intake. Patients should also be advised to choose whole grains when possible, as they contain vitamins, minerals, and fiber not present in refined grains. Vitamin C boosts the immune system and also aids in collagen production. Nurses can educate patients on foods containing vitamin C, including bell peppers, broccoli, citrus fruits, kiwi, spinach, strawberries, and tomatoes. Vitamin A is also essential for collagen production, and foods that contain vitamin A include apricots, cantaloupe, carrots, cheese, eggs, liver and liver products, mango, milk, peaches, and pumpkin. Zinc is needed for tissue healing and can be found in red meat, fish, shellfish, dairy products, eggs, and poultry. Iron can help wound healing by supporting oxygenation and can be found in red meat, fish, eggs,

whole-grain bread, dark leafy vegetables, dried fruit, and nuts (Cleveland Clinic, 2023b).

When choosing or recommending a dressing for a wound, the nurse has many factors to consider. There are many types of dressings, and they serve many purposes. The nurse must consider the volume of exudate, whether the wound is acute or chronic, and if there are signs and symptoms of infection. The goal of the dressing is to protect the wound from the environment while promoting healing. The patient's quality of life should be considered when choosing a dressing, as the dressing type should optimize patient compliance, minimize cost, and allow for maximal function (Britto et al., 2024).

Inert or passive dressings can be absorbent or non-absorbent and are typically used as a supplement dressing. Inert dressings include gauze, lint, non-adherent dressings, and tulle. Interactive or bioactive dressings are more commonly used on the wound's surface. These dressings can also be absorbent or non-absorbent, or can also be moisturizing. These dressings include films, hydrocolloids, foams, hydrogels, and hydroactive dressings and may aid in protection, absorption, hydration, or may have antimicrobial properties or support new tissue growth (Sussman, 2023). Foam dressings are often used for chronic wounds and pressure injuries. The frequency of foam dressing changes ranges from daily to a few times per week (Britto et al., 2024).

Various wound dressings are used for different purposes. Tulle dressings include paraffin gauze, nonparaffin tulle, and silicone tulle. Paraffin gauze has been used on low-to high-exuding wounds and as a primary dressing for superficial low-exuding wounds. This dressing can protect new tissue growth, is atraumatic to surrounding skin, and is conformable to the wound bed; however, it is no longer commonly used due to the potential of shedding fibers and having an open weave. Nonparaffin tulle is now widely used in place of paraffin gauze because it

can provide a protective layer, but nurses should remember that it can dry out if left in place for too long. Silicone tulle is used for patients with fragile skin because the contact layer is soft. Non-adherent dressings may be basic and constructed from cotton wool with a plastic surface. These dressings are non-absorptive and are used as a primary dressing for superficial low-exuding wounds. High absorption non-adherent dressings are polymers used on moderate-to-high exuding wounds as a secondary dressing. These dressings should not be used on dry or low-exuding wounds. Film dressings are made from polyurethane film and allow for moisture control, provide a breathable bacterial barrier, and are transparent, which enables healthcare workers to easily assess the wound without removing the dressing. Films are often used as a primary dressing for superficial low-exuding wounds or as a secondary dressing over an alginate or hydrogel dressing. They should not be used when the skin surrounding the wound is fragile or for moderate-to-high exuding wounds (Sussman, 2023). Film dressings have the benefit of being flexible, and while they do not allow external bacteria to enter the wound, they allow gas exchange. Film dressings are self-adhesive. They are not absorbent, however, and can lead to maceration if the wound is excessively moist. Film dressings are most appropriate for shallow wounds, such as skin graft donor sites, minor wounds, and as a secondary dressing. The recommended frequency of dressing changes for film dressings is every few days. For some wounds, a weekly routine dressing change may be appropriate (Britto et al., 2024).

Hydrocolloid dressings are capable of low to moderate absorption and promote autolytic debridement, which occurs when the body's enzymes break down and remove necrotic tissue. These are used on clean wounds with low-to-moderate exudate, but should not be used on dry, necrotic, or high-exuding wounds. They can lead to overgranulation and maceration and should not be used on diabetic wounds. Standard foam dressings are helpful for fluid absorption, moisture

control, thermal insulation, and cushioning (Sussman, 2023). This extra cushioning can help protect the wound from further trauma (Britto et al., 2024). They are also able to conform to the wound bed. Standard foam dressings are used for moderate-to-high exuding wounds, and some types are made for use with fragile skin. They should not be used on dry or necrotic wounds. Soft silicone foam dressings are non-adherent and typically used as a pressure prevention strategy and for wounds in patients with fragile skin. Foam hydroactive dressings aid in fluid absorption and moisture control and can conform to the wound bed. They are similar to foam dressings and can be used for moderate-to-high exuding wounds. There are foam hydroactive dressings that can be used for cavity wounds and types that can be used for patients with fragile skin. They should not be used for dry or necrotic wounds (Sussman, 2023).

An alginate dressing is a hydroactive dressing made from seaweed polysaccharides that are transformed into a gel. It is highly porous and helps to promote hemostasis (Britto et al., 2024). Alginate dressings aid in fluid absorption and moisture control. They also promote autolytic debridement and are conformable to the wound bed (Sussman, 2023). Alginate dressings can change to a yellow or brown color and may be mistaken for purulence (Britto et al., 2024). These dressings can also be used for moderate-to high exuding wounds, and some products are available in rope form for use in cavity wounds. Other types of alginate dressings contain silver. These dressings should not be used on dry or necrotic sounds or friable tissues, and should not be packed tightly into cavity wounds (Sussman, 2023). Alginate dressings are typically changed every 1-3 days (Britto et al., 2024).

Gauze wet-to-dry dressings are cost-effective and widely available, but the material is not moisture-retentive and has a non-selective debridement action when removed. While biofilm may be removed when the dressing is removed, new granulation tissue can also be lost with this type of dressing. Gauze dressings

are more susceptible than many types of dressings to contamination and require a secondary dressing. If used for packing a wound, the dressing should be changed multiple times per day (Britto et al., 2024).

There are multiple types of hydrogel dressings, including sterile amorphous, preserved amorphous, and sheet hydrogel dressings (Sussman, 2023). The primary component of hydrogel dressings is water, along with a hydrophilic starch polymer (Britto et al., 2024). The purpose of these types of dressings is to rehydrate the wound bed, provide moisture control, promote autolytic debridement, and provide cooling and pain relief. Hydrogel dressings are used on dry and low-to-moderate exuding wounds and superficial burns. Some hydrogel products contain antimicrobial agents. Hydrogel dressings should not be used on high-exuding wounds or when an anaerobic infection is suspected. These dressings can also lead to maceration and should be monitored closely (Sussman, 2023). Hydrogel dressings require a secondary dressing and are often used for venous or arterial ulcers and surgical wounds. They may also be used when the provider is concerned that the wound bed may become too dry. Hydrogel dressings are changed every 1 to 3 days (Britto et al., 2024).

A hydrocolloid dressing is a cross-linked hydrophilic polymer that uses a gelatin-type component. These dressings are available as sheets, paste, or powder. Initially impermeable to water, they become more absorptive and form a gel. This type of dressing may be used to lower wound pH or inhibit bacterial growth. They can be used across joints or to fill wound cavities and are often used for pressure wounds with minimal to moderate amounts of exudate. Hydrocolloid dressings should not be used on wounds that are known to be infected or have necrotic tissue. These dressings should be changed every 2-4 days (Britto et al., 2024).

Antimicrobial dressings include those that contain various antimicrobial agents. They can also be used for debridement, and some types are intended to stimulate

wound healing. Antimicrobial dressings are typically changed daily, but may be changed every few days if the dressing is not saturated (Britto et al., 2024). If a patient's wound continues to not heal as expected with an antimicrobial dressing, the type of dressing should be carefully reviewed. The antimicrobial product used and other characteristics of each dressing vary, and the wound may respond more positively to a different product (Sussman, 2023).

Nurses with specialized training in wound care can be a valuable asset to the healthcare team. Certified wound care nurses are specially trained in wound prevention and management. They can assess, treat, and create care plans for patients with complex wounds. They can also educate staff nurses and other healthcare professionals as they care for these patients. A certified wound care nurse should be consulted for complex or nonhealing wounds (Open RN, 2021).

Case Study

The treatment plan was changed to include a new dressing during Mrs. Wilson's clinic visit. What might that dressing be? Select all options that could apply.

- Hydrogel dressing
- Paraffin gauze
- Gauze wet-to-dry dressing
- Alginate dressing
- Hydrocolloid dressing

What should the nurse document about the wound at each subsequent visit? Choose all that apply.

- size

- depth
- description of the wound bed
- what Mrs. Wilson likes to watch on TV during dressing changes
- amount of exudate
- appearance of exudate
- How many times her son called the clinic
- How often dressing changes have been completed

Section 6 Personal Reflection

Why is patient education essential to promote optimal outcomes? What are some of the different types of dressings? How can being aware of the different types of dressing improve your clinical practice? How can Certified Wound Nurses contribute to the patient's care?

Section 7: Conclusion

With the increasing prevalence of wounds across all practice areas, nurses are exposed to a growing number of wound types and treatment modalities. Nurses who are knowledgeable regarding evidence-based practices are best prepared to provide care to their patients that supports optimal outcomes. Nurses who are aware of best practices can also help the multidisciplinary team and provide quality education to patients and their families.

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