PRESSURE ULCERS

Abstract

Pressure ulcers are wounds in the skin that are caused by prolonged immobility. The severity of pressure ulcers can range from red and painful areas of the skin to an open wound that extends to bone, muscle and tendon. When there is break in the skin, infection often occurs and an infected pressure ulcer is associated with serious complications such as osteomyelitis and sepsis. Skin that is thin and areas of bony prominence, such as the hips, elbows, spine, and other bony areas are commonly at risk of developing pressure ulcers. The National Pressure Ulcer Advisory Panel has provided definitions of the stages of development of a pressure ulcer and is a recommended resource for all healthcare workers, and these are discussed.

Learning Objectives:

1. Identify pressure ulcers and their causes.
2. Identify the factors that increase the risk of developing pressure ulcers.
3. Identify the complications that may arise with pressure ulcers.
4. Describe the techniques that are used to prevent pressure ulcers from occurring.

Introduction

Pressure ulcers (also known as bed sores, decubitus ulcers, or pressure sores) are wounds in the skin that are caused by prolonged immobility. These lesions are common. Approximately 1 million pressure ulcers occur each year in the United States and in some patient populations, the incidence of pressure ulcers was reported to be greater than fifty percent. Within the general population, certain people are at greater risk of developing pressure ulcers. Among this higher risk population, there are procedures and techniques that may be used to reduce the risk of the formation of pressure ulcers.

Overview of Pressure Ulcers

Pressure ulcers can be relatively small and easily treated but some can cover large areas of the body and can affect bones, muscles, and tendons. Pressure ulcers can be a source of serious infections, and the presence of a pressure ulcer significantly increases the risk of death. They can be damaging and disfiguring, and the estimated cost of treating ulcers is approximately $6 billion a year and 2.2 million hospital days.

Prolonged immobility is the basic cause of pressure ulcers. Immobility, in turn, initiates and aggravates several mechanisms of injury that start the development of a pressure ulcer. There are also risk factors that increase the chances of developing a pressure ulcer and many of these, such as diabetes, obesity, smoking, and stroke, are very common.

Fortunately, a lot is now known about pressure ulcers; why they happen, how to treat them, and how to prevent them. Pressure ulcers

take work and time to prevent but they can be avoided. Pressure ulcers have been called bed sores, decubitus ulcers, pressure sores, and pressure ulcers. Currently, the preferred term in the medical community is pressure ulcer.

What is a Pressure Ulcer?

Pressure ulcers are wounds in the skin that are caused by prolonged immobility. Although the definition of pressure ulcers seems simple, the mechanisms that cause pressure ulcers are not. In addition, pressure ulcers take time to develop. They go through stages from mild to severe. Understanding pressure ulcer stages and development is important to detecting and preventing pressure ulcers. If pressure ulcers are not detected and treated in the early stages, they can cause significant and irreversible harm. Pressure ulcers may even contribute to a patient's death. Pressure ulcers and their complications are a direct cause of death in people who are paralyzed from the waist down.

The National Pressure Ulcer Advisory Panel has provided definitions of the stages of development of a pressure ulcer.

Stage I:

At Stage I, the pressure ulcer is just beginning to develop. The skin is red, warm, and may be sore. Those providing direct care to patients should look for these areas on bony prominences such as the elbows, heels, hips, lower back near the coccyx, and the shoulder blades. If proper treatment is applied, the skin will recover and the pressure ulcer will not get worse.

Stage II:

In Stage II, there is actual breakdown of the skin surface. The pressure ulcer looks like a blister or an ulcer. However, only the very top layer of skin, the dermis, has been damaged.

Stage III:

Stage III ulcers involve deeper skin damage that is below the level of the dermis. The wound can be very deep, but it will not extend to below the subcutaneous layer and other structures such as bones, connective tissue, muscles will not be damaged.

Stage IV:

Pressure ulcers that are stage IV are very serious. The ulcer is very large, the damage may go all the way to the bone, the joints may be affected, and the wound may be infected.

With relatively simple techniques and conscientious care, pressure ulcers can be prevented, and the progression of a Stage I or II pressure can be prevented, as well. Fortunately, most pressure ulcers are Stage I or Stage II and heal without surgical treatment.

Incidence and Cause of Pressure Ulcers

As mentioned above, pressure ulcers are common occurrences. While it is impossible to know exactly how many pressure ulcers are occurring at any one time, studies have estimated the prevalence of pressure ulcers in hospitalized patients to be between 41-69%, and 25-66% of all people who have had a spinal cord injury will develop a pressure ulcer.

There are many risk factors that increase the chances of developing a pressure ulcer. People who are at a high risk for developing a pressure ulcer are: 1) the elderly, 2) people who are in long-term care facilities, 3) people who already have a pressure ulcer, and 4) people who have suffered a spinal cord injury. These risk factors and others that increase the chances of developing a pressure ulcer will be discussed in a later section.

The human body is made to move. When people are sitting still and even when they are sleeping, they are moving. People toss and turn while in bed, they shift positions when they are sitting at a desk, and whether they are at work or at home, they get up, move about, and stretch. In ways that are obvious and in ways that are subtle, people are almost always in motion.

Immobility then is an abnormal condition and prolonged immobility is not healthy for the body. People who can only move for relatively short periods of time, or not at all, are likely to develop illnesses and complications including but not limited to, blood clots, lung infections, damage to the bones and joints, muscle weakness, and pressure ulcers.

Immobility

The basic cause of pressure ulcers is immobility. Immobility can be absolute in that a patient may not be able to move at all. Immobility can also be relative when a patient can move but the ability to move is seriously impaired. In either case, a pressure ulcer will develop if the level of immobility is significant.

Pressure ulcers occur for two reasons: 1) immobility causes a pathologic process - decreased blood flow - that affects skin integrity; and, 2) immobility aggravates several phenomena, friction, pressure, and shear force, that normally would not cause harm. A significant level of immobility leads to or causes decreased blood flow to the tissues, pressure on vulnerable tissues, friction, and shear force. Pressure, friction, and shear force may be normal occurrences, while decreased blood flow is not.

Immobility is the basic cause of pressure ulcers. Decreased blood flow, pressure, friction, and shear force are the mechanisms of injury and the specific reasons why pressure ulcers develop.

Decreased Blood Flow

The body needs nutrients and oxygen and these are delivered to the organs and the tissues by the blood vessels of the circulatory system. The blood vessels are easily compressed and occluded if they are under pressure but because people are constantly moving and changing positions, this compression and occlusion is not maintained long enough for the tissues to suffer from a lack of blood. For example, when a person is sitting in a chair, that person's body weight will compress and occlude some blood vessels to a degree that compromises blood flow but because the person does not normally remain seated for an entire day and is constantly shifting positions, this occlusion and interruption in blood flow does not cause harm. Compare this to a person who is bedridden with reduced mobility or who cannot move at all, the amount of occlusion and the prolonged lack of blood flow can easily lead to conditions conducive to formation of a pressure ulcer.

Pressure

Constant, unrelieved pressure of body weight is probably the biggest contributing cause of pressure ulcers. If the pressure of body weight is applied to one area of the body and that pressure is applied for a long period of time without interruption, the blood vessels that supply the tissues with nutrients and oxygen are occluded. If this disruption in blood flow is severe enough and lasts long enough, the tissues will die and a pressure ulcer will form.

The amount of pressure that is required to contribute to the development of a pressure ulcer will vary, depending on the area of the body, the thickness of the skin and the underlying tissues, the health of the skin and the underlying tissues, and the presence and amount of shear force and friction. It is impossible to determine how much pressure is too much and will contribute to the development of a pressure ulcer. However, it is clear that in certain vulnerable areas of the body and for people who have risk factors, the amount of pressure that can be dangerous is relatively slight. So, what might seem to be safe - the weight of someone's arm on an elbow - may be a hazard.

Friction

When a person, who is sitting or lying down, changes positions, the skin rubs against clothing, sheets, or whatever part of the body that is resting against the bed or chair. This movement creates friction, and friction can damage skin that is already compromised by pressure and immobility. Imagine taking sandpaper or a nail file and rubbing an area of skin that is weak and sensitive; the skin would quickly become

abraded. Friction is caused by movement, so it may seem contradictory to speak of friction when immobility is one of the primary causes of pressure ulcers. However, complete immobility is uncommon. Most people who develop a pressure ulcer can and do move but they are doing so much less than normal. The immobility compromises the skin's integrity, making it more vulnerable to the effects of friction.

Shear Force

Shear force can be demonstrated by pressing the palms of the hands together and applying a moderate amount of pressure, then trying to slide one hand down. If the applied pressure is high enough, the hands will not move and the result will be heat, friction, and a "pulling" on the layers of tissue. This is called *shear force* or the *shear effect*, and the constant heat, friction, and tension on the tissues it produces is one of the contributing causes of the development of pressure ulcers.

This description seems to imply that shear force is obvious and very noticeable. However, shear force happens in subtle way to people who are immobile or who are on prolonged bed rest. For example, if the head of the bed is elevated, gravity will naturally cause the body weight to move down, and it is easy to see how a subtle shear force would develop. It is important to remember that shear force can be easily generated if someone is immobile. If the body weight is not well distributed, even to a slight degree, shear force can result after prolonged immobility.

Risk Factors for Developing Pressure Ulcers

A patient's prolonged immobility causes specific mechanisms of injury that lead to pressure ulcers: they are decreased blood flow, pressure, friction, and shear force. Immobility is relatively common but not everyone who is immobile develops a pressure ulcer or develops a pressure ulcer as easily as some others. This occurs because there are risk factors that increase the chances of developing pressure ulcers, factors that make some people more susceptible to these lesions.

Age

As people age, their skin gets weaker, dryer, thinner, more permeable to moisture, and more fragile. People lose fat and their circulation diminishes. These changes increase the vulnerability of the skin and make the skin less able to heal and less able to withstand pressure, friction, shear force, and a decrease in blood flow. Finally, as people age they tend to be less mobile.

Older people are more likely to suffer illnesses that can lead to immobility; illnesses such as advanced chronic obstructive pulmonary disease (COPD), arthritis, hip fractures, and stroke. Elderly people are also more likely to have other medical conditions that can predispose them to pressure ulcers. These will be discussed separately.

Urinary Incontinence

Urinary incontinence is a significant risk factor for the development of pressure ulcers. When urine contacts the skin and it is not promptly washed off, bacteria that can harm the skin multiplies. As urine decomposes, irritating chemicals are formed that can damage the skin. Constant moisture increases friction forces on the skin. The mechanisms behind the increased friction is not completely understood

but this friction is another source of damage caused by urinary incontinence. Finally, when someone has urinary incontinence, the skin must be washed more often than it normally would be washed. The frequent washing removes surface fats, dries the skin, and subtly removes microscopic skin surface layers that are protective.

Fecal Incontinence

Fecal incontinence is a significant risk factor for the development of pressure ulcers. There are bacteria and enzymes in feces that are extremely irritating to the skin, especially for someone whose skin integrity is compromised by age, immobility, and urinary incontinence.

Medical Conditions or Lifestyle Factors

Cancer, dehydration, diabetes, excessive body weight, lack of pain perception, malnutrition, peripheral vascular disease, a previous pressure ulcer, a prolonged time in surgery, smoking, and stroke are all risk factors that increase the chances of developing a pressure ulcer. These factors increase the risk for developing a pressure ulcer by causing immobility, decreasing blood flow, affecting the integrity or health of the skin, or affecting pain perception. For example, the nicotine in cigarette smoke constricts the blood vessels in the hands and feet, a stroke can lead to decreased pain sensation and reduced mobility, and dehydration and malnutrition negatively affect the health of the skin.

It is estimated that patients who are incontinent are four times as likely to develop a pressure ulcer as are patients who are not incontinent. Urinary and fecal incontinence together seem to greatly

increase the risk for developing a pressure ulcer, more than the presence of either one alone.

Diabetes is a common disease. Approximately 26 million Americans have type 2 diabetes and approximately 1 million have type 1 diabetes. Diabetes decreases the peripheral circulation and causes nerve damage that can affect pain perception. These complications of diabetes mean that people who have diabetes have a high risk for developing pressure ulcers because vulnerable areas of the skin do not get blood flow and healing mechanisms are disrupted.

Risk Assessment Scales

Identification of patients who are at risk for the development of pressure ulcers is obviously important, and there are several formal risk assessment scales that can be used to determine who is likely to develop a pressure ulcer. These risk assessment scales use the best available evidence to standardize the assessments. Using a standardized assessment scale, rather than depending on the knowledge of each individual professional, can ensure that all vulnerable patients will be assessed and identified in the same way using the same criteria. Commonly used assessment scales include the Braden Scale, the Norton Scale and the Waterlow Scale for the assessment of adults; and the Braden Q Scale, the Glamorgan Scale, and the Strakid scale for the assessment of children. Each scale uses slightly different criteria. The Braden Scale, for example, assesses activity level, friction or shear, mobility, moisture, nutrition, and sensory perception. Each scale has its value, and the merits and limitations of each one will not be discussed here.

Bony Prominences

Pressure ulcers can happen in many places but four of the most common areas are the heels, the hips, the base of the spine, and the elbows. They can also develop on the back of the head, the spine, the shoulders, the hips, and the ears - *anywhere there is constant pressure, and where there is very little skin above the bone.* For example, the heels, elbows, the shoulders, and the spine are all bony parts of the body and there is not much skin to pad and protect these areas; consequently, when a person's body weight presses down on these areas, the skin can easily become damaged and a pressure ulcer can develop. Pressure that can cause a pressure sore ulcer may even be caused by wrinkles in the sheets.

Complications of Pressure Ulcers

Pressure ulcers are painful and disfiguring. They can also cause serious complications. When the healing process is prolonged, pressure ulcers can be dangerous. It has been estimated that each year approximately 60,000 people die from complications of pressure ulcers and the presence of a pressure ulcer increases the risk of death almost five times. If a pressure ulcer becomes infected, the risk of death is even higher. With proper treatment, however, most pressure ulcers will heal.

Tissue Infections

Infection is the most common complication associated with pressure ulcers. The presence of bacteria and other microorganisms in a pressure ulcer is almost unavoidable but the development of an

infection is not. Infection of a pressure ulcer can be especially serious in the elderly and in people who have a compromised immune system.

Detecting infection in a pressure ulcer can be difficult. It is *more* difficult to detect in people who are at high risk of developing a pressure ulcer because many of these people have decreased pain sensation and compromised immune systems.

Bone Infections and Sepsis

An infection of the bone is called osteomyelitis. Osteomyelitis is a very serious complication of pressure ulcers. It can be very difficult to detect, and it often requires surgical treatment.

Sepsis is the term for an infection that moves from a local area into the blood stream. When bacteria enter the bloodstream, they can travel to any area of the body and infect any organ. Sepsis can cause damage to the heart, brain, kidneys, *etc.*, and in elderly patients, sepsis is often fatal. Patients who have a pressure ulcer that is Stage II or worse are at risk for developing sepsis.

Prevention of Pressure Ulcers

Preventing pressure ulcers is one of the more important responsibilities for a CNA who is caring for a patient who is immobile and at risk for developing a pressure ulcer. Preventing pressure ulcers requires constant vigilance, continual assessment and monitoring of the patient, and application of specific techniques. Prevention keeps a patient safe from serious complications and reduces the length of a patient's course of therapy.

Prevention of pressure ulcers is basically a three-step process: 1) identifying patients who are at risk, 2) performing periodic assessments, and 3) using specific techniques designed to prevent pressure ulcers. Identifying patients who are likely to develop a pressure ulcer requires the CNA to know and understand the causes of pressure ulcers, mechanisms of injury that cause them, and risk factors associated with their development, which were discussed above.

Assessment

An assessment for pressure ulcers should be done when a patient is admitted, and then a schedule for re-assessment should be established. Some patients may need to be assessed as often as every 24 hours. The timing and frequency of the assessment will depend on the level of risk.

The patient should be checked literally from head to toe. Special attention should be paid to high risk areas, such as the sacrum, heels, elbows, hips, and the back of the head. If the patient is able to provide reliable feedback, ask him/her if there is pain in any of these areas or elsewhere. Examine the skin for temperature (unusually warm or cold), color (redness or pallor), moisture (excessively moist or dry), and for any breaks in the skin.

Techniques for Prevention

Position Changes:

Position changes reduce the pressure on vulnerable areas for people who are immobile and who are at risk for developing a pressure ulcer.

Position changes are critically important; *patients who are immobile must be moved*. A patient must not remain in the same position hour after hour. Most of the time, it is recommended that a patient who cannot move independently be moved at least every two hours.

Some patients may need to be moved more frequently. Very often the schedule for position changes will be ordered by a physician or recommended by a physical therapist. The standard routine that is used is left side, back, right side, and then repeat. When possible, the CNA should avoid positioning the patient to be lying with the body weight on vulnerable areas such as the hip, base of the spine, *etc.* It is also important to make sure that bony areas with thin skin are not touching each other. One example would be the ankles. The head of the bed should not be elevated more than 30 degrees to prevent shear force from damaging the skin.

Performing position changes can be challenging in terms of time and patient comfort. However, any change in position is better than remaining completely immobile in the same position. If for some reason a complete position change cannot be done, small position changes that take less time to accomplish should be performed. Also, position changes are vitally important once a pressure ulcer has developed. At all costs, the CNA should try to avoid any pressure on that area. If the pressure on a pressure ulcer is not reduced, healing will be delayed or may stop completely.

Dry Skin:

Skin that is wet can become irritated and irritation can lead to skin damage and pressure ulcers. Skin that is wet from urine is especially

at risk. Patients who are incontinent of urine or stool should be checked frequently and their skin should be cleaned and dried if it is wet or soiled. Only a soap that has been approved for use in patients with delicate skin should be used. Ordinary bar soaps can be too drying.

Padding:

There are different ways that padding can be used to prevent pressure ulcers. The paddings a CNA uses depends on what is available at the workplace and what the patient requires. When using the various padding tools such as mattresses, pillows, foam rubber devices, padded boots or heel supports, air or water-filled pads, *etc.*, a CNA must remember to keep these clean and dry. Padding tools can contribute to the development of a pressure sore if they become wet or contaminated.

It is also important to remember to make sure that there are no ridges or sharp edges on these tools that could put pressure on the skin. The same is true for bed linens. These should be free from wrinkles and ridges as much as possible. Special beds filled with air, liquids or silicone beads (much like a waterbed) are often used for people who might develop a pressure ulcer or who already have one.

Creams and Lotions:

Creams and lotions may help prevent pressure ulcers from developing. These can prevent urine and feces from directly contacting the skin and they can help reduce the effects of friction and shear force.

The treatment of a pressure ulcer will depend on the stage of the ulcer. Ulcers that are Stage I can be treated with simple, non-invasive therapies, frequent assessments, and conscientious use of the prevention techniques, especially frequent position changes and skin cleaning. Stage II ulcers will need more intensive care and possibly the use of dressings. Complicated ulcers that are Stage 3 or Stage 4 may require surgery, special cleaning techniques and dressings, or skin grafts. This section will divide the treatment of pressure ulcer into two categories: 1) supportive care and medical therapies, and 2) surgical therapies.

It is important to try and treat pressure ulcers as soon as possible and before they develop into Stage II, III or IV. The size and depth of a pressure ulcer is inversely related to the chances of healing; the wider and deeper the ulcer, the less chance there is that it will heal.

Supportive Care and Medical Therapies

When a pressure ulcer is in Stage I or Stage II, supportive care in the form of the preventative measures (discussed in the previous section), such as frequent position changes, keeping the skin free of urine and feces, can prevent a pressure sore from progressing to Stage III or Stage IV and will help these ulcers heal. A patient may also benefit from nutritional supplementation that includes extra protein and vitamins. The assessment schedule may need to be readjusted. Repositioning may need to be done more frequently.

Medical therapies include various types of dressings that cover the wound and promote healing, solutions for cleansing the wound, topical medications that promote wound healing and prevent infection, and

negative pressure wound therapy. For some patients, dressing alone may be used and for others a combination of the three, the cleansing solutions, the topical medications, and dressing may be prescribed.

Pressure ulcers that involve a break in the skin should be covered by a dressing. An intact skin is the body's first line of defense against infection because the intact skin acts as a mechanical barrier that physically prevents bacteria, viruses, and other microorganisms and moisture from entering the body and causing an infection.

There are many different types of dressings that are used to cover pressure ulcers. Dressings perform the basic function of covering the wound, which prevents bacteria and other microorganisms and moisture from entering the wound. However, the dressings that are used to cover a pressure ulcer also have other, more complex functions. For example, the material that many pressure ulcer dressings are composed of do prevent moisture from entering the wound but the material also keeps the area of the wound moist to a specific degree, which promotes healing. Pressure ulcer dressings also absorb the drainage from the wound, and some are impregnated with material that breaks down dead skin and fills the dead space in the wound, which help the pressure ulcer to heal.

A simple saline solution may be used to clean and flush out a pressure ulcer, or a solution that has antibacterial properties may be used. Topical medications such as creams and ointments that have antibacterial properties and/or have enzymes that dissolve dead skin may also be applied a pressure ulcer.

As previously mentioned, there are many different dressings, cleaning solutions, and topical medications that can be used to treat a pressure ulcer. The choice of which one to use and whether to use a combination will depend on the nature of the pressure ulcer. The optimal treatment of pressure ulcers is still being developed, and at this point the benefits or disadvantages of each dressing type, medication or solution is not clear. It is not clear which of these therapies works best, and different healthcare facilities use the approach they feel is most beneficial. Whatever the physician or wound care specialist has prescribed, the CNA should follow that treatment plan.

If the CNA is responsible for using cleaning solutions and/or applying dressings, substitutions should not be made. Some things like 3% hydrogen peroxide are suitable for simple wound cleaning but may be harmful to a pressure sore. Every patient with a Stage III or Stage IV pressure ulcer should have specific wound care instructions ordered by the physician or a wound care specialist, and a CNA should not deviate from those instructions.

Negative pressure wound therapy has shown some promise in healing pressure ulcers. In negative pressure wound therapy, the pressure ulcer is covered with an absorbent sponge and an occlusive dressing. A vacuum tube is placed through an opening in the occlusive dressing, and the vacuum tube is applied to a vacuum pump. The vacuum pump creates negative pressure and the negative pressure increases circulation in the area and removes wound drainage that would otherwise prevent healing.

Surgical Therapies

If a pressure sore has reached Stage III or Stage IV, the preventative techniques will not work. Specific treatment - often surgical treatment - is needed to prevent the pressure sore from becoming permanent, to promote healing, and to prevent complications.

These treatments will be ordered by a physician. Taking care of and monitoring the progress of pressure ulcers is also a subspecialty of nursing. Many hospitals and healthcare facilities have a nurse who has special training and certification in the area of wound care. The therapies that are used for a pressure sore will depend on many factors. The following treatments are used for Stage III and Stage IV pressure ulcers.

Debridement:

Debridement is a surgical technique. It involves cutting away dead, damaged, and infected tissue, and debridement can be used for pressure ulcers. It is felt that dead and damaged tissue acts as a reservoir for bacteria and if that tissue is not removed, the ulcer will not heal. The tissue can be removed with a scalpel, with a high-pressure liquid, with salves/creams that dissolve the unwanted tissue, or with a combination of methods. Whirlpool baths and wet dressings can also be used; these loosen the dead tissue so it can more easily be removed.

Skin Grafts:

A skin graft may be used if the pressure ulcer is very deep or very wide and it is felt that normal healing may not be enough to close the wound.

Summary

Pressure ulcers are wounds in the skin that are caused by prolonged immobility. Pressure ulcers are common, and the severity of these lesions can range from an area of the skin that is red and painful to an open wound that affects bone, muscle and tendon. Pressure ulcers that involve a break in the skin are often infected, and the infection can cause serious complications such as osteomyelitis and sepsis. Pressure ulcers usually develop in areas of the body where the skin is thin and there is a bony prominence. The heels, the hips, the base of the spine, and the elbows are most susceptible but the back of the head, the spine, the shoulders, the hips, and the ears are also areas where pressure ulcers are commonly found.

Prolonged immobility is the basic cause of pressure ulcers, and prolonged immobility also causes and/or aggravates more specific mechanisms of injury, such as decreased blood flow, friction, pressure, and shear force. Some people are more susceptible to the development of pressure ulcers because of the presence of certain risk factors, such as advanced age and certain medical conditions, as discussed.

Prevention of pressure ulcers focuses on keeping the skin clean, dry, well nourished and well hydrated, and includes frequent position changes. People who are incontinent of urine or stool need to have their skin cleaned quite often. Frequent position changes are the most effective technique for preventing pressure ulcers as constant pressure

on a vulnerable area is probably the single biggest factor in the development of a pressure ulcer.