

PROLONGED, COMPLETE IMMOBILITY: PREVENTION AND TREATMENT

Abstract

The human body thrives on movement and suffers when movement is not possible. A patient who cannot move is at risk for developing serious complications that require complex care. Complete and prolonged immobility can cause serious health problems and deteriorating health, including serious complications. Some of the more common and important complications include pressure sores, venous thrombi, bone loss and muscle wasting, contractures and lung infections and pulmonary complications. Preventive care is vital to avoid these conditions from developing. Prevention is far more effective than treating the condition after it has developed.

1. Identify prolonged, complete immobility and its complications.
2. Identify the causes and preventions of pressure sores.
3. Identify causes and treatments for complications in immobile patients, such as venous thrombosis, contractures, and lung infections.
4. Describe the *primary* cause of bone and muscle loss in this patient population.
5. Describe the CNA's role in detection, prevention, and treatment of complications associated with prolonged immobility.

Introduction

Physical activity and movement is essential for the health of every person. The human body is designed to move and without movement, the human body is susceptible to a wide variety of illnesses and pathologies that are directly caused by immobility. Short periods of immobility, such as bedrest, are usually not harmful and may be therapeutic; however, there are significant differences between bedrest and prolonged, involuntary immobility. Bedrest can be helpful but immobility is often harmful, and immobility for long periods of time is *never* beneficial. A Certified Nursing Assistant (CNA) will be responsible for providing care to patients who are immobile and who are likely to be immobile for a long time. The causes and complications of prolonged, complete immobility, and the therapies used for preventing and treating complications of prolonged, complete immobility are discussed in the following sections.

Prolonged and Complete Immobility

Prolonged, complete immobility is defined here as an/a: 1) involuntary condition in which the patient cannot make any substantial movement, 2) condition that is likely to be long-term or permanent, and 3) condition that increases the patient's health risk. Complete immobility may be further understood by comparing it to short-term bedrest.

Bedrest is often prescribed as a therapeutic measure for hospitalized patients, and physicians often recommend rest to patients who are suffering from a minor illness such as a cold or the flu. Bedrest is also used in post-operative patients, patients who are critically ill but who are likely to soon recover, patients who are being mechanically ventilated, and patients who are unable to tolerate being out of bed and ambulating. In these cases, bedrest may be unavoidable. It may also be beneficial or necessary for patient safety. Regardless of the reason, bedrest in such situations is

temporary. It may be needed for a day, several days, or a week or more but within a relatively short period of time the patient will be ambulatory again.

Short periods of bedrest can be tolerated and it can be therapeutic. Unfortunately for some patients, bedrest is a permanent condition or it is likely to be prolonged. Long periods of bedrest are inevitably harmful, and patients who are confined to bed for a significant amount of time will suffer harm to essentially every organ system of the body. People who are completely immobile, for example, who cannot move at all, are at risk for serious health problems.

There are no universally used and accepted definitions of bedrest, complete bedrest, and complete immobility. These terms are best understood to simply be points along a scale that describes an unnatural and potentially unhealthy level of physical inactivity. At one end of this scale the patient may need to stay in bed for 24 hours after knee surgery while at the other end the patient has suffered a devastating stroke, cannot move, and may never move. The first patient will be unlikely to suffer consequences from this brief period of bedrest but the second patient will likely develop serious complications from this level of inactivity.

To review, bedrest and complete bedrest are prescribed, usually on a temporary basis, and can be therapeutic. Complete, prolonged immobility is never healthy. The following diagram shows the progression from bedrest to complete immobility:

Bedrest → Complete Bedrest → Complete Immobility
Low Risk → Moderate Risk → High Risk

Sedentary Lifestyle and Inactivity

The links between exercise and health, and inactivity and illness, have been clearly established. A sedentary lifestyle increases the risk for developing chronic diseases and regular exercise has a strong preventive effect.

The association between physical activity, health, and disease is not limited to regular exercise. Even the most sedentary person is, in small ways, constantly moving. People are constantly moving and changing positions when they sleep. Someone may have a job that requires sitting at a desk all day. To a casual observer, it may seem that this person is inactive but looking closer, even a "desk jockey" may be constantly moving; the person may be shifting positions, stretching, or getting up for a drink or to use the bathroom.

These subtle movements are lost when someone is completely immobile. For example, a stroke victim usually cannot move at all or movement may be severely limited. When all significant levels of physical activity stop, serious health problems begin to develop.

A patient who is completely immobile may have some level of ability to move; for example, he/she may grasp an object, or nod yes or know in answer to a question, but this level of movement is not enough to prevent complications. Complete immobility also means that the patient cannot ambulate and cannot move from one position to another, even in the slightest.

Causes of Prolonged and Complete Immobility

There are many reasons why someone may not be able to ambulate. The patient may have had a paralyzing stroke. The patient may have suffered a

traumatic accident. The patient may have an overwhelming illness that is not responsive to therapy or for which the recuperative process is very long.

Table 1: Causes of Prolonged, Complete immobility

<p>Cerebrovascular accident, such as a stroke</p> <p>Induced paralysis and chronic illness</p> <p>Significant and prolonged illness</p> <p>Trauma</p>

Regardless of the reason why a patient is unable to move, the risks to that person's health are the same. Complete and prolonged immobility can cause serious health problems and deteriorating health. Serious complications are possible and preventive care is vital.

Complications of Prolonged And Complete Immobility

Prolonged and complete immobility is the direct cause of complications that can be dangerous and potentially fatal. These complications may require complex care. Complications may arise with patients who are on bedrest but these patients are typically less at risk than someone who is completely immobile.

Complications of prolonged immobility are listed in Table 2. The more common complications will be discussed in detail as well.

Table 2: Complications of Prolonged Immobility

<p>Bone loss</p> <p>Cardiovascular changes</p> <p>Constipation</p> <p>Contractures</p> <p>Immune system dysfunction</p> <p>Kidney stones</p> <p>Lung infections and pulmonary complications</p> <p>Muscle wasting</p> <p>Pressure sores</p> <p>Sensory deprivation</p> <p>Venous thrombosis</p>
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Pressure Sores

Pressure sores are perhaps the most well-known complication of prolonged, complete immobility, and pressure sores are quite common in certain patient populations. Pressure sores (also called bed sores, pressure ulcers, skin ulcers, or a decubitus ulcer) are localized open wounds in the skin that are caused by immobility. Pressure sores develop when people are unable to move for long periods of time, and can form after relatively short periods of immobility. The causes of a pressure sore - pressure, shear effect, friction, heat, and moisture - will be highlighted next.

Pressure:

When individuals are immobile, their body weight is being constantly applied to a few, small areas of the skin. This constant pressure is the primary underlying reason why pressure sores develop. The pressure of body weight is made worse if there are bones that are close to the surface of an area of the body that has a relatively thin layer of tissue. The pressure may be a large amount for a relatively short period of time, or a lesser amount for a longer period, but pressure is key to the development of pressure sores.

Circulatory Disruption:

The skin, the muscles, and fat tissue are metabolically active. They need a constant supply of blood and oxygen to stay healthy. Aside from the outer layers of the skin, these tissues have a dense network of blood vessels. Many of these blood vessels such as the capillaries are small and fragile and they are easily occluded by even a slight degree of pressure. When someone is completely immobile, the constant pressure of body weight occludes the blood vessels that supply the affected area. This results in a lack of blood supply and very quickly causes tissue damage.

Shear Effect:

By pressing the palms of one's hands together and applying a moderate amount of pressure while sliding one hand down against the other, a slight sensation of warmth should be noticed; and the harder the hands are pressed together the greater the amount of friction and heat that is produced. These same effects of heat and friction happen when someone is completely immobile and this is called the *shear effect*. When a person is immobile and sitting, or is in bed with the head elevated, the skin stays in one place but the underlying fat and muscle tissue slides or "shears" away from the skin. This sliding of the skin away from the underlying tissue

disrupts blood flow, causes heat and friction, and is a significant cause of pressure sores.

Friction:

The shear effect can increase on the skin. Friction wears away the outer layer of the skin and can increase the vulnerability of someone to pressure sores.

Heat and Moisture:

The parts of the body that are affected by, or likely to be affected by pressure sores are those areas that are not open to the air. Consequently, heat and moisture can build up and this predisposes the skin to injury.

Pressure, shear effect, friction, heat, and moisture are the direct causes of pressure sores. Advanced age, dehydration, fecal and urinary incontinence, loss of body fat and muscle, malnutrition, and certain medical problems such as diabetes makes individuals vulnerable to such effects that increase the risk of developing a pressure sore.

Pressure sores can occur anywhere on the body that is subjected to pressure, shear effect, friction, heat and moisture; however, the elbows, the back of the head, base of the spine (coccyx or sacrum), the shoulder blades, the heels, and hips are the most vulnerable. These vulnerable areas usually have a thin layer of skin and bones very close to the surface of the body.

Pressure sores develop through stages over time. There are grading systems that are used to characterize the seriousness of a pressure sore.

Pressure Sore Grading System

Grade 1:

In Grade 1 the affected area is discolored. It may be slightly red, blanched, or simply appear darker than the surrounding normal skin but there is a noticeable change in skin color. The skin feels warm, and edema and swelling are present. If the area is red it does not blanch (turn white) when pressure is applied.

Grade 2:

In Grade 2 the outer layer of the skin is broken and damaged. At this point the pressure sore looks like an open blister or open wound.

Grade 3:

In Grade 3 pressure sores the damage goes through the upper skin layers into the fat, but muscles, bones, and tendons are not exposed or damaged.

The pressure sore looks like a deep cavity.

Grade 4:

Grade 4 pressure sores are the most serious. Bones, muscles, and tendons are exposed, the affected tissue becomes necrotic, and the area is often infected.

Pressure sores are common in certain patient populations, and aside from infections and loss of tissue, pressures sores are responsible for thousands of deaths every year.

There is a wide variety of treatment for pressures sores, including:

- debridement (removal of dead and/or infected skin)
- periodic wound cleaning and the application of different types of specialized dressings
- antibiotics (when needed)
- skin grafts
- hyperbaric oxygen therapy

The treatment of a pressure sore is often prescribed and coordinated by a registered nurse who has advanced training, such as a wound, ostomy, and incontinence nurse. These treatments can be successful but early detection and prevention of a pressure sore is far better than subsequent treatment.

The Centers for Medicare and Medicaid Services (CMMS) consider pressure sores to be a hospital-acquired event. This means that in the opinion of the CMMS pressure sores are *preventable* and that hospitals will not be reimbursed with Medicare or Medicaid funds for treatment of a patient who develops a pressure sore.

Venous Thrombosis

Thrombus is the medical term for a blood clot in an artery or a vein. Venous thrombi (often called deep vein thrombosis, or DVT) are a serious complication of both complete immobility and bed rest. Venous thrombosis can form after as little as three days of immobility.

Venous thrombi happen most often in the lower legs but they can occur almost anywhere there is blood flow. Someone who has a venous thrombosis may have pain, swelling and warmth at the location of the thrombosis but it is also possible that these signs and symptoms will be absent.

The body has natural anticoagulants that can dissolve venous thrombi but blood clots in the veins and sometimes in the arteries *can* break off and move through the circulation to the heart, the brain, the lungs, or one of the extremities. When this happens, a blood clot is called an *embolus*, and the embolus travels through the circulation where it may completely occlude a blood vessel. This effectively deprives the affected area of blood and oxygen and a large embolus in certain areas such as the brain or heart can cause serious harm, such as a stroke (discussed below).

Blood clots are a complication of complete immobility for several reasons, such as decreased circulation, bodily positioning, muscle inactivity, and dehydration.

Decreased Circulation:

Blood has a natural tendency to clot but if blood is moving and circulating this will not happen. Movement, whether it is ambulation or simple changes in position, helps to circulate the blood and prevent blood clots.

Positioning:

When someone cannot move, blood will naturally tend to “settle” in areas that are in a dependent position. This is a simple effect of gravity and it results in blood pooling in certain areas and the possible formation of blood clots.

Muscle Inactivity:

Unlike the arteries, the veins do not have strong muscles that contract and move blood through the circulatory system. By the time blood has reached the veins the initial force of a heart beat that pushes blood along through the arteries and capillaries and the pressure in the arteries are no longer factors that circulate the blood. Other mechanisms are needed to push blood through the veins and back to the heart and one of the most important is *muscular contraction*.

When moving the muscles (especially the leg muscles while walking), a person's muscles will contract, squeeze down on the veins, and push blood back to the heart.

Dehydration:

Dehydration makes the blood more viscous and the greater the viscosity of the blood the greater the risk of developing blood clots. People who are immobile, for a variety of reasons, are more likely to be dehydrated.

Stroke Caused by Venous Thrombosis

Venous thrombi are potentially serious. Approximately 90% of all cerebrovascular accidents (CVA), also referred to as a stroke, are caused by a venous thrombus that has embolized and has occluded a blood vessel in the brain. A stroke is one of the most common reasons for prolonged, complete immobility.

Lung Infections and Pulmonary Complications

When someone is immobile, even for short periods of time, secretions can pool in the lungs. When this happens, bacteria and other microorganisms,

which live in the lungs, may multiply and a lung infection may occur. Prolonged immobility also causes wasting of the respiratory muscles and places people in a dependent position, for example, lying down, from which it is more difficult to fully expand the chest. It also weakens the muscles needed to cough, which prevents a person from clearing airway secretions.

Many patients who are immobile have suffered a stroke. A stroke may damage the gag reflex and place a patient at risk for aspiration. Patients who have been sedentary, smoked cigarettes, or have chronic obstructive pulmonary disease (COPD) or emphysema are more likely to suffer pulmonary complications from immobility than someone who has been active, is a non-smoker, and has healthy lungs.

Urinary Tract Infections

Being immobile for long periods of time increases the risk of developing a urinary tract infection. The bladder loses muscle tone and the patient is unable to completely empty the bladder when he or she urinates. This allows the bacteria and other microorganisms that are normally found in urine to multiply and a urinary tract infection can occur. In addition, elderly patients have decreased bladder tone; patients who are immobile may be dehydrated; and, some patients who are immobile have in-dwelling urinary catheters.

Loss of Muscle Strength and Muscle Tissue

When individuals become completely immobile, their muscles are not being used. Muscles need movement and resistance to stay strong. Without movement or resistance, muscles slowly but surely lose strength. A common phrase used to describe this phenomenon is, *"use it or lose it."*

Immobility does not need to be extensive to cause muscle tissue and strength loss. Even a short period of time of complete immobility can cause serious loss of muscle tissue and muscular strength. It has been estimated that approximately 10-15% of muscle mass and muscle strength can be lost after a week of immobility.

This complication of complete immobility is especially pronounced in the elderly for two reasons. First, loss of muscle mass is an inevitable part of aging so an elderly person who is immobile is losing more muscle mass. In addition, elderly adults appear to be more susceptible than young adults to the loss of muscle strength and muscle tissue that is caused by immobility.

Contractures

Contractures are a significant complication of prolonged immobility. A contracture is defined as "a fixed position of a joint caused by pathologic changes to the connective tissues." This condition is permanent. This occurs when the ligaments attached to the bones, and tendons attached to the bones and muscles, become stiff, inflexible and shrink.

Bones are connected at the joints by thick bands of fiber-like tissue called *ligaments*, and muscles are attached to the bones by the *tendons*, which are similar in structure to the ligaments. The ligaments and tendons are called connective tissue, and healthy connective tissue is vital for a person's health. The ligaments provide stability and flexibility to the joints and the tendons allow for the transfer of muscle strength to the bones, which gives a person movement.

The connective tissues must be exercised and stretched to remain healthy and more importantly, to remain supple and elastic. If the ligaments and

tendons are not stretched and routinely placed under stress they stiffen and begin to shrink, ultimately making the joints inflexible. This can happen to the muscles as well, and if this process it is not interrupted, a permanent deformity of the joint, a contracture, may occur. For example, a person with a contracture of the arm will have an arm that is permanently flexed and will not be able to straighten the limb.

Bone Loss

Bones are metabolically active and bone tissue is always being broken down and replaced. The breakdown and buildup of bone tissue are ongoing processes and the formation of new bone depends in part on stress and weight bearing. If a person's bones are not stressed or are not subjected to body weight, the bones lose minerals and become weak and brittle.

Bone loss is an inevitable complication of prolonged immobility. The break down of bone tissue and the formation of new bone tissue is a balance. Immobility disrupts this balance and with sufficient time someone who is immobile will lose a large amount of bone tissue. Unfortunately, many people who suffer from prolonged immobility are elderly. Some degree of bone loss is part of the aging process so an immobile elderly person loses a greater amount of bone tissue.

Sensory and Social Deprivation

Prolonged immobility is inevitably accompanied by some degree of sensory deprivation. Sensory deprivation is defined as "a process in which someone is deprived of normal external stimuli such as sight and sound, for an extended period of time, and the condition is caused by the environment, not the individual's perceptual ability." Physical inactivity, social isolation,

and the inability (in some patients) to communicate can easily lead to depression and disorientation.

Prolonged Immobility: Prevention and Complications

The complications of prolonged immobility may seem inevitable and many of them are difficult to prevent. In addition, some of these complications are prevented and/or treated with therapies that CNAs may not be primarily responsible for implementing.

Pressure sores are often treated by a wound, ostomy, and incontinence nurse, however, the involvement and input of CNAs will be needed for the important aspects of detection, prevention, and treatment. This section will discuss CNA responsibilities regarding several of these complications.

Pressure Sores

The wound, ostomy, and incontinence nurse or the physician will make the plan of care for a patient who has a pressure sore, or the patient who is at risk for developing a pressure sore. A CNA's responsibility will be to help carry out this plan, to notify the nurse or supervisor if the pressure sore is worsening, and to help prevent pressure sores from developing.

Preventing pressure sores involves: 1) keeping the patient's skin clean and dry, 2) changing an immobile patient's position at least once every two hours, 3) maintaining a patient in positions that help avoid the development of pressure sores, for example, positions that decrease pressure on vulnerable areas such as the heels and hips, 4) use of padding and protective devices as appropriate, 5) inspecting the skin at least twice a day,

and, 6) ensuring that specialized dressings stay in place and are not disrupted.

The first step to preventing pressure sores is to recognize the patients who are likely to develop them. Obviously, a patient who is immobile is at high risk but the CNA must also remember that people who are thin are at a higher risk. People with decreased pain sensitivity (such as people with diabetes or people who have had a stroke) are at a higher risk, and people who are incontinent of urine and/or feces are at a higher risk as contact with these secretions increases the risk of skin breakdown. It is important to remember that preventing pressure sores is much easier and far more effective than treating them.

Venous Thrombosis

Encourage a patient to drink but always follow the fluid restrictions that have been ordered by the patient's physician. Make sure the patient is not in a position that will compromise circulation. A CNA should perform periodic circulation assessments, and check dependent limbs for signs of venous thrombosis.

A patient's physician may order the use of graduated compression stockings. Graduated compression stockings are long stockings, often extending past the knee to the middle of the thigh, that are made of a strong elastic material. When they are applied correctly they act as substitute for muscle contractions in the legs and they help move blood from the lower extremities back to the heart.

Graduated compression stockings are a prescribed medical device. If the patient is supposed to wear graduated compression stockings, a CNA must follow the orders regarding how long and how often to use them.

Graduated compression stockings can prevent venous thrombosis and they can also prevent *post-thrombotic syndrome*. Approximately 20-50% of all patients who have a DVT will develop post-thrombotic syndrome, a condition characterized by debilitating pain, cramps and other signs and symptoms. Massaging a patient's legs or routine application of a moisturizing lotion to the legs is discouraged when a patient is known to have DVT because of the risk of blood clot dislodgement. When caring for a patient with a DVT, or at risk for DVT, the CNA should check with a supervisor before performing any massage techniques or skin care.

A CNA should evaluate a patient who is at risk for developing a thrombus. If the patient's leg or foot is red, swollen, hot, or painful, these may be signs that a blood clot is present. However, these signs are not always present when someone has a thrombus. When a CNA is considering whether to evaluate a patient for thrombus, the safest course is simply to assume that someone who has been immobile for a prolonged period time is at risk for developing a thrombus.

Contractures

As with pressure sores, preventing contractures is far more effective than treating an existing contracture. Once a serious contracture has developed, the patient may be left with a permanent deformity and even a contracture that occurs after a relatively brief period of immobility can cause disabilities and pain that last for years.

In order to prevent contractures, the patient's arms, legs, hands, wrists, and other vulnerable joints must be stretched and moved. Limb and joint movement and stretching techniques are determined by a patient's physician, including how often they are done and by whom. However, it is not unusual for a CNA to be responsible for performing these techniques.

A CNA may also be asked to apply splints that are designed to hold the patient's limb in an anatomically correct and stretched position.

Passive range of motion (ROM) exercises are frequently prescribed. Passive ROM exercises are exercises in which the caregiver moves the patient's limbs through a specific ROM, and the patient does not assist and the movement is passive.

Performing passive range of motion exercises will generally involve exercises of a patient's limbs. An example would be passive ROM of a patient's knees:

- Place one hand under the patient's heel
- Place the other hand underneath the leg just above the knee
- With the hand that is holding the heel, bend the leg so that it flexes and then extends
- Use the hand that is underneath the leg near the knee for support

Lung Infections

Lung infections can be difficult to prevent. A CNA can help by making sure the patient is well hydrated. The CNA should always make sure to check a patient's chart before offering any fluids. This way, a CNA can make sure a patient is allowed to drink and also know how much a patient may drink.

A CNA may also be asked to help a patient perform coughing and deep breathing exercises. These exercises are designed to increase the flow of oxygen into the lungs and to help clear secretions. These exercises can be an effective way of preventing lung infections. For example, every two hours, a patient could be instructed to take a specific number of very deep breaths and to produce a specific number of forceful coughs.

Deep breathing exercises are often performed with the help of a spirometer. This is a medical device that provides visual feedback and measurement of how deeply a patient can inhale, and a spirometer can be an easy way to track how well a patient is progressing with deep breathing.

Other Complications

The other complications of prolonged immobility such as bone loss, cardiac complications, constipation, immune system dysfunction, kidney stones, muscle weakness, sensory deprivation, and urinary tract infections can be difficult to prevent.

Urinary Tract Infection:

For preventing urinary tract infections, a CNA can make sure the patient is hydrated. The CNA can also assess the color and appearance of the patient's urine. If the urine is dark, cloudy, filled with sediment, or has a foul odor, these may be indications of a urinary tract infection and the physician should be notified. Good urinary catheter care, if needed can also be helpful.

Muscle Weakness and Bone Loss:

Muscle weakness and bone loss can only be prevented by weight bearing exercises or resistance exercises, and these are obviously not possible if the

patient is totally immobile. However, a CNA should be aware of these complications and take them into consideration when assessing and caring for the patient who is immobile.

Sensory Deprivation:

Sensory deprivation can be alleviated or prevented by varying the environment and providing external stimuli.

Summary

Prolonged, complete immobility has been defined as an involuntary condition in which the patient cannot make any substantial movement, potentially a long-term or permanent condition, and placing the patient's health at risk. This condition is different than bedrest. Bedrest is a short-term temporary therapeutic measure whereas prolonged, complete immobility is often a permanent condition and is associated with serious complications. Common causes of prolonged, complete immobility include a cerebral vascular accident, induced paralysis, and significant and prolonged illness, and trauma.

Complications of prolonged, complete immobility affect essentially every organ system. The more prominent of these complications includes pressure sores, contractures, venous thrombosis, muscle wasting and weakness, bone loss, lung infections, social and sensory deprivation, and urinary tract infections. Pressure sores happen because of pressure, shear effect, heat, friction, and moisture. Detection and prevention of pressure sores are much easier to accomplish and are preferable to treating an existing pressure sore. Complications of pressure sores affecting various parts of the body and organ systems, such as the lungs, have been discussed. Good hydration,

proper positioning, and frequent assessments of body areas, respirations and urinary and bowel output will help to prevent complications of immobility. CNAs may assist to prevent muscles, ligaments, and tendons from becoming inflexible and stiff through limb movement and stretching, and passive ROM exercises. Importantly, sensory and social deprivation can be alleviated by attending to the patient's environment and providing the personal care and external stimulation needed to avoid feelings of isolation and to promote feelings of hope and physical healing.