INTRODUCTION

The human body is designed to move, and physical activity is essential for our health. Without movement our bodies are susceptible to a wide variety of illnesses and pathologies that are directly caused by immobility. The human body thrives on movement and it suffers when movement is not possible.

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. 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 can never be beneficial.

As a Certified Nursing Assistant (CNA), you will certainly be responsible for providing care to clients who are immobile and who are likely to be so for a long time. This module will discuss the causes and complications of prolonged, complete immobility, and the therapies used for preventing and treating complications of prolonged, complete immobility.

OBJECTIVES

After completing this module the learner will be able to:

1. Identify the correct definition of prolonged, complete immobility.
2. Identify four complications of prolonged, complete immobility.
3. Identify the three causes of pressure sores.
4. Identify three actions that can help prevent pressure sores.
5. Identify two potential causes of venous thrombosis in this patient population.
6. Identify the *primary* cause of contractures.

7. Identify a potential cause of lung infections in this patient population.

8. Identify the *primary* cause of bone and muscle loss in this patient population.

9. Identify a treatment used to prevent contractures.

10. Identify a treatment used to prevent venous thrombosis.

**WHAT IS PROLONGED AND COMPLETE IMMOBILITY?**

Many patients need to be on bedrest for a brief period of time. Typical examples of this would be 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 is beneficial, it may be unavoidable, or it is necessary for patient safety. But regardless of why it is prescribed or necessary, bedrest in such situations is temporary; it is 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.

Unfortunately for some patients bedrest is a permanent condition or it is likely to be very prolonged. Short periods of bedrest can be tolerated and it can be therapeutic. 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*, who cannot move, are at risk for serious health problems.

There are no universally used and accepted definitions of bedrest, complete bedrest, and complete immobility, and 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 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, she/he cannot move, and may never move. The first patient will be very unlikely to suffer consequences from this brief period of bedrest, but the second patient will almost always develop serious complications from this level of inactivity. Bedrest and complete bedrest are prescribed, usually temporary, and can be therapeutic. Complete, prolonged immobility is never healthy.

Prolonged, complete immobility is defined here as: 1) an involuntary condition in which the patient cannot make any substantial movement; 2) the condition is likely to be long-term or permanent, and; 3) it puts the patient's health at risk.

**Bedrest → Complete Bedrest → Complete Immobility**

**Low Risk → Moderate Risk → High Risk**

Patient who cannot move are at risk for developing serious complications, and they require a lot of complex care. There are many reasons why someone may not be able to ambulate and is completely immobile. The patient may have had a stroke and has suffered paralysis. The patient may have suffered a traumatic accident. Or the patient may have an overwhelming illness that is not responsive to therapy or for which the recuperative process is very long. But regardless of the reason why the 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 the client’s health is almost certain to deteriorate. Serious complications are possible and preventive care is vital.
Learning Break: The patient who is completely immobile may have some level of ability to move, eg, 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 himself/herself from one position to another, even in the slightest.

**Table 1: Causes of Prolonged, Complete immobility**

<table>
<thead>
<tr>
<th>Causes of Prolonged, Complete immobility</th>
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<tr>
<td>Cerebrovascular accident, aka a stroke</td>
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<td>Induced paralysis and chronic illness</td>
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<td>Significant and prolonged illness</td>
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<td>Trauma</td>
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**COMPLICATIONS OF PROLONGED, COMPLETE IMMOBILITY**

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

But the association between physical activity, health, and disease is not limited to regular exercise. Even if you do not exercise you are constantly moving in subtle and not so subtle ways. Someone may have a job that requires him/her to sit a desk all day. To a casual observer, it may seem that that person is inactive. But look closer and you will see that even a "desk jockey" is constantly moving: he/she is shifting positions, stretching, or getting up for a drink or to use the bathroom. Even the most sedentary
person is, in small ways, constantly moving. And even when we sleep, we are moving and changing positions all night long.

However, all of that movement is lost when someone is completely immobile. For example, a stroke victim cannot move at all or if he/she can move it is in a very limited capacity and when all significant levels of physical activity stop, serious health problems begin to develop. Prolonged and complete immobility is the direct cause of complications that can be dangerous and potentially fatal. These complications can also affect 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 of these will be discussed in detail.

<table>
<thead>
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<th>Table 2: Complications of Prolonged Immobility</th>
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<td>Bone loss</td>
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<td>Cardiovascular changes</td>
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<td>Constipation</td>
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<td>Contractures</td>
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<td>Immune system dysfunction</td>
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<td>Kidney stones</td>
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<td>Lung infections and pulmonary complications</td>
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<td>Muscle wasting</td>
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<td>Pressure sores</td>
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<td>Sensory deprivation</td>
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<td>Venous thrombosis</td>
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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. Pressures 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 they can begin after even relatively short periods of immobility. The causes of a pressure sore are:

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

- **Circulatory disruption**: The skin, the muscles, and fat tissue are very metabolically active. They need a constant supply of blood and oxygen to stay healthy and aside from the outer layers of the skin, all of these tissues have a very 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 bodyweight 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: Press the palms of your hands together, apply a moderate amount of pressure and then try and slide one hand down against the other. You should notice a slight sensation of warmth, and the harder the hands are pressed together the greater the amount of friction and heat 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 is sitting, or in is 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. Because of that 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 increase
someone’s chances of developing a pressure sore and make them vulnerable to pressure, shear effect, etc.

Pressure sores can occur anywhere. 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, but any part of the body that is subjected to pressure, shear effect, friction, heat and moisture can develop a pressure sore. Notice that 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 a period of time and there are grading systems that are used to characterize the seriousness of a pressure sore.

**Table 1: Pressure Sore Grading System**

- **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 blanche (turn white) when pressure is applied.
- **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**: These are the most serious pressure sores. Bones, muscles, and tendons are exposed, the affected tissue has become necrotic, and the area is often infected.

Pressure sores are quite 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 but not
limited to: 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, and; hyperbaric oxygen therapy. The treatment of a pressure sore is often prescribed and coordinated by a registered nurse who has advanced training, a wound, ostomy, and incontinence nurse. These treatments can be successful but early detection and prevention of a pressure sore is far better that treatment.

**Learning Break:** 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 very serious complication of both complete immobility and bedrest. They happen most often in the lower legs, but they can occur almost anywhere there is blood flow. Blood clots are a complication of complete immobility for several reasons.

- Decreased circulation: Blood has a natural tendency to clot, but if blood is moving and being circulated 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 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 we move our muscles (especially the leg muscles when we walk), the muscles contract, squeeze down on the veins, and push blood back to the heart - imagine squeezing a tube of toothpaste from the bottom.

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

Venous thrombosis is a very common complication of immobility, and a thrombosis can form after as little as three days of immobility. Venous thrombi are potentially quite serious. Many blood clots will form and not cause signs or symptoms, and the body has natural anti-coagulants that can dissolve venous thrombi. But blood clots in the veins or (and some times 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 the blood clot is called an embolus, and the embolus travels through the circulation until it completely
occludes 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. Approximately 90% of all cerebrovascular accidents (aka CVA or a stroke) are caused by a venous thrombus that has embolized and has occluded a blood vessel in the brain, and a stroke is one of the most common reasons for prolonged, complete immobility. 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 may be absent.

**Lung Infections and Pulmonary Complications**

When someone is immobile, even for short periods of time, secretions can pool in the lungs. When that happens bacteria and other microorganism which live in the lungs can begin to multiply and a lung infection can occur. Prolonged immobility also causes wasting of the respiratory muscles; places people in a dependent position, ie, lying down, from which it is more difficult to fully expand the chest, and; weakens the cough muscles which prevents the patient from clearing secretions, and; many patients who are immobile have suffered a stroke that has damaged the gag reflex, putting them at risk for aspiration. Patients who have been sedentary, smoked cigarettes, or have chronic obstructive pulmonary disease (aka 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/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 someone is completely immobile, his/her muscles are not being used and muscles need movement and to resistance to stay strong. There is a phrase often heard when referring to exercise: use it or lose it. This simply means that a muscle will slowly but surely lose strength unless it is exercised and stressed and this is clearly not possible in cases of complete immobility. 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 muscle mass from an already diminished supply. 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**

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 our 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 us 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 become stiff, inflexible and they begin to shrink. This can happen to muscles as well and if this process it is not interrupted, a permanent deformity of the joint called a contracture can occur.

A contracture is defined as “a fixed position of a joint caused by pathologic changes to the connective tissues,” and contractures are a significant complication of prolonged immobility. When ligaments and tendons are not exercised - when someone is immobile - these tissues begin to break down, shorten, and become stiff and inflexible. Eventually, the joint is permanently deformed and the person cannot effectively move the limb. For example, someone with a contracture of the arm will have his/her arm permanently flexed and will not be able to straighten the limb.

**Bone Loss**

Bones are metabolically very active and bone tissue is always being broken down and replaced. The break down and build up of bone tissue are ongoing processes and the formation of new bone depends in part on stress and weight bearing. If our bones are not stressed or are not subjected to body weight they lose minerals and become weak and brittle.

Bones 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 the elderly person is losing bone tissue from an already diminished supply.

**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: CARE OF THE PATIENT AND PREVENTION OF COMPLICATIONS**

The complications of prolonged immobility can seem to be 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. Pressure sores for example are often treated by a wound, ostomy, and incontinence nurse. But the involvement and input of CNAs is needed for detection, prevention, and treatment and this module 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. Your responsibility will be to help carry out this plan, to notify the nurse or your 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 the patient’s position. The maximum amount of time an immobile client should remain in one position is two hours; 3) maintaining the patient in positions that help avoid the development of pressure sores, eg, positions that that decrease pressure on vulnerable areas such as the heels and hips; 4) use of padding and protective devices when and where they are appropriate. There is a wide variety of these padding and protective devices and individual types will not be discussed here; 5) inspecting the skin at least twice a day, and 6) ensuring that specialized dressings stay in place and are not disrupted.

**Learning Break:** The first step to preventing pressure sores is to recognize the clients who are likely to develop them. Obviously, the client who is immobile is at a high risk. But you 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. *Preventing pressure sores is much, much easier and far more effective than treating them.*

**Venous Thrombosis**
Encourage the patient to drink, always doing so following the fluid restrictions that have been ordered by the patient’s physician. Make sure you do not position the patient in a ways that will compromise circulation, perform periodic circulation assessments, and check dependent limbs for signs of venous thrombosis.

The patient’s physician may order the use of graduated compression stockings. Graduated compression stockings are long stockings - many extend 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 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. Graduated compression stockings are a prescribed medical device. If the patient is supposed to wear graduated compression stockings, you must follow the orders regarding how long and how often to use them for.

It is very unlikely that massaging a client's legs or routine application of a moisturizing lotion to the legs would apply enough force to dislodge a DVT. However, if your patient has a DVT or is at risk for DVT, it is sensible and prudent to check with your supervisor before doing performing these activities.

**Learning Break:** You can and should evaluate the client 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. 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 client 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 client’s arms, legs, hands, wrists, and other vulnerable joints must be stretched and moved. The way this is done, how often, and by whom will be determined by the patient’s physician. However, it would not be unusual for a CNA to be responsible for performing these exercises. You may also be asked to apply splints that are designed hold the patient’s limb in an anatomically correct and stretched position. Passive range of motion (ROM) exercises are also frequently prescribed, as well. Passive ROM exercises are exercises in which the caregiver moves the patient’s limbs through a specific ROM; the patient does not assist and the movement is passive.

**Learning Break**: Performing passive range of motion exercises is simple. For example, to exercise a client's knees simply place one hand under the client's heel and place the other hand underneath his/her leg just above the knee. With the hand that is holding the heel, bend the client's leg so that it flexes and then extends, using the hand that is underneath the leg near the knee for support.
Lung Infections

Lung infections can be difficult to prevent. As a CNA you can help by making sure the client is well hydrated. (Always make sure to check the patient’s chart before you offer any fluids to make sure the client is allowed to drink and if so, how much). You may also be asked to help the 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 and they can be an effective way of preventing lung infections. For example, every two hours, the patient would 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 the patient can inhale, and a spirometer can be an easy way to track how well the patient is progressing with deep breathing.

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. For preventing urinary tract infections, you can make sure the patient is hydrated, and you 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 can 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 can really only be prevented by weight bearing exercises or resistance exercises, and these are obviously not possible if the client is totally immobile. However, you should be aware of these
complications and take them into consideration when assessing and caring for the patient who is immobile. Sensory deprivation can be alleviated/prevented by varying the environment and providing external stimuli.

**SUMMARY**

Prolonged, complete immobility is defined as: 1) an involuntary condition in which the patient cannot make any substantial movement; 2) the condition is likely to be long-term or permanent, and; 3) it puts the patient’s health at risk. This condition is quite different than bedrest. Bedrest is a short-term temporary therapeutic measure; prolonged, complete immobility is an often permanent condition and is associated with serious complications. Common causes of prolonged, compete immobility include CVS, 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 and far preferable to treating an existing pressure sore. A wound, ostomy, and incontinence nurse will typically prescribed and supervise treatment of pressure sores. Certified nursing assistants will be responsible for keeping the skin clean and dry, frequent position changes, the use of padding and protective devices, and ensuring that specialized dressing remain intact and in place. The longest a patient should remain in one position is two hours.
• Venous thrombosis occurs because of blood pooling, dehydration, and lack of muscle contraction on the blood vessels. Good hydration, proper positioning, frequent assessments of areas susceptible to thrombi, and graded compression stockings are the therapies used to prevent venous thrombosis.

• Lung infections are caused by pooling of secretions, respiratory muscle loss, inability to clear secretions, and ineffective lung expansion caused by a dependent position. Good hydration and coughing and deep breathing exercises can prevent lung infections.

• Urinary tract infections happen because of dehydration, weakening of the bladder muscle, and in-dwelling urinary catheters. Urinary tract infections can be difficult to prevent, but attention to hydration and proper urinary catheter care can be helpful.

• Contractures happen because the muscles, ligaments, and tendons are not stretched or exercised and become inflexible and stiff. Passive ROM exercises can prevent contractures.

• Muscle and bone loss occur primarily because of the lack of exercise and weight bearing.

• Sensory and social deprivation can be alleviated by varying the environment and providing external stimuli.