

**BCS Prosthetics and Orthotics, LLC**



# **BCS Prosthetics and Orthotics, LLC**

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## **An Amputee's Guide Book of how to Manage, prepare and Care for your Prosthesis**

## 1. Preparing for Surgery

Deciding to go forward with elective amputation is never easy but there are many things you can do to prepare mentally and physically for surgery. Choose a team that has experience working with amputees. Research the type of amputation you are having. Your body will heal faster if you quit smoking, manager your blood sugars and reduce your weight before surgery.

### Assembling Your Team

Whenever possible, getting your surgical and rehabilitation team in place before surgery will help you feel comfortable with your team and be better prepared. Meet with your prosthetist before surgery so he or she can answer any questions you might have. Discuss what activities are important to you and determine your post- surgery goals. You will be seeing your team a lot in the coming months so developing a good relationship is key to your success and rehabilitation. Many amputees in our area are eager to share their stories, experiences and offer encouragement. Your prosthetist can help you contact supportive individuals and support groups.

### Levels of Amputation

Your surgeon will determine at what level they will amputate to give you a functional residual limb with sufficient healthy tissue coverage that will have adequate blood supply to heal quickly. Every level has unique benefits and drawbacks as well as different prosthetic interventions. Levels of amputations include:

**Partial Foot:** This includes amputation of the toes, through the forefoot (trans-metatarsal) and the mid-foot (Lis Franc). This reduces the lever the foot provides for balance and forward propulsion while walking. Patients are fit with a “toe filler”, a molded foam insert to prevent the foot from sliding forward in the shoe. Depending on the length of the foot, either a rigid insert is used in the shoe to provide leverage and/or a brace is fit that encompasses the ankle in order to increase support and hold the foot in the shoe.

**Symes:** A symes amputation is essentially an ankle disarticulation, where the long bones of the lower leg are left intact. This amputation is treated like a below-knee amputation and fit with a prosthetic foot and socket design. With a symes amputation, the patient is often able to bear weight through a larger surface area and have a longer lever to control their prosthesis.

**Below Knee:** Below knee (BK) is a very common level for amputations. A BK provides plenty of healthy tissue for the surgeon as well as maintaining the anatomical knee joint. The socket of the prosthesis allows for full range of motion in the knee but encompasses the lower calf section of the leg.

**Knee Disarticulation:** Also known as a “through-knee” amputation, this level is fit like an above-knee prosthesis with a socket that comes up the thigh with a prosthetic knee. This, like a Symes level, allows for some weight bearing on the end of your limb and gives you a long lever to control your prosthesis.

**Above Knee:** An above knee amputation (AK) has a prosthetic socket that encompasses the thigh and pelvis but permits range of motion in the hip to allow sitting and standing comfort. AK patients use a mechanical knee in their prosthesis which may require additional training in order for the patient to become a proficient user.

**Hip Disarticulation/Hemipelvectomy:** This level of amputation involves removal of the femur and/or sections of the pelvis. Though some patients choose to use crutches or other aids for mobility, using a prosthesis is beneficial for reducing strain on the sound side. New prosthetic joint technology has significantly improved stability and gait and motivated users are able to become mobile and very independent.

## What to Take to the Hospital

1. A pair of shorts – A pair of shorts offers comfort, function and obviously easy access to lower limbs.
2. Shoe for sound limb – Your rehab will start shortly after surgery, so make sure you bring a shoe for support.
3. Portable electronic devices – Entertainment and a connection to the outside world can be a welcomed comfort.
4. Reading material – Bring along some reading material to relax your mind and wind down after hard work.
5. Personal pillow/blanket – Bring some comforts of home to ensure you have a good environment.
6. Notepad and pen – You will be receiving a lot of new information and contacts, so come prepared!
7. Friend and family contact list – Bring a list of your support team’s contact information.
8. Clean undergarments – Your hospital stay may be an undetermined length and you should prepare for anything. A set of clean undergarments can keep you fresh and prepared to tackle rehab activities head-on.

## 2. What to Expect After Amputation

Experiences vary and each physician may have a different approach to post-operative care. Generally you can expect to begin rehabilitation immediately after surgery. Though a patient's residual limb is often very tender after an amputation, especially in cases of prolonged limb salvage and wound healing, some patients report relief from chronic pain and general health improvement with removal of an infected limb.

Usually, the limb is very bulbous and swollen and may have small "dog ears" where the skin comes together at the incision. In the next few months, this shape will change dramatically, especially once you begin wearing a prosthesis. The incision will be closed with stitches and staples, which will gradually be removed as you heal. Your team will want the incision to be "CDC" (Clean, Dry, and Closed), indicating that you are healing well and ready to begin fitting for a prosthesis.

Many physicians recommend a protective covering for your limb while you are healing. It may be a plaster cast, removable custom plastic cover or ace bandage and splint. This will help protect your limb if you fall, will limit access to your incision to prevent infection and keep your leg fully extended while healing to prevent contractures.

## Preparing For Your Prosthesis

Research has shown that the first several months of rehabilitation are crucial to your long term success as an amputee. Your physical therapist is the best resource to help you maintain the range of motion and strength in your body and extremities, and to prepare you to learn to walk with a prosthesis. A comprehensive inpatient and outpatient therapy schedule is critical to reaching your goals and becoming a successful prosthetic user. However, this requires motivation and hard work by all parties involved.

## Volume Changes

One of the most important indicators of readiness for a prosthesis is the amount of swelling in your residual limb, or its volume. Volume can change hour to hour and day to day. Your prosthetist will be able to fit you for your first prosthesis once these fluctuations begin to plateau, generally six weeks after surgery. Over the next several years, your volume will continue to decrease with prosthetic use, optimal fit and comfort will depend on adjustments to your prosthetic leg.

Once your staples are removed your prosthetist will measure and fit you for "shrinker socks", nylon-like compression stockings designed to reduce the volume in your limb and prepare you for prosthetic fitting. He or she will generally provide at least two shrinker socks so you can alternate and wear one when you wash the other. Once your volume decreases, you may also add them on top of each other to increase the level of compression.

## Contractures

A "contracture" is shortening of the muscle or muscle group resulting in a joint losing full range of motion. This may be avoided in new amputees with physical therapy and proper post-operative

care. In addition, prolonged sitting in a wheel chair or bed can lead to contractures of the hip flexors and prevent you from achieving an upright posture while walking.

Below-knee amputees should keep their knee straight and elevated with pillows under the calf or wear a fixed cast or ridged dressing to maintain optimal position of the knee.

An above-knee amputee's hips are most likely to become fixed in a flexed and outward position from the body. This is called being "flexed" and "abducted" and can decrease stability and stride length while walking. Frequent stretching in therapy, spending time on your stomach if possible and staying mobile will help your recovery.

## Strength

For all patients, strength in the core muscle groups and extremities will make learning to use a prosthesis significantly easier. Your physical therapist will give you exercises to help strengthen and maintain key muscle groups so that you can become a successful prosthetic user.

## 3. Common Issues

### The Sound Side

Problems stemming from overuse of the un-amputated limb, including future amputation, are common for long-term prosthetic users. You can minimize or prevent those problems by wearing sensible shoes, check your skin for breakdown and infection, and utilize your prosthetic side as much as possible.

### Phantom Limbs & Phantom Pain

Sensations of itchy feet or twitching toes where the amputated limb used to be are called phantom limb sensations and vary widely among amputees. Phantom limb sensations usually dissipate once the patient begins wearing a prosthesis or compression garments. Sometimes phantom pain can become more serious and patients have reported being kept awake at night with feelings of "electricity" or "burning" sensations in the phantom limb. Silver infused socks, visualization, and pharmaceuticals in intervention can help relieve these symptoms. Talk to your medical team for more information and help finding the right solution. Evergreen Prosthetics & Orthotics has multiple resources for our patients dealing with phantom limb sensations. Start by asking your Evergreen prosthetist for more information about these resources.

### Falls

Unfortunately, falls are common for new amputees during the rehab process. Your brain is still expecting your amputated leg to be available and the change in weight distribution can cause you to be unbalanced. Take your time adjusting to your amputation and protect your residual limb

whenever possible. Your therapist will teach you safe falling strategies, and if you are prepared for falls, you will be better able to stay focused and continue your rehabilitation.

## Healing Problems

Everyone heals at different rates, Age, diabetes, and smoking can increase the time it takes for your incision to close. Keep your limb clean and avoid touching the incision area to reduce risk of infection. If you are diabetic, you should be aware of your blood glucose levels and manage your diabetes as best you can to reduce the risk of extended healing times.

## Pain

Tenderness around the incision site is normal and should decrease quickly as you heal. It is normal to feel protective of your limb and some patients find it difficult to put on dressing. Once you begin wearing compression socks, the volume will be reduced and pain should decrease. Talk to your doctor if you feel your pain is unmanageable.

## 4. Getting Your Prosthesis

### Are You Ready?

After about two to three weeks, your staples will be removed and you will begin seeing your prosthetist more regularly for stump shrinker and limb evaluation. Many patients are ready to cast for an initial prosthesis at five to seven weeks. Readiness depends on several factors, including:

**Volume:** Though volume will continue to decrease rapidly during the first year or so, the practitioner will wait for the bulbous shape at the base of the limb to subside and fluctuation in volume to diminish.

**Pain:** Casting and wearing a prosthesis requires manipulation of the limb and weight bearing around the knee. Pain and tenderness of the limb should be minimal at this point.

**Healing:** Your practitioner will wait until your wound is CDC (clean, dry and closed) and all of your sutures are removed before casting to prevent prolonging the healing process.

### What Does a Prosthesis Look Like?

The activities you engage in and your level of amputation determine the type of prosthesis you will wear. However, you can decide the exterior covering of your leg. You might want your

prosthesis to look like a “real” leg or you might want to customize it to fit your personality or lifestyle.

## The Process

Your Practitioner will begin by obtaining a detailed health history and evaluation of your extremities. This will include checking your range of motion, strength, incision site and sound side. They will also discuss your activity level before surgery, goals for the future and your work thus far in therapy. It is a good idea to take time before your appointment to think seriously about what activities are important to you, for example dancing or standing at the stove to cook dinner. Also think about cosmetics. Is it important to you that your leg not draw attention to itself? Or do you want to customize the leg to fit your personality? Talk to your prosthetics about what is most important to you.

Your practitioner will cast you with plaster or fiberglass or take a digital image with a CAD system. The cast will be removed immediately and the prosthetist will use this to create an image of your leg to fabricate your socket. You will be scheduled for an appointment within a week to fit your diagnostic check socket. Your prosthetist will take several measurements for a gel liner to wear between your limb and leg.

The diagnostic check socket, or “DCS”, is a clear plastic version of your final socket, molded to your residual limb. Your foot and components will be mounted to the DCS which allows you to stand and walk so your prosthetist can visualize the pressure in the socket and ensure that it fits appropriately. Communicate with your prosthetist if you have pain, if you feel unsafe, or have other problems while bearing weight through the leg. If you have been getting around well since surgery, you may be surprised at how quickly you begin taking steps and feel more confident.

You may leave your prosthetist’s office with a DCS to wear for short times at home and at therapy to help you become comfortable wearing your prosthesis and determine issues with comfort. If you notice any areas of bright redness or skin breakdown, discontinue use until you can see/speak with your prosthetist. The shape of your limb is changing rapidly and frequent adjustments and visits with the prosthetist are an expected part of the process.

While you are walking, you may also notice problems with the alignment of the prosthesis. The leg will be as stable and safe as possible, and as you become a more proficient walker it may need to be adjusted to keep up with you. Adjustments are easy to make so don’t hesitate to ask for changes. Common problems include your foot pointing in or out, feeling like you are walking up or down hill, or being unsteady. As you become a more experienced prosthetic user, it will be easier to communicate the changes you need, but for now describe the feeling the best you can and do not be discouraged if it takes a few attempts to get it just right.

Once your leg is comfortable and well aligned, you will come in for a transfer appointment. Your prosthetist will take your leg for about an hour and transfer the socket and alignment to create your definitive preparatory leg.

This will be delivered in about one week.

## Wearing a Gel Liner

Generally, most above and below knee patients will be fit with a gel or silicone liner. This is a cushioned interface to wear between your limb and the prosthetic socket that should increase your comfort and help suspend the prosthesis. To put on the liner, you will need to turn it completely inside out and center the end over the end of your limb. Slowly roll the liner up your leg, ensuring that there are no wrinkles and the liner is oriented properly on your limb.

Hygiene is very important as you will be wearing your liner directly against your skin. You will receive two gel liners when you get your prosthesis and you should rotate them regularly. Turn your liner inside out every night and wash it with warm, soapy water. Do not use any harsh detergents or cleansers as this can cause chemical burns on your skin (Dawn Detergent is fine). Roll your liner right side out again and hang it up overnight to dry. This will increase the life of the liner and prevent infection and rash on your residual limb.

## Doning

Step 1: Turn the clean liner completely inside out, and place the bottom directly on the very end of your limb. Step 2: Slowly roll the liner up over your limb using both hands if possible. Step 3: Unroll the liner completely, making sure there are no wrinkles and the liner is oriented properly.

## Adjusting for Volume

As a new amputee, adjusting for volume can be very confusing. Your practitioner will provide you several single ply, three-ply, and five-ply socks when you receive your leg. Ply refers to the thickness of the sock. Single-ply socks are one-third the thickness of a three-ply, and one-fifth the thickness of a five-ply. As your volume decreases, you will add multiple socks on top of each other. To determine the thickness of the ply you are wearing, you add the total number of ply. For example, if you are wearing one five-ply, one three-ply and a single-ply to be comfortable in your socket, you are wearing nine ply of socks.

Your limb volume will change drastically for the first year and your diet, activity level and health affect the number of socks you will wear. Generally you will wear the least amount of sock ply when you first wake up and periodically add additional ply as the day progresses.



Your practitioner needs to know the range of socks you wear throughout the day to determine when you are ready for a new socket. In general, you will have a new socket fabricated between 12-20 ply of socks, depending on how few socks you wear at any given time.

When do you add a sock? When your socket becomes uncomfortable, especially on the end of your residual limb, it is time to add more socks. This is because as volume decreases, you are sinking further down into the socket and the pressures designed to hold you in the socket are no longer in pressure tolerant areas. Experiment with different thicknesses until you are comfortable again and there is no pressure on the end of your limb. You will probably need to repeat this process several times throughout the day. You will soon be very good at guessing how many socks you will need and when to add them. In the meantime, be patient and keep experimenting.

## When to See Your Prosthetist

You will see your Prosthetist about once a week for the first few months. However, if you are unable to get comfortable regardless of sock ply adjustments, have any areas of bright redness that do not go away after half hour of removing your leg, stop wearing your leg until you can be seen. A non-healing blister can prevent you from wearing your leg and set back your rehabilitation.

Please call your practitioner immediately if something is wrong. Clicking, squeaking and strange noises may indicate that components are wearing out and need replacement. Even experienced amputees should see their prosthetist a few times a year to keep their leg in good working condition and replace their gel liners.

## Get Back To Your Active Life!

Each individual has unique goals and activities that are important to them. Honest communication with your team will help you reach those goals. Here are some of Evergreen's patients back in action!

## 5. Helpful Resources

### Glossary of Terms

AK Amputation: An amputation above the knee

Ambulation: The medical term for "walking"

BK Amputation: An amputation below the knee

Contracture: When muscles shorten and make it impossible to straighten a limb  
Donning/Doffing: Taking your prosthesis on and off

Extension: Straighten your limb/joint

Flexion: Bending your limb/joint

Phantom Limb: The sensation that an amputated limb is still attached to the body  
Ply: The

thickness of a sock

Prosthesis: Medical term for artificial leg, foot, arm, or hand

Prosthetist: The medical professional who designs, fabricates and fits prosthetics

Motion (ROM): The degree of motion in a joint

Residual Limb: The remaining portion of the amputated limb

Shrinker Socks: Compression socks used to reduce volume in an amputated limb

Volume: Amount of swelling in a limb

## Managing Fit Utilizing Sock Ply

Prosthetic socks are available in a variety of sizes and typically come in 1-, 3-, and 5-ply thicknesses. One-ply is typically used for shim or fitting. For example, the wearer can use a 3-ply sock and a 1-ply sock to make a 4-ply sock, making it easier to adjust the thickness by adding or removing 1-ply layers. There are wool and synthetic blend styles, and silicone added or sandwiched between layers of socks gives the wearer additional comfort. There are even sheaths that now incorporate a layer of silicone gel.

## The life span of a prosthetic sock

Just how long a prosthetic sock will last depends on several factors, including how often it is worn, how many times it is washed, whether it is washed by machine or by hand, and whether the wearer is sedentary or active. A sedentary prosthetic user yields a longer useful life for his sock by not exerting an inordinate amount of rubbing against the fabric. Conversely, an unusually active or athletic prosthesis wearer would have a sock life span of weeks, not months. Adding silicone gel can help absorb the shear forces exerted between the limb and the socket interface that cause abrasions while wearing a prosthesis.

## Achieving the right fit for your prosthesis

Your prosthetist has taken great care in the design of your prosthetic socket. The contact of your limb against the socket interface is imperative for a comfortable and non-abrasive fit. If you do not use enough socks to achieve a snug and total contact fit, the residual limb may “bottom out,” creating pressure on surfaces of the limb that are not pressure tolerant. Because of this pressure, these areas, such as the end of your limb, the patella or other prominent bony areas, may exhibit redness, blistering, or bruising. If you have on too many ply of socks your daily ambulation will cause a non-total contact situation, resulting in the pooling of fluids and/or blood within these voids. The resultant fluid pooling can cause skin discoloration, an infection, an abscess or a condition known as verrucous hyperplasia or orange peel skin.

The thickness of a 5-ply sock can vary to 3-ply thickness in areas of stretching or wear. If you simply add a sock to compensate for the associated looseness, it could create undue pressure on the top or bottom of the socket and cause one or more of the above-mentioned problems.

The amount of ply that you need for each day of prosthetic wear can vary from day to day and sometimes from morning to afternoon. For example, in the morning, you may require 6-ply of sock, but after sitting through a long meeting, your limb may retain fluid, resulting in a tight, uncomfortable fit since fluid can't be compressed. If this is the case, remove 1-ply of sock and check for a more comfortable and total contact

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fit. If you are unsure of the ply that you require from day to day, a helpful technique is to place the anticipated sock ply on your limb, being careful to smooth out all wrinkles. Then, place a marble-size piece of bread in the bottom of the prosthetic socket. Apply your prosthesis in the normal manner and ambulate for several minutes, assuring that the residual limb is firmly seated within the socket. After a short time, remove the prosthesis and inspect the “marble.” The desired effect is to find the marble slightly flattened. If so, the number of socks is appropriate. If the bread marble has remained round, the number of socks is excessive. Remove 1-ply of sock and repeat the process until a slightly flattened marble is achieved. Conversely, if the marble of bread is completely flattened, then an insufficient number of sock ply is being worn. Add a ply of sock and repeat the procedure until you achieve a satisfactory result. A single ply of sock can make the difference between a productive day and a painful, non-productive one, a memorable vacation or a disaster.