

# KOOTENAI

PROSTHETICS  
& ORTHOTICS

A man with a prosthetic leg is climbing a silver extension ladder. He is wearing a grey short-sleeved button-down shirt, dark blue shorts, a black baseball cap, and glasses. He is holding onto the ladder with his right hand. The ladder is leaning against the back of a dark green vehicle, and a spare tire is visible. The background shows a wooded area with green trees. The text "Resource Guide For New Amputees" is overlaid in a white, cursive font on the left side of the image.

*Resource  
Guide For  
New  
Amputees*

*Serving Greater North Idaho For Over 40 Years*



# KOOTENAI

## PROSTHETICS & ORTHOTICS

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*"Every Step of the Way"*



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# Glossary of Terms

<b>AK Amputation:</b>	An amputation above the knee
<b>Ambulation:</b>	The medical term for walking
<b>BK Amputation:</b>	An amputation below the knee
<b>Contracture:</b>	When muscles shorten making it difficult to straighten a limb
<b>Donning/ Doffing:</b>	Taking your prosthesis on and off
<b>Extension:</b>	Straightening your limb/joint
<b>Flexion:</b>	Bending your limb/joint
<b>Phantom Limb:</b>	The sensation that an amputated limb is still attached to the body
<b>Ply:</b>	The thickness of a sock
<b>Prosthesis:</b>	Medical term for artificial leg, foot, arm or hand
<b>Prosthetist:</b>	The medical professional who designs, fabricates and fits prosthesis
<b>Range of Motion:</b>	The degree of motion in a joint
<b>Residual Limb:</b>	The remaining portion of the amputated limb
<b>Shrinker Socks:</b>	Compression socks used to reduce volume in an amputated limb
<b>Volume:</b>	Amount of swelling in a limb

## 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, manage 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 confident and well 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 offer encouragement and share their stories and experiences. Your prosthetist can help you contact these individuals and support groups.

## Levels of Amputation

Your surgeon will determine where the amputation will take place in order to give you a functional residual limb with sufficient healthy tissue and 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 (transmetatarsal) and the midfoot (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 semi rigid carbon 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 arm to control their prosthesis.

**Below Knee:** Below knee (BK) amputation is the most common level of surgical treatments. A BK amputation 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, the fit is like an above-knee prosthesis with a socket that comes up the thigh with a prosthetic knee. Some weight bearing is possible on the end of the limb and the patient will have a long lever arm to control the prosthesis.

**Above Knee:** An above knee amputation (AK) has a prosthetic socket that encompasses some or all of the thigh and pelvis but permits range of motion in the hip to allow comfortable sitting and standing. AK patients use either a mechanical or microprocessor 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. Short pants make it easier for hospital workers to access your incision regularly for dressing changes. You will be getting up for therapy and even going for short outings around the hospital floor, so a couple pairs of shorts will keep you covered.
2. A supportive shoe for your sound side. Your other leg is going to get a workout and you will need a shoe to facilitate therapy.



# What to Expect After Amputation

Experiences vary and each physician may have a different approach to post-operative care, however you can expect to begin rehabilitation immediately after surgery. Though a patient's residual limb is generally very tender after an amputation, especially in cases of prolonged limb salvage and wound healing, they 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/or 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 protective covering for your limb while you are healing. It may be a plaster cast, removable custom plastic cover or an 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.



*Approximately eight weeks after surgery, staples and sutures are removed, the incision is clean, dry and closed. This leg is ready to begin prosthetic fitting.*

## Preparing for a 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. Depending on your goals, a comprehensive inpatient and outpatient therapy schedule can get you back to your previous activity level in a matter of months. Remember, this requires motivation and hard work.

## Volume changes

One of the most important indicators of readiness for a prosthesis is the amount of swelling, or volume, in your residual limb. Volume can change hour to hour and day to day. Your prosthetist will not be able to fit you for a comfortable leg until these fluctuations begin to plateau, generally six weeks after surgery. Over the next several years, your volume will continue to decrease with prosthetic use, and optimal fit 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. Your prosthetist 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 its full range of motion. This is entirely avoidable in new amputees with physical therapy and proper post-operative care. In addition, prolonged sitting in a wheelchair 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 rigid 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 lying on your stomach if possible and staying mobile will help reduce the risk of contractures.

## **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. The following exercises are meant to be used as a guideline. Your therapist will help you find additional creative and adaptive exercises to meet your individual needs and limitations.

# Helpful Exercises

Key Muscle Groups	Exercise	Benefits
Abdominals	Crunches, sit ups	Improves balance and posture while standing and walking.
Back	Superman extensions	Strengthens spine and back.
Shoulders	Modified push-ups Shoulder press with weights	Increases upper body strength and enables you to transfer from bed to chair and to use a walker or crutches more effectively.
Arms (Biceps and Triceps)	Curls and extensions with weights	
Hands	Grasping	Makes it easier to put on and remove your prosthesis.
Hips	Leg raises and extensions in all directions with resistance bands	Keeps your pelvis level and gives you momentum to walk at different speeds and clear your prosthetic toe to prevent tripping. Crucial in above knee patients to control the prosthetic socket.
Thighs	Knee extension and flexion with resistance	Helps provide stability in the knee and prosthetic socket for below knee patients. Both above and below knee patients gain stability by focusing on these muscles on the sound side.
Calf	Raising up on the ball of the foot Lifting toes	Helps initiate step and propulsion. Partial foot amputees may find this helps prevent ankle contractions.

## **Common Issues**

### **The Sound Side**

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

### **Phantom Limbs and 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 can help relieve these symptoms. Talk to your medical team for more information and help finding the right solution.

### **Falls**

Unfortunately, falls can occur with 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.

### **Issues With Healing**

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 sugar levels and manage your diabetes 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 dressings. 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.

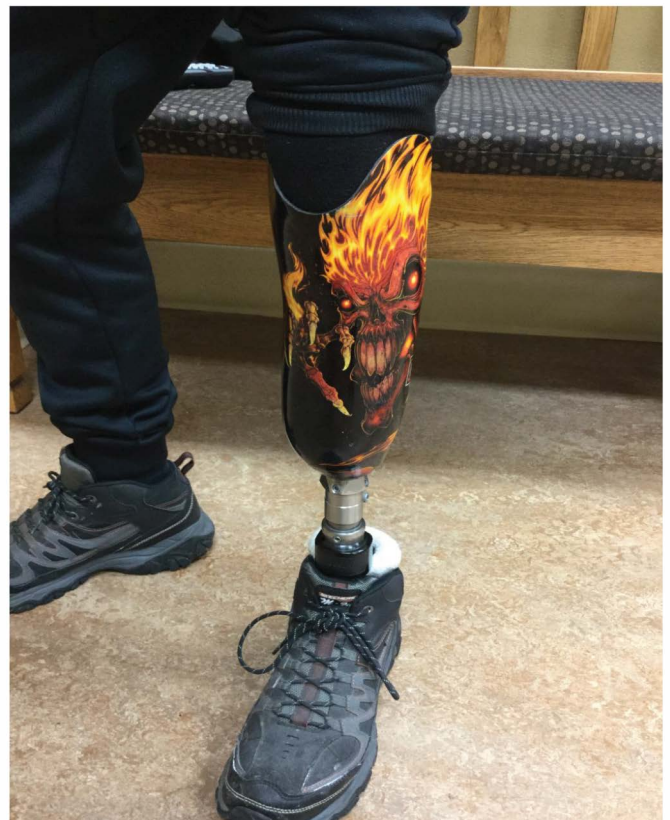
# Getting Your Prosthesis

## Are You Ready?

After about two to three weeks, your sutures will be removed, and you will begin seeing your prosthetist more regularly for stump shrinkers 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 and changes, pain and healing. 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. 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. Your prosthetist 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.

Your practitioner will cast you with a plaster or fiberglass cast 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 the leg.

The diagnostic check socket, or "DCS," is a clear plastic version of your final socket, molded to your residual limb. A prosthetic foot and other 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. 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 feeling 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 your prosthetist. The shape of your limb is changing rapidly and frequent visits are expected.

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, but 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 feeling unsteady, your foot pointing in or out or having the sensation you are walking up or down hill. As you become a more experienced prosthetic user, it will be easier to communicate the changes you need, but for now, describe the feeling as best you can and do not be discouraged if it takes a few attempts to get it just right.



Diagnostic Check Socket, ready to leave the office for a trial fit.

Once your leg is comfortable and well aligned, you will see your prosthetist for a "transfer" appointment. Your prosthetist will take your prosthetic 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**

Most above and below knee patients are 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 your stump. Slowly roll the liner up your leg, ensuring that there are no wrinkles and the liner is oriented properly on your limb.

You will be wearing your liner directly against your skin so hygiene is very important. You will receive two liners when you get your prosthesis and you should rotate them. 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.

## **Donning:**



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 changes can be very confusing. Your practitioner will provide you with 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 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. If you are unable to get comfortable regardless of sock ply adjustments or have any areas of bright redness that do not go away after a half hour of removing your leg, stop wearing your leg until you can be seen by your prosthetist. A non-healing blister can prevent you from wearing your leg and set back your rehabilitation. 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 replace their gel liners and keep their leg in good working condition.**



## **The Next Steps**

For the first several years, you will likely have several new prosthetic sockets made to fit your changing limb. As you become more active you may want upgrade your prosthetic foot and other components to give you more versatility.

## **Frequently Asked Questions**

*Q: With all these layers, will my leg get hot?*

A: While your body is acclimating to the prosthesis, your leg may feel hot and sweaty. Your prosthetist may recommend applying antiperspirant to your limb to decrease sweat. Over time your limb will adjust and be better at regulating its temperature.

*Q: Do I shave my residual limb?*

A: No. Shaving your limb will put you at greater risk for developing ingrown hairs which can keep you from wearing your leg. Over time you may notice that the hair will thin.

*Q: If I have a sore spot, can I pad my socket?*

A: No, you should see your prosthetist as soon as possible. Padding a sore spot will only increase the pressure on the area. However, you may cover an open blister with a band aid or a very thin dressing.

*Q: Why is my leg so heavy?*

A: The weight of your leg depends on its size. If you have a larger build and/or are very active, you may need heavy-duty components to meet weight requirements. Also wearing a cosmetic cover will drastically increase the weight of your leg. Your prosthesis may feel heavy at first until you get stronger and progress further through your rehabilitation.

## Resources and Support

Academy of Nutrition and Dietetics eatright.org	eBay – Disability Resources pages.ebay.com/disability-resources
Adaptive Driving Alliance adamobility.com	Friends Health Connection friendshealthconnection.org
American Association of People with Disabilities aapd.com	Helping Hands Foundation helpinghandsgroup.org
American Diabetes Association diabetes.org	Insulin Independence Association insulinindependence.org
American Heart Association heart.org	Juvenile Diabetes Research Foundation jdrf.org
Amputee Coalition of America amputee-coalition.org	Legs for Life legsforlife.org
American Pain Society ampainsoc.org	National Diabetes Education Program ndep.nih.gov
American Podiatric Medical Association ipma.org	Natl Inst of Diabetes, Digestive & Kidney Disease niddk.nih.gov
Brave Kids bravekids.org	National Rehabilitation Information Center naric.com
Camp No Limits nolimitsfoundation.org	St Luke's Amputee Support Group st-lukes.org
Diabetes Research Foundation diabetesaction.org	Vascular Disease Foundation vdf.org

**Many amputee support groups can also be found on Facebook.**

## Books and Publications

<i>A Life Reclaimed</i> by Sheila May Advento How a quadruple amputee regained control of her life
<i>Just Don't Fall</i> by Josh Sundquist A hilariously true story of a childhood, cancer, amputation and Olympic greatness
<i>You're Not Alone</i> by John Sabolich 38 remarkable amputees who conquered the challenges of a lifetime
<i>No Excuses</i> by Kyle Maynard The true story of a congenital amputee who became a champion in wrestling and in life
<i>The Running Dream</i> by Wendelin Van Draanen Jessica thinks her life is over when she loses her leg in a car accident
<i>No Turning Back</i> by Bryan Anderson An Iraq Veterans true story of courage, determination and hope
<i>How Can You Mend This Purple Heart</i> by T.L. Gould Healing from the ravages of war and the journey of love, redemption, joy, pain, anger and hope
<i>Soul Surfer</i> by Bethany Hamilton Getting back on the board after a shark attack.

# NOTES

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*Every Step of the Way*

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