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# **Handbook for New Amputees**

Shore Prosthetics and Orthotics, LLC is providing this Handbook for information purposes only. The Handbook is not intended to endorse any organization or to replace professional medical advice.



## **Amputee Manual Contents**

### **Amputee Handbook:**

*This important handbook was developed with input by amputees themselves. This handbook discusses the fundamentals of the world of the amputee. Topics include proper care of the prosthesis, health and physical care of the amputee, “tips for getting around”, and other helpful information. Shore Prosthetics realizes that you will have numerous questions and has also put together a useful listing of various web sites that offer information and answers.*

### **Skin and Socket Care: Basic Tips on Care**

*This useful manual will help guide you in the care of your stump and prosthetic socket. Keeping on top of changes in your stump is the cornerstone of your recovery and return to normal activities. This section discusses the most common problems that may develop, how to take steps to avoid them, and how to care for them if they develop. Although this manual was created to help you, it is the advice of Shore Prosthetics and Orthotics LLC to seek immediate medical care if problems occur with your stump and to contact Shore Prosthetics and Orthotics LLC if problems develop with the fit of your prosthesis. Please remember that **“When in doubt...have it checked out.”***

### **Useful Definitions:**

*Like anything new, your prosthesis has various parts that you are not familiar with. This handbook includes a list of terms and easy to understand descriptions that will help you understand your new prosthetic limb.*

## Frequently Asked Questions

### Part 1: Preparing For Amputation

How might you react to your amputation?

Amputation involves emotional loss not just physical loss and most people grieve for the loss of the physical part just as much as the loss of a loved one.

After amputation, you may feel depressed. You may feel anxious or frustrated because you suddenly feel dependent on others and concerned about your future ability to function, to work, and to maintain your relationships. You may be angry at the events bringing you to this surgical necessity. You may feel confused over the changes in your body as a result of amputation and of the learning required to take care of your residual limb and/or prosthesis. You may fear and avoid public places out of embarrassment, discomfort and self-consciousness.

You may also feel relief from the pain caused by the diseased or injured part. You may feel relieved from the stress of trying to maintain the non-functioning limb. You may feel unburdened by finally making and carrying through the inevitable amputation decision. Lastly, you may feel triumphant in successfully overcoming a life-threatening medical crisis.

The grieving process is normal and expected post-amputation. Grief oftentimes resolves with time and with the acquirement of the knowledge and skills to return to normal daily activities. Your adjustment can be aided by professional counseling as well as contacting amputee organizations.

What is phantom pain?

Phantom pain is pain experienced in the missing limb. It differs from post-operative pain which felt in the residual limb in the immediate days and weeks after surgery. Phantom pain may feel like a stabbing pain, an achy pain or a burning sensation. It usually lessens after time but for some amputees, phantom pain persists in occasional bursts or even in long-time ongoing pain.

Phantom pain can be lessened by massaging the residual limb, (see below, *Caring for the residual limb*) or tapping on the limb. In some amputees, the amount of phantom pain correlates with

*Signs of depression include continued sadness, moodiness, and irritability. Depressed people may have difficulty in sleeping, eating or following instructions. They may lose their former interest in activities and people. Some individuals may become withdrawn and/or preoccupied with the amputation. Others may abuse alcohol or drugs.*

*A prosthesis is an artificial replacement part such as an artificial leg or arm.*

*What is the difference between phantom pain and phantom sensation? Phantom sensation feels like a tingling, numbness, coldness or heat, sense of movement or sense of presence experienced in the missing part. It is a normal reaction to amputation. For most amputees, the sensation lessens over time.*

*What is nerve pain? Nerve pain is a sensation of electric shocks near the end of the amputation site. It can also feel like your stump is waking up from being asleep and is giving you a tingling sensation.*

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the individual's experience of stress. For them, reducing their stress levels lessens their phantom pain. Some individuals respond well to acupuncture as a treatment for phantom pain. For others, medications may help lessen the pain.

How will amputation change how you do everyday routine activities?  
Ie. Bathing, brushing teeth, shaving, walking outside, etc...

These simple activities can become much more difficult in the beginning due to decreased balance. As balance improves, these activities become easier. Instead of getting overwhelmed with the difficulty of routine activities, make it easy on yourself, *have a seat* while doing many activities. See below for ways to modify your living or work space to accommodate sitting and balancing.

You will also learn to pay attention to the surfaces you are walking on and to what the weather conditions are. You will want to make very certain you pay close attention when you are walking from outside to the indoors or going from pavement to a smooth surface. If the weather is raining or snowing or has been doing either when you go to walk onto the smooth surface with your crutches or cane, either of these tools may slip out from under you and you could end up on the floor. Smooth surfaces can become very slick with just a little bit of moisture.

You will develop an increased awareness of potential walking dangers. Look into buying grips for snow and ice to put over your shoes to help you walk more securely on packed snow and ice.

How do you find a prosthetist to get fit with a prosthesis?

A prosthetist is a practitioner who will custom make and fit your prosthesis. Your prosthetist should be a certified professional. The American Board for Certification in Orthotics and Prosthetics performs the credentialing and awards the designation "CP" for Certified Prosthetist or "CPO" for Certified Prosthetist and Orthotist. The CP or CPO designation means that the individual has met the rigorous requirements set by the American Board for Certification to ensure professional service. Your prosthetist will work with your physician to ensure an appropriate device is fabricated and fit to your residual leg when you are ready. The prosthetist also works in coordination with your rehabilitation professionals so that you have the therapy needed to learn to walk with your new prosthetic leg.

*Not all individuals are candidates for a prosthesis. The level of amputation presents different challenges depending on whether you have lost 1 joint, the ankle, or 2 joints, both the ankle and knee. Your overall health plays an important role in your ability to safely use a prosthesis. A below knee amputee uses 20-40% more energy than an able-bodied person. An above the knee amputee uses 30-70% more energy. A double above the knee amputee uses about 200% more energy! Your physician, your prosthetist, and your rehabilitation professionals will evaluate you to see if you would benefit from a prosthesis and would be able to use it safely.*

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Your physician or physical therapist may recommend a particular prosthetist.

You should communicate well with your prosthetist as your residual limb itself will change over time. You will need to return for adjustments and/or replacements of the prosthesis so that it continues to fit your changing residual limb. After your residual limb has stabilized, you may still need a replacement prosthesis every 3-5 years due to normal wear and tear or sooner if your body weight and conditioning change significantly.

How do you pay for a prosthesis?

A typical prosthesis costs from \$5,000 to over \$20,000 depending on the design. If you are covered by Medicare, then Medicare normally will pay 80% of the bill with you being responsible for the remaining 20%. Secondary insurances vary in their coverage of a prosthesis which is considered a “medically necessary” device. You will have to consult your specific insurance plan and you may have to be pre-approved before having your prosthesis made.

Your financial obligation after insurance may still be significant. Speak with your prosthetist if finances are a concern, if the facility may allow alternative payment plans, or if other considerations can be made.

Look under Resources below to contact government and local agencies that may be able to help with financial aid, loans, and other equipment that might be needed such as wheelchairs and walkers.

How do you choose a rehabilitation facility?

Your physician or physical therapist may recommend a particular facility. Research in some depth possible facilities as some are better than others. Ask questions such as:

How many amputees does the facility work with in a year?

How many amputees *your age* does the facility work with in a year?

What is the nurse to patient ratio?

What type of equipment is available and how old is the equipment?

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When selecting a rehabilitation center, key factors to look for include if the facility is experienced with amputees, if they are experienced with your type of prosthesis, and if they have parallel bars for training you to walk.

How do you prepare your home?

Place a chair next to your bed.

Consider a bedside commode (you never know when you may be in need!)

Install grab rails in your bathtub, shower, alongside toilet.

Add a shower seat to your shower.

Install a clapper to remotely turn on and off lights.

Add nightlights in the bedroom for safety in case you need to get up.

Add lifts to elevate the height of your bed and/or living room furniture to make it easier to get up.

Obtain a grabber to pick things up off the floor.

Get furniture moved out of the way.

Teach family members not to leave objects on the floor.

Eliminate throw rugs which slip.

Cover bare wood floors which may be slippery.

Do you need a stair-lift?

If stair climbing is necessary and it is becoming a burden each time you have to climb the stairs, installing a stair-lift may be a good idea for you. However, consider also the possibility of moving your bedroom downstairs to the ground floor.

Do you need a ramp?

Installing a ramp sounds like a good idea initially but ramps are much harder to climb when using a prosthesis. Ramps may also be made too steeply. Make sure, if you want a ramp installed, that the contractor is licensed and follows the standards for ramp construction.

Who can help you modify your home?

You should research all contractors to ensure that they are licensed, familiar with the Americans With Disabilities Act (ADA) guidelines, have insurance, and good references. (Check with the Better Business Bureau at [www.bbb.org](http://www.bbb.org) to see if a contractor has received complaints.)

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How can you modify your car?

For a left amputee with an automatic vehicle, no modifications are usually required. You may want to remove the prosthesis when you drive to avoid getting it caught under the brake pedal. Note, however, that the local license bureau may put restriction on the vehicles you may be able to drive, such as limitation to drive only automatic transmission, depending on your amputation.

If you are a right leg amputee, avoid buying a car with center console as this reduces legroom on your prosthetic side. You can have the gas pedal added to the left side of the brake. This left-sided pedal can be turned off to allow other drivers to operate the vehicle in a normal manner.

Hand controls may also be an option.

Who can make car modifications, including installing hand controls?

In general, most car manufacturers have departments dedicated to providing mobility solutions including financing options. You can call the manufacturer of interest or search the particular manufacturer's website. According to Amputee Coalition of America research, a modified new vehicle may cost anywhere between \$20,000 to \$80,000. However, manufacturers also often offer rebates for vehicle modifications. Modifying a used car or an older model may reduce your costs. Some states may waive the sales tax on the purchase of physician-prescribed mobility equipment and a tax consultant can help you determine if your adaptations might qualify for a tax deduction.

Many commercial outfits also specialize in car modifications such as hand controls.

How do you prepare your family?

Positive support at home especially in the beginning is especially important. Family may help in changing dressings, in massaging the stump, and in keeping the walking areas of the house clear of objects.

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### Part 2: Caring for the residual limb

How do you clean the residual limb?

Wash limb every night with mild soap and warm water. Rinse with clean water. Pat skin dry. Do not shave the skin, apply lotions to the skin, or apply hot or cold compresses. Inspect the skin, front and back, for blisters and abrasions.

Why must the residual limb be massaged?

Massaging and tapping reduces skin sensitivity and increases tolerance to pressure. The residual limb needs to “toughen up” so increase the pressure of the massage and/or tapping as the limb heals. This prepares the limb for the eventual pressure of a prosthesis.

Massaging also breaks up scar tissue which causes your skin to attach to the bone beneath. Scar tissue inhibits movement of the tissues.

In addition to your practice of massaging the residual limb, you may benefit from rehabilitative massage therapy from a licensed massage therapist. Massage therapy may reduce intractable phantom pain, relieve muscle spasms due to unbalanced movement post-amputation, and improve blood circulation. Acupuncture has also proven to successfully reduce phantom pain. A licensed acupuncturist experienced in amputee care is preferred.

How do you wrap/rewrap the leg?

If you are not fitted with a shrinker sock, then you should routinely wrap the residual limb with an elastic bandage. This keeps the limb in a proper shape to fit your prosthesis. Your prosthetist or your rehabilitation nurse can show you the process listed below.

Cover the end of the limb with diagonal turns starting with the inside corner followed by the outside corner. Overlap bandage by ½ an inch. Avoid any creases. Keep pressure on the limb with greater pressure lower and less pressure higher.

*When should massaging begin? As early as possible as allowed by your physician.*

*How often? Several times a day for about 5 minutes at a time.*

*How should the limb be massaged? Using cocoa butter on the tips of two fingers, one placed above the scar and one placed below the scar, move both fingertips on the skin in a direction at right angle to the scar, then along the scar, and then in circles over the scar. Light tapping or slapping of the end desensitizes the skin.*

*Elastic bandages to use: One or two 4 in. elastic bandages of enough length to cover residual limb*

*Start with bandages that are dry and rolled.*

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If you are a below the knee amputee, extend the wrap one turn above the knee and then return to below the knee. If you are an above the knee amputee, extend the wrap one turn around the hip and then return to the residual limb. Repeat turns until you have 2 layers covering the limb. Be careful not to have any wrinkles on any of the wraps. Wrinkles will cause uneven pressures on your limb.

Your physician or prosthetist will instruct you on the length of time initially to leave the wrapping on the leg.

Rewrap your limb every 3-4 hours but more often when bandages shift. Rewrap after exercising.

Shrinker socks and elastic bandages should be hand-washed daily with mild soap and warm water. Dry by laying sock or bandage flat and patting with a towel. Do not put them in a dryer or wring them out or hang them up to dry.

When you see any unusual skin irritation or drainage, you should immediately contact your prosthetist or physician.

### **Part 3: The Prosthesis**

The **Prosthesis** is a device which enables the person to bear weight on the limb which has been amputated. The prosthesis is designed for the individual amputee. This design is formulated to meet the criteria of each patient. This includes visible physical attributes such as skin condition, changes in limb volume, muscular contractures, etc. Equally important, the prosthesis is designed to meet the activity levels of the individual. These activity levels can vary from helping to transfer from a wheel chair to a bed, performing normal physical work, to being an unlimited athlete. The design of the prosthesis requires a lengthy discussion between the individual and the prosthetist to come up with a design that will meet all the needs the prosthesis is required to do.

Once you are fit with a prosthesis, why does the fit of the prosthesis change?

The prosthesis does not change but your leg does. It is normal and is called residual limb maturation. As the limb matures, the size of the residual limb will become smaller. This is due to decreasing edema or swelling which had been present since the amputation. Unused muscle tissue in the residual limb also shrinks. All these in combination will reduce the volume of

*Shrinker Sock:  
Size should fit snugly. If  
painful, consult you  
prosthetist.*

*If the shrinker is not snug,  
consult your prosthetist.*

*Can you wear the  
prosthesis all day long  
initially? What should be  
the initial wearing  
schedule?*

*Your prosthetist should tell  
you what schedule to keep  
as the wearing time  
depends on your particular  
residual limb and  
prosthesis.*

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your residual limb. To make up the difference between your residual limb size and the size of your prosthetic socket, you may add sock ply, a number and thickness of socks. The normal number of socks required are anywhere from none to about 10 ply. Having to add more than 10 ply of socks usually requires modification of the socket to reduce the ply of sock used or replacement of the socket at this time.

How do you know how many sock ply to add to your limb before putting on the prosthesis?

If you are unsure if you have put on the correct number of sock ply, consult your prosthetist. Indications that you do not have enough sock ply include pain on the bottom portion of the residual limb, the prosthesis feels short, or the prosthesis feels loose. Indications that you have too many socks include stubbing your toe, the prosthesis feels long, or the prosthesis feels too tight.

Properly donning or putting on a prosthesis depends on the design. For prostheses that use a silicone lining with a locking pin: When donning the liner, make sure that the pin comes straight down and is parallel to your residual limb when you look at it from all directions. This alignment is necessary to lock the pin into the mechanism built into the socket. If you have trouble engaging the pin into the lock, the solution may be putting lipstick on the end of the pin, trying to engage the pin into the lock again, and then look into the socket to see where the pin has left a red mark. This tells you which way the pin is missing the hole. Then you can remove the liner and put it back on with the pin angle correctly adjusted. Once the pin is locked into the mechanism, make sure it is engaged by pushing on the socket while trying to pull your leg out. If it is locked, you will be unable to remove your limb from the socket without pushing the release mechanism. If socks are required to increase the volume of the residual limb, socks are always applied over the silicone liner not against the skin. This differs with individuals using Pelite liners with either a suspension sleeve or straps. With Pelite liners, the prosthetic sock is against the skin and then the prosthesis is applied to the leg.

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Why does the alignment of the prosthesis need to be changed periodically?

These changes are due to improvement in your walking. Your prosthesis does not change but your abilities do. Once your muscle strength and confidence improves, alignment to the prosthesis is necessary. These alignment changes make your gait smoother and more efficient. Alignment changes can also be made to help unload (reduce the pressure on) an area of your residual limb.

How long will the prosthesis last?

You may need a replacement prosthesis or replacement parts every 3-5 years due to normal wear and tear or sooner if your body weight and conditioning change significantly.

When you have your prosthesis replaced, will you have to learn to walk all over again?

You don't forget how to walk on a prosthetic device. You may experience some slight changes to your walk but these changes are usually overcome. Once you get used to the new prosthesis, you will wonder how you ever walked on the old one!

How long will the liners and socks last?

Silicone liners, with proper care, will usually last 1-2 years. Prosthetic socks, with proper care, will usually last many years. As for the care of the socks and liners, follow the directions supplied with the products. Liners usually can be cleaned with soap and water. At least once a week, rub down the liner with rubbing alcohol. Most prosthetic socks require regular laundering. If they are 100% wool socks, they may need to be line-dried. Otherwise, most wool blends can be thrown into the dryer.

How do you get rid of odor from wearing the prosthesis all day long?

The prosthetic leg will smell! The liners meant to keep the stump constricted are not breathable materials. Natural sweat from the skin gets trapped under the liner and will cause an odor. You cannot use powders, deodorants, or lotions under the liner because they will cause skin irritations and breakdown. To

*Do you need to keep your walker or wheelchair once you have a prosthetic leg? Yes, always keep equipment as you may develop complications with the leg later on that requires you to temporarily return to a wheelchair, etc.*

*What aids should you carry with you routinely to help you get the prosthesis back on if your stump swells:*

*“amputee silk”  
“amputee lubricant”  
“liquid silk”*

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minimize odor, clean liners with soap and water nightly and wipe it down with rubbing alcohol. The rubbing alcohol will dry out the water within minutes and you can use the liner again.

### *Vacation Survival Guide:*

#### *What to carry with you when you travel*

1. socks
2. secondary suspension
3. duct tape
4. first-aid kit including Neosporin, alcohol, antiseptic soap
5. tools
6. spare parts, a draw sock if used, Liquid Silk lubricant
7. plastic bag(s)
8. cellphone
9. phone numbers
10. miscellaneous (ie. PAM, shrinker sock, anti-perspiring type of balm, cane, walker, etc)

*When making hotel reservations, request any special needs such as a shower seat, a room located close to the elevators, or wheelchair accessibility.*

*When making airplane reservations, request bulkhead seating for more leg room. In the airport, you can use a wheelchair from the ticketing counter to the gate. You can ask for a "Pusher" to take you to the gate. They generally have special routes to get you there faster. For changing planes or getting to distant terminals, ask the Flight Attendant to request a wheelchair and a Pusher to get you to your connecting flight or to baggage claim. It is easier on you and conserves your strength for your other activities. The airlines and the personnel at the airport are used to and aware of the needs of people with handicaps. It also gives you some preferential treatment.*

## **Part 4: Resources**

### **National Organizations**

American Orthotic & Prosthetic Association (AOPA)  
330 John Carlyle St., Suite 200  
Alexandria, VA 22314  
(571) 431-0876 [www.aopanet.org](http://www.aopanet.org) email: [info@aopanet.org](mailto:info@aopanet.org)

Amputee Coalition of America  
900 E. Hill Ave., Suite 285  
Knoxville, TN 37915-2568  
(888) 267-5669 or (888) AMP-KNOW  
[www.amputee-coalition.org](http://www.amputee-coalition.org)

BARR Foundation  
136 Northeast Olive Way  
Boca Raton, FL 33432  
(561) 394-6514  
[www.oandp.com/barr](http://www.oandp.com/barr) email: [foundation@t-barr.com](mailto:foundation@t-barr.com)

*Amputee Coalition of America publishes:*

*First Step*

*In Motion*

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Disabled Sports USA  
National Headquarters  
451 Hungerford Drive, Suite 100  
Rockville, MD 20850  
Voice: 301-217-0960 Fax: 301-217-0968  
[www.dsusa.org](http://www.dsusa.org)

### **Publications**

First Step magazine, In Motion magazine  
Amputee Coalition of America:  
900 E. Hill Ave., Suite 285  
Knoxville, TN 37915-2568  
(888) 267-5669 or (888) AMP-KNOW  
[www.amputee-coalition.org](http://www.amputee-coalition.org)

Active Living  
2276 Rosedene Rd., St. Ann's  
ON L0R 1Y0  
(905) 957-6016  
[www.activelivingmagazine.com](http://www.activelivingmagazine.com) email: [activeliv@aol.com](mailto:activeliv@aol.com)

Biomechanics  
CMP Media LLC  
600 Harrison St., San Francisco, CA 94107  
(415) 947-6000 [www.biomech.com](http://www.biomech.com)

**Part 5: Amputee Life: This section is courtesy of amputees who have volunteered their insights and tips.**

**Common concerns of women: How will I be accepted? Will I be attractive?**

Sense of self is an immensely personal issue. Each person's sense of self may be affected uniquely by amputation. However, just as there are many amputees, there are also many personal experiences. Look to the many organizations developed to assist amputees such as the national Amputee Coalition of America. These organizations provide you the opportunity to speak with fellow amputees, read about their experiences, and to listen to discussions about these very same issues. Through the community of amputee experience, each person can find or develop their own sense of inner beauty.

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### **Common concerns of women: Will I be able to wear high heels again? How will it look?**

Yes, different foot designs can be used for different heel heights. Cosmetic covers can be made very realistically. Covers can be from simple to elaborate in realism. With these products, the dressed-up prosthetic leg will not be noticeable.

**For those with children**, be aware that initially your children will be in charge of helping you! This may lead to role reversal. When you are stronger as an amputee, you may find that it takes a while for the roles to reverse back.

**Will you be able to perform in sports as you used to do? Ie. Tennis, running, bicycling, swimming, etc.** Amputation itself is not a contraindication to athletic participation. For individuals of high activity level, the manufacturer of prosthetic devices tailor many devices specifically to athletes. Your prosthetist should identify your personal goals, including athletic goals, during the design process in order to meet all of your needs. In some cases, amputees might even have more than one device made, a prosthesis for everyday use and a different prosthesis for athletic competition. For more information on amputee sports, contact the Disabled Sports USA organization at [www.dsusa.org](http://www.dsusa.org)

**Get used to jokes.** You may need to become desensitized to comments. Most people don't joke to make fun of you. They make "stupid jokes" because they are uncomfortable and don't know what to say. Sometimes people joke in order to relate to you and to become a part of your different world.

**Don't be surprised** if people cannot visit you in the hospital. It may be because they have difficulty dealing with your amputation at a time when you need the most support.

**Never shave the stump.** If there is an ingrown hair, have it removed by a dermatologist. Shaving the stump breaks down the skin.

**Expect to spend a lot of effort** practicing good liner/stump hygiene because of its vulnerability to skin breakdown. Expect the stump to be more vulnerable to changes. Body weight is being transferred through the residual limb to interact with the ground instead of the usual transfer point of the foot.

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**Expect to need physical therapy.** In the beginning, physical exertion will take a greater amount of effort until you get used to it. After physical therapy, you will continue to need physical training with both extremities. If you have only one leg amputated, expect problems to develop with the opposite remaining limb due to the changes in body dynamics. You will need to develop good gait habits to balance weight correctly and to avoid developing low back pain and knee problems in the opposite leg. Make sure your prosthetist or physician examines the other foot. If you are diabetic, the other foot may also be suffering from poor blood circulation and is also at risk for future amputation.

**If you have to sit for a prolonged amount of time**, such as on an airplane trip, disengage the leg. Periodically contract the hamstrings to improve blood circulation. Don't let the stump hang down. Keeping the stump horizontal prevents leg swelling.

**Take advantage of handicapped facilities** that can be provided for you such as wheelchair entrances, etc.

**Choose light-weight shoes.** Excessive weight on the end of a prosthesis will act like a pendulum.

Amputees can still travel, be adventurous, and be unlimited and unhindered in their experiences. If you are not convinced, look into Disabled Sports USA and see what the Paralympics are all about, sign up for downhill skiing, or train for your first marathon.

***An informed amputee will realize that he or she has the ability to continue living life very similar to life before the amputation.***



## **Skin and Socket Care: Basic Tips on Care**

*(Always contact your healthcare provider or prosthetist if sores or blisters erupt)*

***Note:** Minor skin irritations such as sores and blisters can develop into more serious conditions such as ulcers and serious infections. Always take care of your skin and if blisters and/or sores develop immediately consult your physician.)*

*For your prosthetist to work at maximum efficiency, your socket needs to fit your residual limb intimately. This is called a “total contact” socket, and fabricating this socket requires the skills of a prosthetist. Thought sockets are usually made of flexible materials, often they are limited in their ability to flex and change shape while maintaining proper support. If major changes occur to the shape of the residual limb, such as those changes that develop over time, the socket has to change its shape as well. If changes to the socket are not made to accommodate the changes to the residual limb friction and increased pressure will occur which will lead to sores, blisters and even serious ulcers and infections.*

### **Comfort in a prosthetic socket depends on the following:**

- **Maintaining a good fit**
- **Correct alignment**
- **Skin care**

Fit and alignment are the responsibility of your prosthetist; however, he cannot help you unless you tell him when something is wrong. The first rule for a proper fit is “communication.”

Skin care is the responsibility of the individual. There are a few basic rules, the first of which is cleanliness. Please remember that the residual limb is encased in a completely, or partially, airtight socket, which does not breathe or allow sweat to evaporate. Sweat is acidic and salty and, when allowed to dry, forms tiny crystals on your skin. If sweat is left on the skin and socket, bacteria can grow, and if the skin is broken, infections may occur.

## **To avoid skin problems, follow these steps:**

- Every day, or more often if necessary, wash the residual limb with a mild antibacterial soap and rinse well.
- Every day, wash everything in contact with your skin with a mild antibacterial soap and rinse well. This includes socks, nylon sheaths, silicon sockets, gel inserts and flexible or hard sockets. Please note any manufacturer's instructions for cleaning.
- Do not shave the residual limb. Shaving can cause ingrown hairs, and can often lead to infected hair follicles.
- Only use softening creams when your skin is at risk of cracking or peeling.
- Do not use alcohol-based products on your residual limb. Alcohol will dry out the skin and can cause cracking or peeling which can become infected.
- If you must cover an abrasion, use the thinnest dressing possible. If the abrasion was caused by pressure, adding a thick dressing will only increase the pressure and thus make the condition worse.
- Do not add soft materials such as wool to "pad" a sore spot. This will only add more pressure and make the condition worse.
- If you develop a sore spot allow the residual limb to "breathe." Try not to wear the prosthesis until the sore area is healed.
- Be aware of how your socket fits. If you notice changes to the fit, contact your prosthetist immediately.
- Try to maintain the same body weight. A weight gain or loss will change the size and shape of the residual limb and thus affect the fit of the socket. If you are trying to lose weight, keep in contact with your prosthetist.

## **If a problem does occur, it usually falls into one of the following categories:**

- **Rash**
- **Blister**
- **Ulcer**
- **Infection, local or disseminated**
- **Verrucous (wart like) hyperplasia**

*First visit your prosthetist. The problem can usually be solved with a prosthetic adjustment. If you have an ulcer or infection, or if you have diabetes or circulatory disease and have anything more than a mild rash, consult your physician immediately.*

## **Rashes:**

### **A rash can be caused by:**

- **An allergic reaction, often to your own sweat, or a fungus, similar to athlete's foot. It can also occur by an allergic reaction to the liner that contacts your skin.**

### **To avoid rashes:**

- Wash and rinse the residual limb and liner every day.
- Lightly dust the residual limb with a medicated talc powder such as Gold Bond at night, and if not contraindicated by the manufacture of your liner, before donning your liner. Some people prefer Ammens because it does not contain talc.
- Use a light film of diaper rash cream such as Balmex at night.

### **To treat rashes:**

- Use an antihistamine lotion, such as Benadryl, which will usually take care of the rash if it is caused by an allergic reaction.
- If the rash is not treated soon enough you may want to try over the counter cortisone cream.
- Use a commercially available athlete's foot treatment such as Tinactin.
- If the rash does not respond within 24- hours after applying any of the above treatments seek medical help.

## **Blisters:**

- **A blister can be caused by abnormal pressure or by shearing of the skin against a "tacky" liner.**

### **To avoid blisters:**

- Maintain a good fit.
- Visit your prosthetist regularly to maintain a good fit.

- Avoid weight gains or losses.
- Blisters can be avoided by using a “paint-on” type film dressing such as New Skin or MedLogic’s LiquiShield which is designed to help prevent skin breakdown.

### **To treat blisters:**

***NOTE: Persons with diabetes or circulatory disease should always consult their physician.***

- A surface blister should be left intact if possible. If the blister opens, keep it clean and covered with a thin layer of antibiotic ointment.
- A line of itchy blisters sometimes appear around the edge of, or inside of, silicone liners, especially in hot weather. A little mineral oil or baby oil around and under the edge of the liner prevents this from occurring. Treat the blisters as described above.
- Blisters that occur with above-knee sockets can sometimes be covered with a thin see-through dressing such as LiquidShield.
- Ulcers and local disseminated infections should all be treated by your physician; however, the fit of your prosthesis should always be checked. If the cause of the pressure is removed, the problem will often be resolved without the need for aggressive measures.

### **Verrucous Hyperplasia:**

This is an itchy, red, raised, circular area on the distal end of a residual limb, caused by suction being applied to the end of the limb. This condition frequently occurs when the socket is too tight and the limb does not make total contact with the bottom of the socket.

### **To prevent verrucous hyperplasia:**

- Maintain a good “TOTAL CONTACT” socket fit.

### **To treat verrucous hyperplasia:**

- Remove the source

## **General Tips:**

Excessive sweating can be removed by using a strong antiperspirant gel on the residual limb. Apply every night until the sweating is reduced, then as often as necessary to control sweating. Do not use this if there are any breaks in the skin integrity. A stronger preparation, Dri-sol, is available by prescription.

## **General Helpful Hints:**

- When any irritation of the residual limb occurs immediately seek the advice of your prosthetist. If the irritation becomes worse or becomes infected, immediately seek the help of your physician.
- If you suffer from vascular disease or diabetes, always take every wound, blister, boil or irritation seriously. Seek medical care immediately.
- The longer your residual limb is irritated the bigger the problem will become. At the first signs of irritation seek care.
- If you develop an area of irritation that becomes worse, or if you develop an area that becomes infected, develops a blister or boil, do not wear your prosthesis. Allow the residual limb time to heal before using your prosthesis.
- If you experience any pain when wearing your prosthesis seek the care of your prosthetist immediately.
- Never wait for the problem to go away. Problems will only get worse and increase the healing time.
- Always make sure that your prosthesis fits properly. An improper fit will lead to irritation and possibly more serious complications.
- If problems with the fit of your prosthesis occur, see your prosthetist immediately. If you do not experience any problems with the fit of your prosthesis you should visit your prosthetist regularly (at least every six months) to ensure proper fit and function.
- Clean the liner every day, at a minimum, to avoid irritation from sweat and the possible spread of infection. Use an antibacterial soap to clean the liner and follow with the application of rubbing alcohol. Allow the liner to fully air dry before donning it.
- Wash the prosthetic sock after every use (daily). This will prevent residual limb irritation as well as the spread of infection.

- Do not use products that are supposed to toughen the skin of the residual limb. Allow the skin to toughen on its own. If problems occur contact your prosthetist and/or physician.
- Talk to your prosthetist about proper shoe style with regards to your prosthesis. Shoes can change the mechanics of the prosthetic fit and can lead to irritation and eventual complications.
- Home remedies should be avoided without consulting your prosthetist and/or physician.
- Non-professional advice about your prosthesis, its fit, function, daily care, and treatment of complications should be avoided or at least talked about with your prosthetist/physician.
- If any problems occur remember: **“When in doubt, have it checked out!”**

# Useful Definitions

## A

**AAOP:** American Academy of Orthotists and Prosthetists, a professional society of orthotists and prosthetists.

**ABC:** Board Certified Practitioners, American Board of Certification in Prosthetics.

**Abduction:** Motion of the body part away from the mid-line of the body.

**Abrasion:** Wearing away of the skin through rubbing or friction.

**ACA:** Amputee Coalition of America.

**Accessible:** Easy to approach, enter, operate, participate in, and/or use safely and with dignity by a person with a disability.

**Acquired Amputation:** Limbs surgically removed due to disease or trauma generally diabetic/vascular, cancer, bone infection, non-union of fractures, or trauma.

**Acupuncture:** An original Chinese practice of puncturing the body at specific points to cure disease or relieve pain.

**ADA:** Americans with Disabilities Act. Enacted 1990.

**Adherent Scar Tissue:** Scar tissue formed in the healing process that sticks to underlying tissue such as muscle, fascia, or bone.

**AE:** Above elbow, also referred to as “transhumeral”.

**AK:** Above knee, also referred to as “transfemoral”.

**Alignment:** Position of prosthetic socket in relation to foot and knee.

**Alternative Therapy:** Treatment that is used in place or in conjunction with traditional medicine. Examples include: acupuncture, yoga, chiropractic, massage.

**Ameli:** A medical term for absence or partial absence of limbs at birth. Amelia can sometimes be caused by environmental or genetic factors.

**Amputation:** Loss or absence of all or part of a limb.

**Anterior:** Front, as front portion of a shoe or foot.

**AOPA:** American Orthotic and Prosthetic Association

**Architectural Barrier:** Stairs, ramps, curbs, or anything that obstructs your walking or wheelchair mobility,

**Assistive/Adaptive Equipment:** Devices that assist in activities or mobility, including ramps, bars, changes in furniture heights, environmental control units, and other devices.

**Atrophy:** A wasting of tissues; the decrease in size of a normally developed extremity or organ.

## **B**

**BK:** Below knee, also known as “transtibial”.

**BOC:** Board of Orthotists/Prosthetists Certification.

**Body Image:** The awareness and perception of one’s own body related to both appearance and function.

**Body-Powered Prosthetics:** A prosthesis that usually employs a harness for two purposes: suspension and control. Through relative body motion, the amputee is able to generate tension in a control cable. By routing the cable, the tension can be transmitted to the prosthesis where it can generate the desired effect.

**Bumper:** A rubber like device inserted into a knee or ankle component as a resistance or extension aid. Bumpers come in different durometers (color coded), which allow the amputee to have different resistance levels.

## **C**

**C-leg:** The Otto Bock 3c100 C-leg is a metal frame that holds a hydraulic cylinder, microchip, and rechargeable battery. The C-leg system includes a strain pylon that senses weight and position providing information about the amputee’s gait to the microprocessor.

**Causalgia:** A constant, usually burning pain resulting from injury to peripheral nerve.

**Check or Test Socket:** A temporary socket, often transparent, made over the plastic model to aid in obtaining proper fit and function of the prosthesis.

**Comorbidity:** The presence of coexisting or additional diseases with reference to an initial diagnosis or with reference to the index condition that is the subject study.

**Congenital Amputee:** An individual born missing a limb(s). Traditional these persons are not amputees but are “limb deficient”.

**Congenital Anomaly:** A birth abnormality such as a missing limb.

**Contracture:** Tightening of muscles around a joint that restricts the range of motion of that joint.

**Contralateral:** Occurring on or acting in conjunction with a part on the opposite side of the body.

**Cosmesis:** Used to describe the outer, aesthetic covering of prosthesis. Refers to appearance of the prosthesis.

**CP (Certified Prosthetist):** A person who has passed certification standards as set by the American Board of Certification in Prosthetics.

**CPO (Certified Prosthetist-Orthotist):** A person who has passed certification standards as set by the American Board of Certification in Prosthetics and Orthotics.

**Custom Fit:** Fitting an individual with an item/device made from an image of the individual’s anatomy, fabricated according to the needs of that individual.

## D

**DAK:** Double (aka. bilateral) AK, also referred to as “bilateral transfemoral”.

**Debride:** A term for the removal of necrotic, infected, or foreign material from a wound.

**Definitive or “Permanent” Prosthesis:** A replacement for a missing limb or part of a limb that meets accepted check-out standards for comfort, fit, alignment, function, appearance, and durability.

**Desensitization:** The process of making the residual limb less sensitive to touch by massaging, tapping, or using a vibrator.

**Diabetic Amputation:** Amputation due to complications caused by diabetes. Causes include neuropathy, ulcers, and foot disorders.

**Disarticulation:** An amputation through a joint, commonly the hip, shoulder, knee, elbow, or wrist.

**Distal:** The end of the residual limb. Farther from the central portion of the body. Opposite of proximal.

**Donning and Doffing:** Putting on and taking off a prosthesis.

**Dorsiflexion:** Pointing the toe/foot upward, toward the body.

**Durometer:** Different “density” of strength and in the context means it will allow the ankle to move, bend, or flex more or less.

## E

**Early Prosthetic Fitting:** A procedure in which a preparatory prosthesis is provided for the amputee immediately after removal of the sutures.

**ED:** Elbow Disarticulation. An amputation through the elbow joint.

**Edema:** A local or generalized condition in which the body’s tissues contain an excess of fluid.

**Elastic Wrap:** Elasticized bandage used to prevent swelling and encourage shrinkage with support and maturation of the residual limb.

**Endoskeletal Prosthesis:** A prosthesis built more like a human skeleton with support and components on the inside. This design may have a soft cosmetic cover on the outside.

**Energy Storing Foot:** A prosthetic designed foot with a flexible heel. It is designed with a spring that stores energy when weight is applied to it and releases energy when the amputee transfers weight to the other foot.

**End Procedure:** A fibular stabilization procedure. The opposing bundles of cut muscle tissue are sewn to small holes drilled into the end of the bone of the residual limb. The major significance of this procedure is the increased surface area available for loading. Because the muscle has been directly attached to the bone, it remains active – thus maintaining its mass or even increasing in size.

**Exoskeletal Prosthesis:** A prosthesis that is hollow on the inside with a hard outer surface to bear weight.

**Extension Assist:** A method of assisting the prosthetic to “kick forward” on the swing through phase to help speed up the walking cycle.

**Extremity or Limb:** Relating to the arm or leg.

## F

**Foot Function:** Substituting use of the feet for the hands.

**Forequarter Amputation (Interscapulthoracic):** Amputation of the arm, shoulder, clavicle, and scapula.

**Functional:** Designed with the primary goal of controlling an individual's anatomical function, such as providing support or stability or assisting ambulation.

## G

**Gait:** The process of walking.

**Gait Training:** Learning how to walk with a prosthesis.

## H

**HD: Hip Disarticulation:** Amputation that removes the leg at the hip joint, leaving the pelvis intact.

**HP: Hemipelvectomy:** An amputation where approximately half of the pelvis is removed.

**Hybrid Prosthesis:** A prosthesis that combines several prosthetic options in a single prosthesis, usually for individuals who have a transhumeral (above the elbow) amputation or deficiency. The most common hybrid prosthesis utilizes a body-powered elbow and a myoelectrically- controlled terminal device (hook or hand).

## I

**IAOP:** International Association of Orthotics and Prosthetics.

**Hizarov Technique:** A bone fixation technique using an external fixator for lengthening limbs, correcting pseudarthroses and other deformities, and assisting the healing of otherwise hopeless traumatic or pathological fractures and infections, such as chronic osteomyelitis.

**IPOP: "Immediate Post Operative Prosthesis."** A temporary prosthesis applied in the operating room immediately after the amputation.

**Ischial Containment Socket:** A derivative of the Narrow MI., as a special attempt is made to form a little pocket for the ischium to sit on.

**Ischium:** The lower portion of the hipbone. This is the bone that protrudes from your pelvis that may get sore when sitting on a hard surface for extended periods of time.

## **K**

**Kinesiology:** The study of human motion.

**Knee Disarticulation (KD) or Through The Knee (TDK):** Amputation of the leg through the knee.

## **L**

**Lateral:** To the side, away from the mid line of the body.

**L-Codes:** Reimbursement codes used in the prosthetic/health care industry to identify what services and/or specific devices and components were provided.

**LE:** Lower extremity.

**Limb:** Pertaining to the arms or legs.

**Liner:** Suspension systems used to attach the prosthesis to the residual limb and/or provide additional comfort and protection of the residual limb. These liners may be made of silicon, or gel substances.

**Long's Line:** A straight line from the head of the femur through the distal end of the femur down to the center of the heel of the prosthetic foot.

## **M**

**Medial:** Toward the midline of the body.

**Modular Prosthesis:** An artificial limb assembled from components or modules usually of the endoskeletal type. May have a cosmetic covering shaped and finished to resemble the natural limb.

**Multiaxis Foot:** Allows inversion and eversion and rotation of the foot and is effective for walking on uneven surfaces.

**Myodesis:** Muscles anchored to the end of the bone. Referring to muscles anchored by sutures through the bone.

**Myoelectrics:** Literally muscle electronics. This is a technology used in upper extremity prosthetics to control the prosthesis via muscle contracture using electrical signals from the muscle to power the prosthesis.

**Myoplasty:** Muscles anchored to opposing muscles.

## N

**Neuroma:** The end of the nerve left after amputation that continues to grow in a cauliflower shape. Neuromas can be troublesome, especially when they are in places where they are subject to pressure from the prosthesis socket.

**Neuropathy:** An abnormal and usually degenerative state of the nervous system or nerve.

**Normal Shape/Normal Alignment (NSNA):** also known as narrow ML socket. The socket more closely approximates the shape of the musculature of a residual limb, when compared to a quad socket. The sides or medial/lateral measurement is tightened down to squeeze the residual limb with most of the squeezing taking place on the outside or lateral side. This helps control the rotation of the socket by putting pressure along the fleshy area of the leg that can handle some side-to-side pressure.

**Nylon Sheath:** A sock interface worn close to the skin on the residual limb to add comfort and wick away perspiration.

## O

**Occupational Therapy/OT:** Teaching how to perform activities of daily living such as feeding, grooming, bathing, and dressing as independently as possible.

**Orthosis:** A device that is used to protect, support, or improve function of parts of the body that move. Orthoses is plural.

**Orthotics:** The profession of providing devices to support and straighten the body.

**Osseointegrations:** The growth action of bone tissue, as it assimilates surgically implanted devices or prostheses to be used as either replacement parts or as anchors.

## P

**Partial Foot Amputation:** An amputation of the front part of the foot. Also called “Chopart Amputation”

**Partial Suction:** Usually refers to the socket of an above the knee prosthesis that has been modified to allow the wearing of prosthetic socks while wearing the prosthesis.

**PFFD (Proximal Femoral Focal Deficiency):** A congenital anomaly where the femur is lacking in completeness.

**Phantom Pain:** Pain that seems to originate in the portion of the limb that was removed.

**Phantom Sensation:** The normal ghost image of the absent limb may feel normal at times and at other times be uncomfortable or painful.

**Phocomelia:** A medical term for a congenital condition in which one or more limbs are missing, with the hand and/or foot attached directly to the trunk of the body.

**Physiatrist:** A doctor or rehabilitation medicine that specializes in the comprehensive management of patients with impairments and disabilities arising from neuromuscular, musculoskeletal and vascular disorders.

**Physical Therapist:** A therapist who is concerned with your gross motor activities such as transfers, gait training, and how to function with or without a prosthesis.

**Pistoning:** Refers to the residual limb slipping up and down inside the prosthetic socket while walking.

**Plantar:** The bottom of the foot.

**Plantar Flexion:** means the toe is pointing down toward the sole. Almost like pushing the gas pedal down and simulating that position or alignment.

**Ply:** Thickness of stump sock material. The higher the ply the thicker the sock.

**Pneumatic/Hydraulic:** Used in reference to knee joints and provides controlled changes in speed of walking.

**Posterior:** The back side of the body or part in question, i.e. posterior knee or patellar region.

**Prehension:** To hold, grasp, or pinch.

**Preparatory Prosthesis:** An unfinished functional replacement for an amputated limb, fitted and aligned in accordance with sound biomechanical principles and worn for a limited time to accelerate the rehabilitation process.

**Prosthesis:** An artificial part of the body. In the case of the amputees, usually an arm or leg. Prostheses is plural.

**Prosthetics:** The profession of providing cosmetic and/or functional restoration of missing body parts.

**Prosthetist:** A person involved in the science and art of prosthetics. One who designs and fits artificial limbs.

**Proximal:** Nearer to the central portion of the body. Opposite of distal.

**PTB: Patellar Tendon Bearing:** BK prosthesis where weight is on the tendon below the kneecap.

**Pylon:** A rigid member, usually rubber, between the socket or knee unit and the foot that provides a weight bearing support shaft for an endoskeletal prosthesis.

## Q

**Quad Socket:** A socket designed for an above the knee amputee that has four distinctive sides allowing the muscles to function as much as possible.

## R

**Ramus:** The front middle portion of the pubic bone palpated just above the genitals.

**Range of Motion (ROM):** The amount of movement a limb has in a specific direction at a specific joint such as your hip or knee.

**Reattachment Surgery:** The surgical attachment of a severed limb that involves reconnecting the arteries, veins, nerves, and grafting skin and muscles together. Some also involve putting the patient in a hyperbolic chamber, which causes the blood vessels, skin, muscles, and nerve tissue to regenerate more quickly and completely.

**Rehabilitation:** The process of restoring a person who has been disabled by injury or disease to a functional life.

**Residual Limb:** The portion of the arm or leg remaining after the amputation. Sometimes referred to as the “stump”.

**Revision:** Surgical modification of the residual stump.

**Rigid Dressing:** A plaster wrap over the residual limb, usually applied in the operating or recovery room immediately following surgery for the purpose of controlling edema (swelling) and pain. It is preferable, but not necessary, that the rigid dressing be shaped in accordance with the basic biomechanical principles of socket design.

## S

**SACH Foot:** Solid – ankle Cushion Heel.

**Shock Pylon:** A prosthetic pylon that dampens the vertical forces exerted on the residual limb and is used to cushion the impact when walking.

**Shoulder Disarticulation (SD):** Amputation through the shoulder joint.

**Shrinker:** A prosthetic reducer made of elastic material and designed to help control swelling of the residual limb and/or shrink it in preparation for a prosthetic fitting.

**Shuttle Lock:** A mechanism that locks a pin attached to the distal end of a liner locking the residual limb into a socket.

**Single Axis Foot:** A foot is based on an ankle hinge that provides dorsiflexion and plantarflexion, i.e. toe up and toe down.

**Socket:** The portion of the prosthesis that fits around the residual limb/stump and to which the prosthetic components attach.

**Social Worker:** A professional who assists you by helping to coordinate your discharge from the hospital and oversees appropriate contact with other services or organizations. The social worker will help to facilitate your re-entry into family and community life.

**Soft Socket:** A soft – liner built into a prosthetic socket to provide cushioning or permit muscle function.

**Split Hooks:** Terminal devices with two hooks – shaped fingers operated through the action of harness and cable systems.

**Stance Control:** A friction device with an adjustable brake mechanism to add stability to a prosthetic knee unit.

**Stump:** A work commonly used to refer to the residual limb.

**Stump Shrinker:** An elastic wrap or compression sock worn on a residual limb to reduce swelling and shape the limb.

**Suction Socket:** A socket designed to provide suspension by means of negative pressure vacuum in a socket. Achieved by forcing air out of the socket through a one – way valve when donning and using the prosthesis.

**Supercondular Suspension:** A method of holding on the prosthesis by clamping on the bony prominence above a joint, called “Condlyes.”

**Suspension System:** The method used to hold a prosthesis on to the body. Includes a locking pin, TES belt, suspension sleeve, waist belt, supercondular, PTB and suction.

**Swing Phase:** Prosthesis moving from full flexion to full extension. Usually used in reference to prosthetic knee units.

**Switch Control:** Use of electric switches to control current from a battery to operate an electric elbow, wrist rotator, or terminal device.

**Symes Amputation:** An amputation through the ankle joint that retains the fatty heel pad portion and is intended to provide end weight bearing.

## T

**TEC:** Total Environmental Control liner.

**Temporary Prosthesis:** A prosthesis made soon after an amputation as an inexpensive way to help retrain a person to walk and balance while shrinking the residual limb.

**TENS Unit:** Transcutaneous Electrical Nerve Stimulation. The units are small, battery powered, and weigh only a few ounces. Electrodes are placed on the skin near the area of pain and are attached to the TENS unit and electrical currents, which disrupt the pain signal so that the pain is no longer felt, are sent to the effected nerves.

**Terminal Device:** Devices attached to the wrist unit of an upper extremity prosthesis that provides some aspect of the function (grasp, release, cosmesis, etc.).

**TES Belt:** A neoprene or Lycra suspension system for AK prostheses that has a ring that the prosthesis slides into. There is a neoprene belt that attaches around the waist by Velcro/hook and loop fasteners. Used to give added suspension of a prosthesis and/or control rotation.

**Therapeutic Custom Shoe:** A shoe designed and fabricated to address an individual's medical condition. A therapeutic custom shoe is made over a modified positive model of an individual's foot and can be either custom – molded or custom – made.

**Therapeutic Recreation:** Provides instruction in retraining to leisure activities.

**Transfers:** Moving from one position to another (such as from sitting on a bed to sitting in a wheelchair).

**Transtarsal Amputation:** Through the tarsal bones or foot bones. See partial foot amputation.

## U

**Unilateral:** Affecting only one side.

**Upper Extremity (UE):** Having to do with the upper part of the body. In reference to amputees with arm or shoulder amputations.

## V

**Variable Volume Socket:** Lightweight and custom – made. The two – piece design makes it possible to don and doff the prosthesis without subjecting the dysvascular limb to unnecessary shear. The patient can adjust the socket itself as well as vary the sock ply to maintain proper fit. Socket adjustability eliminates the need to replace the preparatory socket several times before stabilization occurs.

**Vascular Amputation:** Amputation caused by lack of blood flow to a limb or limbs. Causes include arterial and venous catheterization, heart defects and disease, thrombocytopenia, familial coagulation defects, arterial anomalies, high blood pressure, septic emboli and mucocutaneous lymph node syndrome.

**Voluntary – Closing Devices:** Terminal Devices that are opened by body motion and closed by elastic bands or springs.

## W

**Wrist Disarticulation (WD):** Amputation through the wrist.