Prosthetics: Choosing What is Right for You

Artificial limbs, also known as prostheses, are defined as devices that are used to replace a missing body part or member. They are a vital part of the rehabilitation process following an amputation and help restore mobility to patients, leading to better patient outcomes and less co-morbidities. Studies have shown that amputees who receive a prosthesis after amputation have fewer future incidents requiring hospitalization and lower overall healthcare expenditures.

Types of Prostheses

There are many different kinds of prostheses available to patients depending on their individual clinical needs. Prosthetics are generally categorized according to the part of the body that they are used to replace. Within these general classifications, there are many sub-classifications that describe specific features of the prosthesis that are used to control the device, whether it be body powered or controlled by microprocessors or other electronic means. As technology has advanced, prosthetic devices have gotten more powerful, more energy efficient, and closer to mimicking the function of the anatomical body parts they replace.

Partial Foot Prostheses

A partial foot prosthesis replaces the function of the anatomical foot when part of the foot has been amputated. This can range from a few toes to the majority of the foot. In order to properly restore the function of the missing portion of the foot, the prosthesis must provide a proper lever arm in order to allow the patient to maintain a proper gait pattern and avoid unnecessary falls. This is usually accomplished by fabricating a solid material, also known as a toe filler, that replaces any amputated section of the foot along with a rigid arch support that replaces the function of the natural lever arm of the anatomical foot.

Trans-Tibial Prostheses

A trans-tibial prosthesis replaces the function of the anatomical foot, ankle, and lower section of the leg, up to the knee. Trans-tibial prostheses must address the missing ankle joint and replace its function through the design and fabrication of the prosthesis. Trans-tibial prostheses usually consist of a custom fabricated prosthetic socket, a pylon, and an ankle and/or foot component. Prosthetic feet and ankles provide various features depending on the clinical needs of the amputee. Types of prosthetic ankles include both single axis and multiaxial designs. Examples of prosthetic feet include a very basic design consisting of a solid ankle and cushion heel (SACH foot), flexible keel feet that allow the foot to flex when pressure is applied, energy storing feet that store and return energy during walking, and feet that use microprocessors to control motion of the foot during walking

Trans-Femoral Prostheses

A trans-femoral prosthesis replaces the function of the anatomical foot, ankle, lower leg, knee and upper leg, up to the hip. Trans-femoral prostheses must

address all of the issues addressed by trans-tibial prostheses and must also replace the function of the anatomical knee. Trans-femoral prostheses usually consist of a custom fabricated prosthetic socket, a prosthetic knee component, a pylon, and an ankle/.foot component. Prosthetic knees use several different types of mechanism to replace the anatomical knee based on the clinical needs and functional abilities of the patient. Examples of prosthetic knees include single axis designs, polycentric or multi-axial designs, knees that use friction to control movement, knees that use hydraulic or pneumatic cylinders to control movement, and knees that use a microprocessor to control movement.

Partial Hand Prostheses
A partial hand prosthesis replaces the function of the anatomical hand and fingers when part of the hand has been amputated. Traditional partial hand prostheses use a simple open or closed position of the prosthetic terminal device to provide the ability to grasp items, replacing the basic function of the anatomical hand. Recent advances in technology have led to the development of partial hand prostheses that include independently controlled prosthetic fingers, further mimicking the anatomical hand.

Trans-Radial Prostheses
A trans-radial prosthesis replaces the function of the anatomical hand, wrist, and forearm up to the elbow. Trans-radial prostheses use either a body powered system consisting of a shoulder harness, a series of control cables, and a terminal device; or a myo-electric system that relies on the amputee's ability to contract certain muscles in the arm which activate electrodes that creates coordinated muscle, nerve, and brain function that directs the position and action of the prosthetic arm.

Trans-Humeral Prostheses
A trans-humeral prosthesis replaces the function of the anatomical hand, wrist, forearm, elbow, and upper arm up to the shoulder. Trans-humeral prostheses use the same control mechanisms as trans-radial prostheses but may use multiple systems to control movement of the elbow as well as the terminal device, whether it is a hook, hand, or other mechanism.

External Breast Prostheses
External breast prostheses are used to replace the anatomical breast after removal through mastectomy. They are typically worn in conjunction with a specialized bra containing a pouch that maintains the proper anatomical position of the external breast prosthesis.

Choosing the right prosthesis
The style and type of prosthesis that is right for a patient is a decision that involves the patient, prosthetist, physician, and other healthcare professionals that are part of the rehabilitation team. Things that must be considered include the shape and status of the patient's residual limb, the patient's past medical

history, any conditions that may affect the patient's ability to use a prosthesis, and the patient's functional abilities, commonly known as a "functional level". Functional level assessment applies only to lower limb prostheses, specifically to components that replace the anatomical function of the hip, knee, ankle, and foot, and was originally developed for the Medicare program but has become widely accepted in the medical community as a means of measuring the patient's ability or potential ability to use certain prosthetic devices in an effective manner. Functional level assessment is a measure of the patient's ability or potential, not a specific device's ability to function. When determining the patient's functional level, things that must be considered include the patient's age, vocation, activity level prior to amputation, current living circumstances, and any other criteria that are identified through evaluation by the physician, prosthetist, and other members of the rehabilitation team. Current functional levels range from K0 which describes amputees that do not have the ability or potential to ambulate while wearing a prosthesis to K4 which describes amputees who ambulate at the highest levels while wearing a prosthesis. Most insurance carriers coordinate coverage of certain prostheses to match the patient's functional abilities, often reserving advanced technology devices for only those patient's who meet the requirements of higher functional levels.

The Doctor's Prescription for your Prosthesis

Medicare and most payers require a valid and complete prescription from a physician in order to provide coverage for a prosthesis. Your physician will typically provide you with a prescription for a prosthesis as well as a referral to a prosthetist in order to complete the fabrication and fit of your prosthesis. The physician should communicate his or her desires for the type, style, and design of the prosthesis that best suits your medical need. As the recipient of the prosthesis, your involvement in this process is crucial toward obtaining a positive outcome. Do not be afraid to ask questions regarding what type of prosthesis is right for you and how it may help improve your overall health.

Fabricating Your Prosthesis

Fabrication of your prosthesis begins with the creation of the prosthetic socket. This is typically done by taking a cast of the patient's residual limb or using a computer aided design/computer aided manufacturing (CAD/CAM) system to create a positive model of the residual limb. The positive model is then altered by the prosthetist to account for areas subject to excess pressure and surface weight bearing. The ultimate goal of the prosthetist is to create an intimately ftiing prosthetic socket that distributes the patient's weight evenly while limiting movement of the residual limb inside the socket. Once the positive model of the patient's limb is modified by the prosthetist to account for areas where extra relief is necessary to maintain an appropriate fit, heated sheet plastic is then applied to the positive model of the limb to create the basis for the prosthetic socket. Once the fit of the prosthesis is confirmed the socket is strengthened through a lamination process, usually through the application of some form of acrylic resin.

Once the socket is completed, componentry appropriate for the patient's functional level is selected and incorporated into the prosthesis resulting in a complete prosthesis. The prosthetic components are aligned to ensure a proper gait pattern and a protective cover is very frequently applied to protect the components of the prosthesis as deemed necessary.

Your Prosthesis and Your Health Insurance

Most insurance plans, whether private or public, provide coverage for prostheses. Traditional Medicare covers prostheses with a 20% coinsurance. For patients who have Medicare and a Medicare supplement policy, their prosthesis may be covered with little to no out-of-pocket cost.

The provider of your prosthesis should provide you with a complete estimate of the cost of your prosthesis, including any patient responsibility, prior to delivery of the prosthesis. If this cost estimate is not offered, ask for it. It is not an unreasonable request and providers who are not willing to provide a cost estimate should be used with caution.

The Good News: Prostheses have been Shown to Improve Quality of Life, Mobility, Rehabilitation, and an Overall Reduction in Total HealthCare Expenditures for Patients and Payers

A current area of focus on the delivery of healthcare in the United States is the use of cost effective delivery models that reduce the overall cost of healthcare to both patients and insurers. Recent studies on the cost effectiveness of prostheses have shown promising results. Studies show that the use of a prosthesis actually reduces the overall cost of healthcare as a result of increased patient mobility and a reduction in related health issues. Additional studies are currently underway to further quantify actual cost savings in healthcare expenses for patients who receive a prosthesis as opposed to those who do not.