Celebrating 40 Years of Excellence

PROSTHETIC & ORTHOTIC UPDATE

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Amputees Now on Firm Footing

Courtesy, Freedom Innovations.

Prosthetics Today

Over the past decade, no class of prosthetic componentry has shown greater advancement than foot and ankle systems. Today's components reflect improved engineering, lightweight materials and versatile designs, producing enhanced biomechanical benefits and a more natural gait for amputees.

The closer a selected foot-ankle system matches the abilities, environment and activities desires of the amputee, the better the outcome. That's where our experienced prosthetic staff makes a major difference.

The first step is to determine the appropriate degree of prosthesis complexity and performance based on the patient's physical condition and capabilities. While the selection of prosthetic feet has grown, amputees may be limited in their access to many of them by the extent to which those designs are deemed reimbursable under Medicare and private insurance.

Medicare uses a system of "functional levels" to define medical necessity for different degrees of sophistication of prosthetic devices. A new amputee's predicted functional level is generally determined by the referring physician and prosthetist, taking into account the patient's (1) history; (2) current status, including condition of the residual limb; and (3) desire to ambulate.

Though new designs typically tend to the high end of performance—and cost—more choices are becoming available and increasingly affordable for the lower functional levels. Moreover, new features are making some foot options appropriate for more than one level.

K1 — Low-Level Function (Household Ambulator)

Amputees in this category have the ability or potential to use a prosthesis for transfers on level surfaces at a fixed cadence and tend to be older patients who have undergone an amputation due to vascular insufficiency. They generally require safe, basic function and light weight for moving relatively short distances.

The **SACH** (solid ankle, cushion heel) **foot** is the basic prosthetic unit for the K1 patient. The SACH foot simulates plantar flexion at heel strike by compression of an elastic heel wedge and provides forefoot dorsiflexion by means of a flexible toe section. The SACH foot's simple construction (no moving parts), light weight, and low cost make it an ideal choice for preparatory (training) prostheses.

SACH Foot
Courtesy, Ohio Willow Wood.

(Continued on page 2)

Linda Welke, C.O. Joins Nobbe Team

Certified Orthotist Linda Welke is the newest member of the Nobbe Orthopedics professional staff.

Linda is a 1995 graduate of Jamestown College in North Dakota and completed her orthotics and prosthetics education at California State University in Dominguez Hills. Her primary responsibilities will be shared between our Santa Barbara and Santa Maria offices.

Linda Welke,

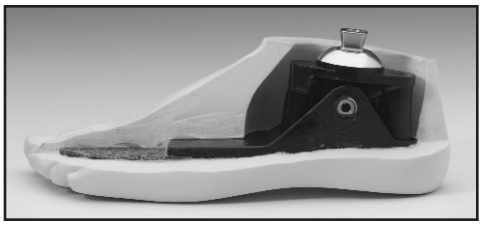
After serving as a practitioner in the Los Angeles/Beverly Hills area for more than five years, Linda brings to our practice an impressive depth of experience and community involvement. She possesses a particularly strong background in the orthotic management of pediatrics, plagiocephaly, trauma and scoliosis. With her experience and commitment to her patients, Linda will definitely enhance our quest to provide the highest quality of services to Central Coast residents.

We are pleased to note that **www.nobbeorthopedics.com** is up and regularly being updated. The site offers resources to patients; links to insurance carriers, support groups and associations and manufacturers; and other helpful information about our services and locations.

Prosthetic Foot Options Meet Full R

(Continued from page 1)

The single-axis foot incorporates the enhancement of an ankle component. This mechanism allows the forefoot to move downward through forward action at the ankle, rather than through initial heel strike. Move-ments are modulated by plantar flexion and dorsiflexion bumpers. This is also a low-cost, lightweight option, though some-what more expensive than SACH models. Some single-axis models incorporate dynamic response characteristics appropriate for as high as K3 use. Because single-axis feet increase knee stability in early stance phase, they are often preferred for above-knee amputation levels.



Single-axis foot
Courtesy, Ohio Willow Wood.

K2 and K3—Mid-level Function (Community Ambulator)

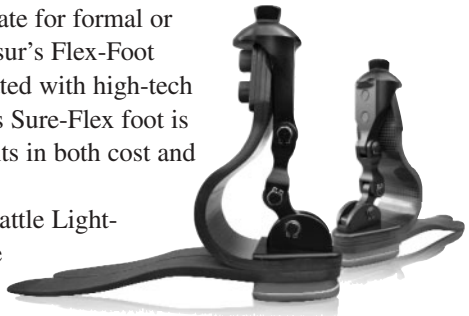
Amputees in the K2 classification have the ability or potential for ambulation on uneven surfaces and to navigate curbs and stairs. K3 patients can be expected to navigate inclines and higher barriers and to sustain their activity over time, as in those who maintain employ-ment or engage in sports such as golf or walking programs.

Elation Flex-Foot
Courtesy, Össur.

Patients in this group can benefit from more durable SACH foot models, certain multiaxial designs, and feet incorporating dynamic response charac-teristics. Compared to a SACH model, dynamic response feet provide increased range of motion, decrease impact loading on the contralateral sound foot, and may reduce energy expenditure in ambulation. The newer designs often offer a flexible keel foot as part of the system to provide dynam-ic assist at toe-off, helping propel the leg into swing phase. Here are some notable examples:

• The Össur Elation Flex-Foot incorporates a carbon fiber keel in its design with the added feature of button-powered heel-height adjuster to allow patients to use shoes of differ-ing heel heights appropriate for formal or informal wear. While Össur's Flex-Foot series is typically associated with high-tech and high performance, its Sure-Flex foot is appropriate for K2 patients in both cost and performance.

• The long-popular Seattle Light-foot is now also available as the LightFoot2, incorporating an improved keel providing enhanced rollover.



Cadence HP
Courtesy, Seattle Systems.

• Otto Bock's Springlite II is a proven lightweight energy-storing foot adaptable to a wide range of patient weight, heel height and foot size requirements.

• Freedom Innovations, a new manufacturer on the scene, offers two innovative feet in its Revolution series: the Runway, featuring a user-adjustable heel height, and the Renegade, an extremely lightweight foot with built-in shock-absorbing qualities.

Tribute foot incorporates multiaxial ankle.
Courtesy, College Park Industries.

Multiaxial ankles are well-suited to K2 and K3 function in that they accommodate uneven terrain by providing inversion-eversion and some degree of transverse rotation in addition to dorsiflexion and plantar flexion. The multiaxial mechanism may be a distinct component mated to a separate prosthetic foot. Examples include the Seattle C-stance ankle combined with a Seattle Lightfoot and the College Park Endo IP ankle used with a TruStep foot. Alternatively, the ankle mecha-nism can be made an integral part of the foot component, as with the K2 Sensation and College Park Tribute.

Talux foot
Courtesy, Össur.

Multiaxial ankle/foot systems are particularly appreciated by amputees who enjoy outdoor activities, notably hikers and golfers. They also lend them-selves well to the needs of bilater-al amputees. These patients frequently benefit from a dynamic response foot built around a flexible keel, which deforms during weight-bearing, storing energy, then releases that energy during late-stance phase, providing forward propulsion.

Renegade foot
Courtesy, Freedom Innovations.

Foot-ankle systems for these levels now reflect many of the design advantages pre-viously developed for the very active, high-impact level 4 patient. Steady improvements in weight reduction and reliability have brought K3-K4 components within the realm of moderately active amputees. For example, light-

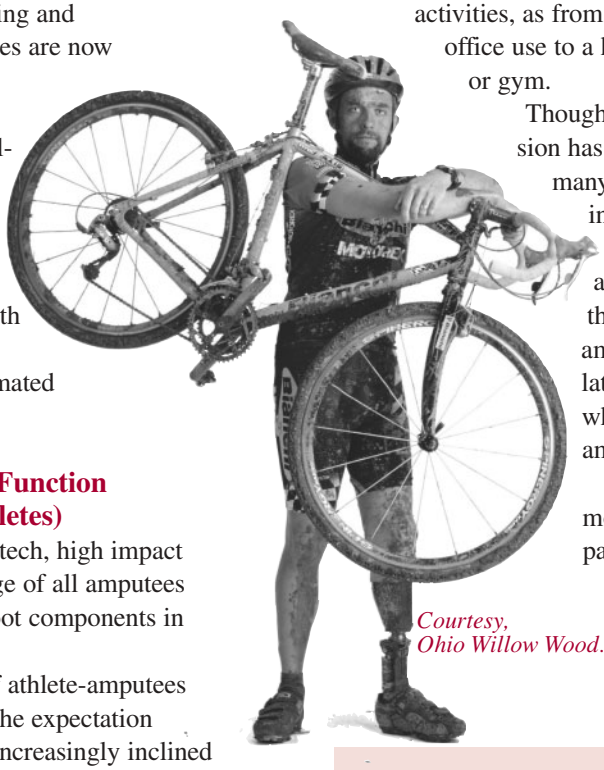
Impulse foot
Courtesy, Ohio Willow Wood.

ange of Amputee Abilities, Lifestyles

weight carbon fiber materials, energy-storing and shock-absorbing heels, and split toe features are now available in various newer products.

Other leading dynamic response feet suitable to the K2-K3 categories now available include:

- Össur Ceterus Vari-Flex (formerly the Flex-Walk) and Talux
- Otto Bock C-Walk
- Endolite Dynamic Response Foot (with Multiflex Ankle)
- Ohio Willow Wood Impulse (can be mated with the Earthwalk ankle).



Courtesy, Ohio Willow Wood.

K3-K4—Upper-Level Function (High-activity, Athletes)

The K4 applications are typically high tech, high impact and high cost. A relatively small percentage of all amputees will qualify for reimbursement of ankle-foot components in this category.

Though formerly largely the domain of athlete-amputees and active children, these systems reflect the expectation that some middle-aged amputees may be increasingly inclined to remain an active participant in golfing, hiking, shopping and gardening.

Devices appropriate for K4 and some higher-level K3 amputees exhibit high performance spring-like qualities and shock-absorption capabilities. Examples of devices in this range include:

- Össur Ceterus and Re-Flex VSP
- Otto Bock LuXon Journey, and LuXon Max DP, and
- Ohio Willow Wood Impulse, Carbon Copy 2 and Pathfinder.

The College Park TruStep, a pioneering system appropriate for highly active amputees, features a fully articulated foot, split-toe design and dynamic response. College Park's Venture offers a new feature, patient-adjustable stride control, for adjusting the foot's gait characteristics to reflect changing activities, as from home or office use to a hiking trail or gym.

Ceterus (left) and Vari-Flex feet
Courtesy, Össur.

TruStep advanced foot
Courtesy, College Park Industries.

LuXon Journey high performance foot
Courtesy, Otto Bock HealthCare.

Though this discussion has highlighted many of the leading ankle-foot components available to the lower-limb amputee population, there are in fact many more, all of which offer some special benefit to particular amputees.

Pathfinder system.
Courtesy, Ohio Willow Wood.

Our role is to determine and provide the most appropriate componentry for the patients entrusted to our care.

We welcome your inquiries about any of the components discussed in this article and will be pleased to work with you to devise the best solutions to amputee prosthetic needs.

The Art and Science Of Foot Selection

With numerous companies generating an ever-increasing number of prosthetic foot models, the choice of a particular foot for a given patient has become a complex matter as time-honored favorites are regularly being surpassed in performance, cosmesis and patient acceptance. It is the prosthetist's role to be current on the latest proven products and help the prescribing physician and amputee understand the benefits and limiations of the various models under consideration.

Foot selection typically entails tradeoffs involving the major selection criteria: performance, durability, weight and cost. While active patients and amputee athletes garner most of the media and marketing attention, the far greater numbers of lower-limb amputees occupy the opposite end of the ability spectrum: typically older, dysvascular people who have neither the desire nor the energy to walk more than a block or two. For these patients low weight, and often low cost, become overriding factors.

Reimbursement, particularly under Medicare, often limits the range of choices. The concept is a good one to limit fraud and abuse; however, in some cases prosthetists are prevented from providing the foot they feel will be of most benefit to a patient, because it will not qualify for reimbursement given the patient's functional level.

Our practice is prepared to recommend and provide the most appropriate prosthetic components for each patient we serve, reflecting both physical and fiscal realities. Call us for more information.

Shock Pylons Enable More Normal Gait

Prosthetic ambulation can be quite painful and damaging as impact forces at heel strike are transmitted up the prosthetic limb through the socket to the residual limb and on to the upper leg, hips and back. Undampened, these unfriendly forces can discourage even the fittest amputees from achieving their functional potential.

An increasingly applied tool in the effort to reduce impact stress is the shock pylon, a component that simulates the rotation and shock absorption of the natural limb.

What's New

The pylon of an endoskeletal prosthesis serves as the connector and weight-bearing member between the foot component and the socket of a below-knee prosthesis, or the knee unit of an above-knee system. The primary expectations of basic pylons is that they withstand the recurrent shock of heel strike and weigh no more than necessary.

Shock pylons are capable of considerably more function, helping to mitigate common amputee unnatural gait compensations undertaken to avoid impact shock.

Various shock pylon designs are engineered with compression springs, pneumatic or hydraulic systems to significantly raise the amputee's threshold of ambulation discomfort. Shock pylons are sometimes integrally built into a prosthetic foot assembly, such as the Ohio Willow Wood Pathfinder and the Össur Ceterus and Reflex VSP. Others, such as the Endolite Mercury Pylon and Seattle AirStance, are separate components fabricated into the finished prosthetic limb.

DuraShock Pylon

Fillauer's DuraShock Pylon is a newer impact stress-reducing design, notable for its ability to accommodate 60 degrees of axial rotation—30 degrees in each direction—thereby reducing torsional strain on the residual limb.

DuraShock Pylon
Courtesy, Fillauer Inc.

That capability makes the DuraShock applicable for active amputees who frequently use twisting and turning motions in their vocational setting and/or in recreational activities such as golf, tennis, hiking and gardening.

Other notable designs in this category include Otto Bock's Delta Twist Shock Absorber, which features independently adjustable rotation settings for heel strike and toe off, and Össur's Total Shock.

Note to Our Readers

Mention of specific products in our newsletter neither constitutes endorsement nor implies that we will recommend selection of those particular products for use with any particular patient or application. We offer this information to enhance professional and individual understanding of the orthotic and prosthetic disciplines and the experience and capabilities of our practice.

We gratefully acknowledge the assistance of the following resources used in compiling this issue:

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