Geriatric Footwear

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Objectives

After reading this continuing education article, you should be able to:

1. Identify the special footwear needs of older patients.

2. Describe the components of footwear for older patients.

3. Understand therapeutic relationships pertaining to footwear for older patients.

4. Apply this knowledge in the successful clinical care of older patients.

The interest in footwear for older patients surfaced as a significant issue with the adoption of the Therapeutic Shoe Provision of the Medicare Act. The requirements provide allowed reimbursement for Medicare-eligible patients who have diabetes, and who have one or more of the following conditions:

History of partial or complete amputation of the foot
History of previous foot ulceration
History of pre-ulcerative callus
Peripheral neuropathy with evidence of callus formation
Foot deformity
Poor circulation

In addition, the patient must be under a comprehensive plan of care by a medical physician (M.D. - D.O.) for his or her diabetes. The patient must also need special shoes (depth or custom molded) because of his or her diabetes.

For the purposes of Medicare, and as a general requirement, a custom molded shoe is constructed over a cast or model of the patient's foot. It has to be made of leather or another suitable material of equal quality. The custom shoe must have inserts that can be removed, altered, or replaced, according to the individual's conditions and needs. The shoe must have some form a closure, such as laces or Velcro.

A depth shoe has a filler or insole that extends from heel to toe and provides at least 3/16 inch of additional depth when removed.

An Extra Depth provides a 1/4 inch additional depth and the Super Depth shoe provide 1/2 inch additional depth for total contact orthoses or inserts.

AT RISK CONDITIONS

It is clear to clinicians that for many older patients who are equally "at risk" from other conditions such as arterial insufficiency, rheumatoid and degenerative arthritis, gout and other conditions of the neurologic and musculoskeletal systems, footwear holds a direct relationship to foot problems. As an example, the "at risk" conditions include as primary examples:

DIAGNOSIS - CPT CODES

Amyotrophic Lateral Sclerosis - 355.20
Arteritis of the Feet - 477.6
Arteriosclerosis Obliterans (ASO), - 440.20

Arteriosclerosis of Extremities
Occlusive Peripheral Arteriosclerosis
Peripheral Arterial Disease
Arteriosclerosis with Claudication - 440.21
Arteriosclerosis with Rest Pain - 440.22
Buerger's Disease (Thromboangitis Obliterans) - 443.1
Chronic Indurated Cellulitis - 682.7
Chronic Deep Thrombophlebitis - 451.19
Chronic Superficial Thrombophlebitis - 451.0
Chronic Venous Insufficiency - 459.81
Lymphedema Secondary to -
Milroy's Disease - 757.0
Malignancy - 457.1
Peripheral Neuropathies -
Malnutrition & Vitamin Deficiency - 357.4
Malabsorption - 579.0
Alcoholism - 357.5
Pernicious Anemia - 281.0
Carcinoma - 357.3
Diabetes Mellitus - 250.00-250.93
Drugs & Toxins - 357.6
Hereditary Disorders -
Hereditary Sensory Radicular Neuropathy - 356.2
Angiokeratoma Corporis Diffusum (Fabrays) - 272.7
Amylois Neuropathy - 277.3
Leprosy - 030.0-030.03
Multiple Sclerosis - 340.0
Neurosyphilis - 094.0-094.87
Traumatic - 959.7
Peripheral Vascular Disease - 443.81
Raynaud's Disease - 443.0
Uremia - CRF - 585.0
Intractable Edema Secondary to -
Congestive Heart Failure - 428.0
Renal Insufficiency - Kidney Disease - 585.0
Hypothyroidism - 244.9
Diabetes Mellitus
IDDM - 250.01
NIDDM - 250.00
IDDM - Neuropathy - 250.61

IDDM - PVD - 250.71
NIDDM - Neuropathy - 250.60
NIDDM - PVD - 250.70

and as secondary examples:

Acromegaly - 253.0
Alzheimer's Disease - 331.0
Arthritis - DJD - 715.92
Arthritis - RA - 714.0
Gout - 274.9
Cerebral Palsy - 343.9
Coagulation Defect - Hemophilia - 286.9
CVA - 438
Phlebitis - 451.2
Sarcoidosis - 135
Sickle-Cell Anemia - 282.60
Previous Amputation - Foot - 895.0
Previous Amputation - Toe - 895.0
History of Prior Ulcer - 701.1
Pre-ulcerative hyperkeratosis - 707.9
Foot Deformity - 736.7
Vascular Insufficiency - 443.9
Reflex Sympathetic Dystrophy - 337.22
Coagulation Defect, Anticoagulants - 286.7

ETIOLOGY OF FOOT PATHOLOGY

It must be remembered that shoes alone do not cause foot problems. But shoe to foot incompatibilities do help precipitate pressure areas, pain, and limitation of ambulation. They require the same careful selection for the non-diabetic patient as does the patient with diabetes mellitus.

The human foot is an organ that is both static and mobile. It provides support for the body while at rest and during propulsion, and provides ambulation. For the older patient, the ability to remain mobile and functional is many times the difference in the quality of life, the ability to retain the activities and instrumental activities of daily living, and the ability to remain non-institutionalized.

The human foot, in addition to its static and propulsive activity, is subjected by the changes in society to additional forces and activities. These changes are reflected in the hard, flat walking surfaces and the forces of gravity, which are related to the weight and activity of the individual as well as the changes in muscular activity related to function motion and disability. With the older patient, gait dysfunction and osseous remodeling are related to the resiliency of the foot itself and the ability to respond and adapt to stress. Footwear as worn by the

patient must function as an integral part of activity and become an extension of the individual.

The foot, from a morphologic standpoint, is basically a modified rectangle. When disease and/or deformity is present, the changes that occur may alter the sides of the rectangle, but the basic figure is retained to a greater degree. It should also be noted that the foot is three dimensional and that all considerations of footwear, modifications and related orthotics must consider this fact. Issues that must be considered include loading, stance, propulsion, gait and speed and their interaction to the shoe, which is in a sense, an article of protective clothing.

GERIATRICS AND SHOES

The shoes provided to older patients must be appropriate for the activity that is being undertaken. They must assist not only in protection, but also in helping to reduce shear and shock. They must assist in the transfer of force from one part of the foot to another, during the gait cycle and during stance. In addition, shoes should not produce pain and discomfort.

Shoes can be modified or combined with orthotics as a working unity to help reduce sensitive or painful areas. Shoes for older patients can be selected and modified to support flexible deformities, accommodate fixer deformities, and control or limit motion, as needed, to compensate for degenerative joint changes that occur in the foot.

Shoes for older patients must protect and provide comfort. They must assist in both stance and locomotion to help us cope with the environmental changes in society. These include the hard, flat surface or the plane of support; the social and psychologic pressures of society; the effects of prolonged and repetitive micro trauma associated with occupational needs; the weight of the individual; and the effects of the shoes last, construction and material in relation to incompatibilities.

It is also important to recognize the needs of the older person as a human being. This is someone who still wants to function as an integral member of society. It is important to consider the impact of disease and disability on shoe selection as well as changes, such as atrophy and hypertrophy, neuromuscular responses, or psychic or psychogenic responses, involving the patient as a whole.

ANATOMY OF THE SHOE

The modern shoe is defined by the last, which determine the shape and cubical content of the shoe. The various forms of construction and materials will vary depending on the shoe's projected use and cost. The height of the heel may have a direct relationship on design, with men's shoes generally having a lower or military heel. Shoes that are generally defined as "orthopedic" usually have a Thomas heel, which provides an extension of the medial portion for the heel for

additional support. But today, the use of the molded sole and wedge design provides footwear that are essentially unisex.

The upper of the shoe usually includes portions referred to as the vamp, quarter, lace stay, top facing, back stay, collar, linings, foxings, toe box, and shank piece. It has such designations as the throat, shank, vamp line, and toe box depth. The vamp is the lower part of the upper which attaches to the sole or welt. The quarter usually refers to the back portion or heel area of the upper or that portion that would go around the outline of the counter. The lace stay usually refers to a reinforcement of leather or other material found in front of the insertion of the lace-eyelets. The lace-stay covers the tongue, which is a protective of leather or other material that provides protection of the foot from the eyelets and lacings. Many shoes today utilize a padded collar to add to the comfort of footwear.

Better shoes generally have two linings for additional protection. But when they are broken or cracked, that can cause limited pressure points. The same is true for foxings or trimmings.

The box or tip of the shoe is usually reinforced over the toes, providing rigidity for additional protection and style. Very shallow toe boxes create compression incompatibilities, especially with digital contractures and edema. Higher to boxes provide greater depth. The counter of the shoe by classic design, is a rigid reinforcement for the heel area. A long counter, extends the medial segment to the navicular area.

The insole, depending on the type of shoe construction and material utilized, provides the initial contract between the sole of the foot and other segments of the shoe, such as the sock lining, filler, counter under quarter, bottom filler and shank, as well as the welt and sole. The filler usually consists of ground cork between the insole. With molded soles, some of the traditional shoe construction is modified. The outsole is that portion of the shoe used for ground support.

The thickness and selection of materials comprising the insole, outsole, and fillers have an effect on the weight diffusive capacities of the shoe. Once worn for a period of time, the weight dispersing qualities of the material are manifest from the effects of weight bearing, loading and ambulation, in relation to the foot and its function.

The shank of the shoe usually refers to the area of the outsole between the breast of the heel and the widest portion of the outsole, when designating position. The shank piece is a rigid supportive material (steel or laminate) that varies in width and determines the rigidity of the area on weight bearing. It is inserted in the heel center and the ball portion of the shoe. The shank pitch of the sole is the plane or angle of the shank area from the breast of the heel to the sole contact or ball of the foot. The wedge shoes and molded soles used today act in a sense as a shank filler

and add rigidity. It should also be noted that heel height, sole material and shoe modifications are measured in eighths (1/8").

SHOE CONSTRUCTION

The final area of discussion for the generic shoe lies in its construction, for example, Goodyear Welt, Stitchdown, McKay, Littleway, Turn Sole and Molded Sole. Shoe modification ease will also depend on the type of construction.

Shoe lasts need to be compatible with foot types, for example, inflare, outflare, or straight. Where deformities exist, there may need to be special lasts such as "bunion last" or "extra depth" lasts.

When the older patient cannot be fit with a commercially available stock shoe, a depth, extra depth, super depth or custom molded shoe needs to be considered.

Examples of special needs include the following:

Residuals of osteoarthritis
Residuals of rheumatoid arthritis
Hallux limitus
Hallux rigidus
Metatarsal phalangeal arthritis
Amputated hallux
Amputated digits
Hallux valgus - Mild
Hallux valgus - Severe
Short first ray (Morton's syndrome)
Hammer toes - Digital contractures
Flexible inverted heel
Flexible pes planus - Mild or severe
Rigid pes planus
Pes cavus - Mild or rigid (severe)
Metatarsalgia
Intermetatarsal neuritis
Severe residual deformity
Gouty arthritis
Calcaneal spur
Calcaneal bursitis
Plantar fasciitis
Limited dorsiflexion
Peripheral vascular impairment
Limb length discrepancy - Less than 1 1/2"
Limb length discrepancy - More than 1 1/2 "
Forefoot amputation - Transmetatarsal
Forefoot amputation - Lisfrank or Chopart

Charcot joint or foot
Unstable ankle

SHOE MODIFICATIONS

Examples of shoe modifications commonly employed for the older patient include but are not limited to some general concepts.

Heel Wedges

The medial heel seat wedge is used for valgus deformities and the lateral heel seat wedge is used for varus deformities involving the heel. These wedges, placed between the heel and outsole, are at times used with sole wedges to achieve gait modification and are used to provide better balance to the heel.

Sole Wedges

Sole wedges are usually used with other shoe modifications (such as heel wedges) for alignment, support, and to help attain a better gait pattern. The lateral sole wedge may also be called a "lateral Dutchman." These are all usually placed between the outsole and the filler and adapted back into the welt.

Metatarsal Bars

The metatarsal bar is used to shift the weight from the metatarsal heads to locations along the metatarsal shafts. The bar is placed on the outsole as an external shoe modification. In addition, the bars generally permit heel rise to push off without additional metatarsal head weight bearing. They are usually placed just proximal to the metatarsal heads. Modifications include the Denver Bare (which may be placed internally), the Hauser Bar, or Comma Bar, as well as other modification of the principle.

Thomas Heel

The Thomas heel, a common component of the orthopedic shoe, is a medial extension of the heel to improve balance, provide additional support, and relieve pressure from the shank area. The heel may be reversed (reverse Thomas heel) to provide similar functions for the lateral aspect of the shoe.

A flared heel is used to provide broader support and additional stability to the ankle and heel the heels from "running over". The flare may be used either medially or laterally. The extension of the flare is usually equal to the widest portion of the counter.

Shank Filler

A shank filler, in effect, turns any shoe into a "wedge shoe" by filling in the area between the anterior portion of the heel and contact point of the outsole. By filling in the area between the breast of the heel and toe break, a total contact weight bearing area can be provided, and then shank area then becomes more stable. Shank filler can also be used medially for excessive valgus of the foot and laterally, for excessive varus of the foot.

Where there is a loss of push off function in gait, a long steel stiffener can be employed, extended to the toes. It precludes the shoe from remaining in a dorsiflexed position. It is usually placed from the breast of the heel to the anterior toe area, between the outsole and filler, as would be a steel shank. In a sense, it is a spring extension of the steel shank.

Rocker Bar

A rocker bar is a modification of the metatarsal bar and is designed to prevent and flexion or extension of the shoe. It can be employed where pain is present with toe bending. Function occurs by the weight rocking into heel rise and push off. The bar usually extends from the midshank area to just proximal to the anterior tip of the shoe, with the widest point of the shoe usually at the highest point of the rocker bar.

SACH & KEEL Heels

Where there is a need to provide simulated plantar flexion (extension) or ankle motion, a solid ankle cushion heel or SACH heel, can be ordered. This provides a soft wedge at the posterior inferior tip of the heel of the shoe at heel strike. If there is some shortage of the extremity, a heel seat cushion can be added internally. If greater motion is desired and there is no clinical shortage of significance, adding a heel cushion to the opposite shoe will provide such response. Limiting motion with a SACH heel, can be accomplished by using a metatarsal bar, rocker bar, steel spring, or double sole. The KEEL heel can be used to eliminate lateral forces that ten to turn the heel or ankle, such as in post fracture care.

Steel Springs

Long steel springs can be employed to strengthen the shoe and reinforce the arch area of a lightweight shoe. The spring is placed at the center of the heel to the widest portion of the outsole, between the outsole and filler or between the insole and outsole.

Limb Length Accommodations

Where there are significant limb length problems, cork or other material build-ups can be fabricated. Neoprene crepe can also be used for this function as well as for

shock absorption and weight diffusion. Properly modified the same materials can also be adapted for weight dispersion.

Where there is significant limb length shortage than can not be managed by the previous identified methods, a skate build-up or extension can be prescribed. Stability must be assured to avoid ankle injury.

Various forms of shoe modification have also been employed, such as add the filler under metatarsal or calcaneal areas for pain. However, orthoses properly used are more effective and tend to be less costly for the patient, as they can be transferred from shoe to shoe.

Additional shoe modifications include medial longitudinal arch pads (or "cookies"), metatarsal pads, internal heel wedges, calcaneal bars, heel pads and lifts,

Barton and Thomas Wedges

Shoe modifications can be considered when shoe lasts are compatible with foot types, when shoe construction can be considered for modification, and when the patient will comply. Custom molder shoes should be considered when therapeutic modification can not be completed in an efficient fashion.

SHOE SELECTION

Shoe selection also needs to focus on the basic shoe types, bal, blucher, low cut, high top and surgical as well as the functional needs of the patient. When orthotics or other internal shoe modifications are to be considered, appropriate last must be utilized to accommodate for the depth reduction. Older patients generally are more comfortable with less rigidity and more flexibility unless there are specific deformities are present, which require modification.

As a final comment, footwear is needed for protection and should permit the patient to function as normally as possible. The shoe must function as a unit with the patient and be compatible with and supportive to the patient's functional requirements and ambulatory needs. Selecting shoes for older patients should always place comfort and function above style, but patients also need to function in society, making intelligent compromise a consideration for the patient's overall welfare.

QUESTIONS

1. For diabetics to receive shoes under the therapeutic shoe provision, which of the following is correct?

a. The patient must have insulin dependent diabetes.
b. The patient must be under a comprehensive plan for the management of their diabetes.
c. The patient must have diabetes for a minimum duration of five years.
d. The patient must have vascular impairment in addition to diabetes.

2. Which basic shoe type is usually considered optimal for the older diabetic patient?

a. Blucher
b. Bal
c. High Cut
d. Low Cut

3. Foxings are usually present on which segment of the shoe?

a. Sole
b. Filler
c. Upper
d. Tongue

4. The shank area is located on the

a. Back Stay
b. Sole
c. Upper
d. Toe Box

5. The _____ heel usually extends the support for the medial portion of the heel and arch

a. Gordon
b. SACH
c. Thomas
d. KEEL

6. The last determines the

a. shape of the shoe
b. Size of the collar
c. Placement of the lace stays
d. Amount of filler

7. The classic depth shoe usually has a

a. Flexible sole
b. High toe box
c. Double back stay
d. No shank area

8. The medial heel seat wedge is used for

a. Varus deformities
b. Plantar fasciitis
c. Valgus deformities
d. Drop foot

9. Which of the following shoe modifications transfer weight from the metatarsal heads?

a. SACH Heel
b. Hauser Bar
c. Lateral Dutchman
d. Medical Sole Wedge

10. Which of the following method of shoe construction is usually associated with the classic orthopedic shoe?

a. Littleway
b. Turn Sole
c. Stitchdown
d. Good Year Welt

11. Which shoe flare is usually most compatible with pronation?

a. Inflare
b. Outflare
c. Straight
d. McKay

12. The standard Thomas Heel reinforces which area of the shoe?

a. Lateral counter
b. Shank
c. Back stay
d. Medial counter

13. Shoe modifications are measured in which of the following linear measures?

a. 1/8"
b. 1/16"
c. 3/16"
d. 1/4"

14. The term used to fill in the outsole of the shoe between the heel and ball is termed

a. Quarter
b. Vamp
c. Rocker Bar
d. Shank Filler

15. A medial longitudinal arch pad, placed in a shoe is known as a

a. Cookie
b. Lift
c. Thomas Wedge
d. Anterior Calcaneal Bar

16. Under the Therapeutic Shoe provisions of Medicare, a non-insulin dependent, diet-controlled diabetic patient with an amputated left hallux

a. Automatically qualifies for depth shoes
b. Qualifies for depth shoes if he or she sees their family physician within the last year
c. Qualifies for depth shoes only if there is a comprehensive plan for the management of their diabetes
d. Qualifies for two pair of shoes per year because of the amputation

17. Steel springs are usually placed in the

a. Heel
b. Longitudinal arch area
c. Toe Box
d. Shank area

18. The classic rocker bar transfers weight over the

a. Toes
b. Metatarsal Heads
c. Metatarsal Shafts
d. Heel Spur

19. Which of the following is not considered as a part of the shoe upper?

a. Quarter
b. Vamp
c. Collar
d. Shank

20. Which material is usually utilized to replace a shoe closure when a patient cannot tie a depth shoes?

a. Foxings
b. Velcro
c. Quarters
d. Self-closing tongue

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