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Assessing Diabetic Foot Problems in the Older Patient

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Abstract

Man's foot is all his own. It is unlike any other foot. It is the most distinctive human part of the whole of his anatomical makeup. It is a human specialization and whether he is proud of it or not, it is his hallmark and so long as man has been man and so long as he remains man it is by his feet that he will be known from all other members of the animal kingdom. It is his feet that confer upon him his only real distinction and provide his only valid claim to human status.

Abbreviations: LOPS: Loss Of Protective Sensation; ABI: Ankle-Brachial Index; LOS: Loss Of Protective Sensation; VPT: Vibration Perception Threshold; MST: Monofilament Sensory Testing; PVR: Pulse Volume Recorder; ABI: Ankle Brachial Index; ADL: Activities of Daily Living; IADL: Instrumental Activities of Daily Living

Review

Learning Objectives

To identify and recognizes and changes in the foot and its related structures associated with diabetes, aging, and chronic diseases. To identify primary foot and related complications associated with diabetes mellitus and aging. To define clinical strategies to assess the "at risk" patient and understand primary management options, including service indicators. To develop management programs that stress assessment, education, and prevention including referral and continuing education programs.

Introduction

The first component of prevention is patient education. The patient and in particular, the older diabetic must be fully informed about their problems, and understand the management process and be willing to make changes in their life style to prevent future complications. Diabetic patients, particularly the older diabetic patients are burdened with complicating foot disorders and concomitant disease. The benefits of periodic assessment and continuing surveillance as well as continuing care is needed to manage the diabetic patient with foot changes as a public health, social, and ethical responsibility of society [1-4].

This paper will:

a) Outline an assessment protocol;

b) Discuss risk stratification principles;

c) Identify common foot and related problems and complications associated with selected risk systemic diseases;

d) Provide early preventive strategies to reduce complications and amputations as well as provide guidelines for care and referral;

e) Identify changes in the foot and related structures associated with aging and chronic Diseases.

Assessment

The primary factors that contribute to the development of foot problems in the diabetic and elderly are associated with the degree of walking, the duration of hospitalization or institutionalization, the lack of and prior foot care and management, the environment, soft tissue atrophy and joint deformities, emotional adjustments to life, past and current medications and therapeutic programs, and the presence of chronic diseases such as diabetes mellitus, peripheral vascular disease, arteriosclerosis, degenerative arthritis, rheumatoid arthritis, gout, muscular diseases and myopathies, neurologic diseases and neuropathies, infection, the residuals of prior trauma, psychiatric disorders, and dermatoses. Additional risk factors include prior amputation, past history of foot ulcers, peripheral neuropathy, visual impairment, nephropathy, a history of dialysis, Charcot joint, and a history of prior vascular surgery, angioplasty, and prior tobacco use [5-17].

Other significant problems include cognitive problems (i.e. dementia, delirium, depression, and isolation); iatrogenesis (i.e. polypharmacy, catheters, restraints, prolonged bed rest, and abuse); disabling complications (i.e. vascular, neurologic, and ulcerative changes); frailty (i.e. immobility, balance issues, pain, endurance limitation, atrophy of muscle and bone, anemia, and fall history): and nutritional problems (i.e. anorexia, weight loss, osteopenia, vitamin deficiency, malnutrition, and impoverishment). In addition, changes in medical, psychological, and functional capabilities, limited activity, a lack of assessment, surveillance, and care, add to the burden of illness associated with diabetes mellitus.

The Podogeriatric and Chronic Disease Assessment Protocol (Helfand Index) developed for the Pennsylvania Department of health, Diabetes Control Program recommended as an instrument to assess, reassess, and utilize as a continuing surveillance format to enhance the early diagnosis of complications, recommendations for care and education, and to follow the principles of primary, secondary, and tertiary prevention.

The initial component of the Podogeriatric Assessment and Risk Stratification process is to identify the history of the present illness and complaints to include the but not limited to the following: swelling of feet, painful feet, hyperkeratosis, onychial changes, bunions, painful toenails, infections, cold feet and other concerns. In addition, the following related issue should be identified and noted to include location; quality; severity; duration; context; modifying factors; and associated signs and symptoms [18-29].

The next component is to identify a related past medical history to include heart diseases, high blood pressure, arthritis (degenerative, rheumatoid), circulatory disease (arterial and venous), thyroid disease, allergies, hyper cholesterol, gout, diabetes mellitus (type I and II), history of smoking, history of alcohol use, related family history, and a social history to include substance abuse, alcohol abuse, and/or medication abuse. A systems review should include constitutional issues, ear, nose, and throat, eyes, dermatologic (skin, hair, and nails), respiratory, psychiatric, hematologic, cardiovascular, peripheral vascular (arterial and venous), musculoskeletal (muscle and joint), gynecologic, lymphatic, genitourinary, neurologic, endocrine, and immunologic.

A review of the patient's medications should include a list of current drugs, evidence of polypharmacy, adverse reactions to drugs and procedures, and the response, including adverse reactions, to current and past therapeutic interventions. The patient's response to prior treatment should be identified and noted and include the management of mobility and ambulation (including ambulatory aids), podalgia (pain involving the foot and related structures) and a history of pododynia dysbasia (pain and/or difficulty in walking).

The initial clinical assessment involves the dermatologic and onychial components to include hyperkeratosis (tyloma and heloma), onychauxis, infection, ulceration, onychomycosis, onychodystrophy, onychogryphosis, cyanosis, hematoma, onycholysis, onychogryphosis, xerosis, tinea pedis, verruca, rubor, discoloration, pre-ulcerative lesions, Beau's lines, onychorrhexis, and hemosiderin deposition. Painful or painless wounds, slow-healing wounds, ulceration, necrosis, chronic scaling, itching, dry feet, hyperhidrosis, diminished or absent hair, fissures, diabetic dermopathy (pre-tibial lesions or shin spots, necrobiosis, chronic onychiaand/or paronychia are important clinical responses and findings.

The next segment is a foot, ankle, and related orthopedic evaluation to include; biomechanics, pathomechanics, hallux valgus, anterior imbalance, metatarsal prolapse, digiti flexus and hammertoes, pes planus, pes valgo-planus, Helbing's sign, range of motion, pes cavus, hallux rigidus or limitus, Morton's syndrome, bursitis, prominent metatarsal heads, Charcot joints (rocker bottom foot), hypoplasia, plantar atrophy, and plantar fat pad displacement. Equinus, drop foot, neurotrophic arthropathy, a gradual change in the shape of the foot, and a sudden. Painless change in foot shape, with swelling and/or a history of trauma are also common in long standing diabetic neuropathy, The clinical signs of an intrinsic minus foot including hammer toes prominent metatarsal heads, wasting of the lumbricales (guttering between metatarsals), dorsal rotation of the foot, distal migration of the plantar fat pad, weak extensors, cock-up deformity of the doral longus tendons, pes cavus, prominent metatarsal heads, and xerosis are present. Postsurgical deformities, such as amputations and their management should be noted. Gait evaluation is also an important issue relating to fall risk and footwear.

The primary elements for the peripheral vascular assessment include the following; coldness, trophic changes, dorsalis pedis pulse, posterior tibial pulse, popliteal and femoral pulses, night cramps, edema, claudication, varicosities, stasis, atrophy, ulceration, stasis, other changes, and amputation (above the knee, below the knee, partial foot, or toe. In addition, pain at rest, especially nocturnal, relieved by dependency, femoral bruits, dependent rubor, plantar pallor on elevation, prolonged capillary filling time (>3-4 seconds), and decreased skin temperature (dermal thermometry), are other clinical findings. Ankle-Brachial Index (ABI) to be utilized as indicated [30-51].

The neurologic evaluation includes the following; Achilles reflex, vibratory sensation (C-128 tuning fork), loss of protective sensation-LOS (Semmes-Weinstein 10 gram monofilament), sharp and dull response, pin prick, paresthesia, hyperesthesia, proprioception, pain, Schaffer's response (pinch tendo Achilles), superficial plantar reflex (Babinski, Oppenheimer's, Chaddock's, or Gordon's response), patellar reflex, Achilles reflex, clonus, Romberg, joint position, burning or other findings. In addition

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sensory changes such as burning, tingling, crawling, and hypersensitivity should be noted. Muscle weakness and foot drop along with diminished or absent sweating are important. Vibration perception threshold should be determined as indicated.

For diabetic patients, the loss of protective sensation (LOPS) should be identified and includes a diagnosis of the loss of protective sensation, Monofilament testing, a history of diabetes mellitus, visual inspection of foot and related changes, foot structure including pathomechanics and biomechanics, the vascular status, and skin integrity. The Neurologic Risk Stratification may be identified as: 0 = no sensory loss, 1 = sensory loss, 2 = sensory loss with deformity and 3 = Sensory loss with a history of ulceration, deformity, and or neurosensory changes with ischemia. Vascular Risk Stratification may be identified as; 0 = no change, 1 = mild claudication, 2 = moderate claudication, 3 = severe claudication, 4 = ischemic rest pain, 5 = minor tissue loss, or 6 = major tissue loss.

In addition, for patients to receive primary foot care as a covered service, the patient must exhibit a series of symptoms and clinical findings in addition to diabetes mellitus or other "at risk" diseases. These elements are Medicare Class Findings. What are required are one Medicare Class "A" Finding; two Medicare Class "B" Findings; or one Class "B" and two class "C" findings. They include the following:

A - Nontraumatic Amputation

B - 1 absent Posterior Tibial Pulse

B - 2 - Advanced Trophic Changes, including a) hair growth (decreased

orabsent absent),b -nail changes (thickening), c -pigmentary

Changes, including discoloration, hemosiderin deposition, and shin spots (dermopathy), d - skin texture (thin. Shiny, or atrophic, and e - skin color (rubor, redness, and/orstasis B - 3 Absent Dorsalis Pedis Pulse

C - 1 intermittent claudication, C - 2 temperature change (coldness or ischemia), C - 3 edema, C -4paresthesia and/or C - 5 Burning.

Medicare also excludes the treatment of flat feet, routine foot care, and supportive devices for the foot, unless covered by an exemption to the exclusions, such as in the case of diabetes mellitus with significant vascular and/or neurologic findings. Medicare also has specific finds for the debridement of onychomycosis involving the toenails. Then include the following: documentation of mycosis & dystrophy causing secondary infection and/or pain which result or would result in marked limitation of ambulation; discoloration, hypertrophy, subungual debris, onycholysis, secondary infection, and limitation of ambulation and pain (pododynia dysbasia).

The clinical findings should also include the classification of mechanical or pressure hyperkeratosis as an extension of risk stratification utilizing the following grading examples: Grades0-no lesion; 1-No specific tyloma plaque, but diffuse or pinch hyperkeratotic tissue or in narrow bands; 2-circumscribed, punctate, oval, or circular well defined thickening or keratinized tissue; 3-heloma milliare or heloma a durum with no associated tyloma; 4-well defined tyloma plaque with a definite heloma with no associated tyloma; 5-extravasation, maceration and early breakdown of structures under the tyloma or callus layer; 6-complete breakdown of structure of hyperkeratotic tissue, epidermis, extending to superficial dermal involvement. If plantar keratosis is noted, the metatarsal head pattern should be noted as right and/or left, metatarsal head areas 1 through 5. Plantar fat pad atrophy and anterior displacement should be included in the assessment.

There are several methods to stratify and classify ulcers including the Wagner, Liverpool, and University of Texas. We suggested the modification developed by Simms, Cavanaugh, and Ulbrecht because it grades the earliest sign of pressure, prior to the clinical evidence of tissue loss. Sub-keratotic hemorrhage, hematoma, and/or maceration as an early indication of infection. The classification is listed as:

Grade-0- Absent skin lesion

Grade-1-Dense callus but not pre-ulcer or ulcer

Grade-2-Pre-ulcerative changes (hematoma-maceration-fissure)

Grade-3-Partial thickness (superficial ulcer)

Grade-4-Full thickness (deep) ulcer but no involvement of tendon, bone, ligament, or joint

Grade-5-Full thickness (deep) ulcer with involvement of tendon, bone, ligament, or joint

Grade-6-Localized infection (abscess or osteomyelitis)

Grade-7-Proximal spread of infection (ascending cellulites or lymphadenopathy)

Grade-8-Gangrene of forefoot only

Grade-9-Gangrene of majority of foot

The protocol also provides a means to stratify onychial (toenail) changes. Because of insurance guidelines related to debridement, stratification is important as follows:

Onychial Grades at Risk

Grade-1-Normal

Grade-2-Mild Hypertrophy

Grade-3-Hypertrophic, Dystrophic, Onychauxis, Mycotic, Infected, Onychodysplasia

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Grade-4-Hypertrophic, Deformed, Onychogryphosis, Dystrophic, Mycotic, and Infected It is also important to identify any degree of discomfort, pain (podalgia), or difficulty in ambulating (pododynia dysbasia) as a result of toenail deformity or infection (bacterial or mycotic).

Footwear should be evaluated as satisfactory or unsatisfactory, particularly as pertains to each individual and their pedal and related status. Footwear patterns of wear, shoe last, depth, fit, lining wear, the presence of foreign bodies, also should also be noted. This review is important because of the "diabetic shoe" provision covered by Medicare. The same is true for foot orthoses and shoe inserts. The same is true for stockings as to fabric (nylon, cotton, wool, acrylic, silk, other material, or none at all. Stockings and shoes also have a bearing on friction. A review of the patient's hygiene is important and a starting point for foot health education.

The final segments of the protocol include an assessment of the patient's foot and related conditions and a plan for care, continuing assessment, and surveillance. The plan for care usually includes podiatric referral, medical referral, additional vascular studies, imaging (radiography, MRI, and scans), clinical laboratory studies, prescriptions, special footwear, and patient education [52,53]. As a part of the assessment process, several instruments can be employedto enhance the evaluation. They include the following as examples: C-128 Hz tuning fork; neurologic hammer; percussion hammer; Babinski hammer; neuroesthiesometer, Vibration Perception Threshold (VPT), including Monofilament Sensory Testing (MST)-5.07-(10 GM)-Norton-West; Tip-Therm; Imaging (radiography, MRI, CT scan, and/or ultrasound; two point discriminator; pin-wheel; Tactic on; Doppler; pulse volume recorder (PVR); radiometer; ABI (ankle brachial index); oscillometer; transcutaneous oxygen; and arteriography.

There are also a number of systemic and/or life changes that contribute to high risk foot problems, especially in patients with diabetes mellitus, Examples include the following: chronic constipation and incontinence; weakened muscle and bone structure; impaired cardiovascular function; diabetes mellitus; peripheral vascular and lower extremity arterial disease; renal impairment and/or dialysis; reduced interest and/or participation in social activities; visual impairment; decreased and/or loss of mobility; agitation; compulsive activities; sleep impairment; a Reduction in Independent Activities of Daily Living (ADL) and/or Instrumental Activities of Daily Living (IADL); increased foot perspiration; neurologic and sensory deficits; self-mutilation; neurologic excoriation; changes in mental status; and untreated and/or undertreated hyperkeratosis, onychauxis, onychogryphosis, ulcers, tinea pedis, xerosis, abrasions, and/or fissures [54].

There are also measurable outcomes of immobility that increase the risk factors for older patients and in particular, older diabetics. The most common include the following: sluggish vascular status; cardiovascular stress; chronic constipation; weakened muscles; weakened bone structure; incontinence; pressure ulcers; increased agitation; depression; decreased appetite; increased risk of pneumonia; and increased risk of urinary infection

In addition quality of life changes increase complication risk and include the following: reduced socialization; withdrawal from surroundings; loss of participation in activities; loss of independent or assisted mobility; loss of independent or assisted bathing and/or dressing; loss of desire to live, to discover life and/or to love; a loss of dignity, decreased desire to eat, loss of independent or assisted toileting, increased problems with sleep patterns, a loss of interest in others, and a failure to live life to the end of life.

Medicare has restrictions pertaining to coverage for primary foot care for patients with diabetes mellitus as well as other diseases and conditions unless there is clinical evidence of vascular and/or neurosensory deficits. The prime examples identified by CMS include the following: diabetes mellitus without evidence of severe vascular or neurologic disease; end-stage renal disease; kidney dialysis; history of organ transplantation, on immunosuppression; hemorrhagic/bleeding conditions, including hemophilia; use of blood thinners/anticoagulants (warfarin, Coumadin); history of artificial joints, heart valves, or blood vessels; history of valvular heart disease, even if you have been advised to take antibiotics around the time of dental work; cancer; chemotherapy for cancer, or other health condition; HIV/Aids; legal blindness; inability to see and/or reach your own feet; living alone; mental retardation; and a history of stroke, spinal cord injury, or brain injury. No other segment of our human anatomy is so classified and thus a detailed assessment if critical to prevent complications from a variety of chronic diseases or/or conditions and this placing the concepts of prevention (primary, secondary, and/or tertiary) have been placed at risk.

CMS has also provided an example list of those diseases considered as Primary Medicare Risk Diseases. These conditions include as examples, the following:

a) Amyotrophic Lateral Sclerosis

b) Arteriosclerosis Obliterans (ASO, Arteriosclerosis, Occlusive Peripheral Arteriosclerosis)

c) Buerger's Disease (TAO)

d) Chronic Indurated Cellulitis

e) Peripheral Vascular Disease

f) Chronic Thrombophlebitis

g) Chronic Venous Insufficiency

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h) Diabetes Mellitus

i) Intractable Edema Secondary to CHF, Renal Disease, and Hypothyroidism

j) Lymphedema Secondary to Milroy's Disease or Malignancy

k) Primary Medicare Risk Diseases

l) Raynaud's Disease

m) Peripheral Neuropathies of the Feet Associated with:

n) Malnutrition

o) Vitamin Deficiency

p) Pellagra

q) Alcoholism

r) Malabsorption

s) Pernicious Anemia

t) Carcinoma

u) Fabry's

v) Diabetes Mellitus

w) Drugs and Toxins

x) Multiple Sclerosis

y) Uremia – Chronic Renal Disease

z) Traumatic Injury

aa) Leprosy

bb) Neurosyphilis

cc) Hereditary Disorders

dd) Amyloid Neuropathy

There are a number of secondary risk factors that equally are risk factors for complications for diabetic and older patients. They include as examples: frailty; cognitive dysfunction; dementia; degenerative joint disease-DJD; rheumatoid arthritis-RA; gout; coagulopathies; hemophilia; heart valve replacement; anticoagulant therapy; Alzheimer's Disease; prior amputation; reflex sympathetic dystrophy; the mentally challenged; paralysis; mental illness; vascular grafts; immunocompromised states HIV – AIDS; implants; and active chemotherapy or other therapies for the management of malignancy.

To properly correct CMS directives, the Department Of Veterans Affairs, issued

VHA Directive 2009-030 on 06/16/2009 to identify risk and medical necessity for America's veterans. This listing includes the following: documented peripheral arterial disease; documented peripheral neuropathy; prior history of ulcer or amputation; visual impairment; cognitive dysfunction; neuromuscular diseases, i.e. Parkinson's Disease; severe arthritis and spinal disc disease; diabetes mellitus; obesity; physically impairment, i.e. Immunosuppression; and >70 years old without other risk factors.

During the assessment process, attention should include the risk factors associated with lower extremity amputation. Primary examples include the following: diabetes mellitus; poor glucose control; arterial insufficiency (PAD); absence of protective sensation; peripheral neuropathy; foot deformity and callus formation in focal areas of high foot pressure; obesity; ulcer history; autonomic neuropathy; anhidrosis; xerosis and fissuring; impaired vision; limited joint mobility; impaired wound healing; in appropriate footwear; excessive high pressure and shear forces; and prior amputation.

Following the assessment process, podiatric consultation is indicated as a part of the total management of diabetic and older patients to include the following:

Signs suggesting generalized diseases that include neuropathy, vascular disease, diabetes mellitus, infection, ulceration, deformity, degenerative joint changes, focal neoplastic diseases, and other conditions as indicated involving the foot and related structures in those cases where concomitant therapy is indicated; Where initial management is ineffective; In the presence of skin lesions involving the foot; In the presence of postural deformities in the foot and related structures; In the presence of diabetes mellitus, neurosensory, peripheral vascular, and other risk diseases; In the presence of foot problems combined with ambulatory and/or walking difficulty (reduced speed), and/or a history of/or risk of falls; Where orthotics are indicated to reduce pain, compensate for and prevent deformities, reduce excess pressure, encourage wound healing, redistribute pressure, and reduce friction; If the patient is unable to obtain and/or provide foot care; and If the patient complains of a foot problem or has specific questions about care including information on footwear and orthoses.

Podiatric Clinical Services for the elderly and those individuals with diabetes mellitus as examples includes the following procedures:

a) Primary management includes history, examination, medical record review, diagnostic management, treatment, follow-up, and continuing assessment.

b) Primary management also includes imaging studies, laboratory studies, and special diagnostic studies such as biomechanical, neurological, and vascular analysis, as indicated.

c) Pain should be explored to its fullest extent with appropriate diagnostic modalities utilized.

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d) Appropriate medical consultation is to be employed when indicated with care provided with an interdisciplinary approach, especially when systemic diseases are a complicating factor.

e) Appropriate diagnostic tests should be available and employed when indicated to help sustain the quality of life.

f) Debridement, pathomechanical, foot orthopedic, biomechanical, radiographic, imaging, orthotic, dermatologic, and surgical procedures applied as elements of total patient care as indicated.

g) Appropriate pharmacology should be utilized and coordinated in accordance with local policies and procedures.

h) Appropriate footwear and orthotics are to be program components to meet the patient's ambulatory needs and in relation to fall prevention and off – loading principles.

i) Biopsy and guidelines for follow-up of potential malignancies should be considered and provided.

j) Onychial care should be provided in a suitable manner with consideration of the diagnosis and patient outcome projections.

k) At risk patients who have concomitant systemic diseases, such as diabetes, vascular insufficiency, and loss of protective sensation, should receive patient instruction and education, as a part of the institutional education program.

l) Appropriate physical modalities and procedures for primary inflammation of the foot and related structures should be available, and compliment biomechanical and orthotic needs.

m) Health education should be utilized for individual patients, in-group educational settings and as a part of a total interdisciplinary approach to preventive care.

n) Surgical care, when indicated, should be performed in an appropriate setting based upon the projected outcome and quality of life concerns.

o) All care should be provided by those licensed to provide clinical services.

Programs for professional staff education should are developed and include the following outline:

The relationship of foot problems to the older adult and patients with Diabetes Mellitus:

i. Needs

ii. Ambulation and Independence

iii. Risk Diseases

iv. Factors That Modify Foot Health and Care in Society, Such As Medicare

v. And Medicaid

vi. Mental Health Considerations

vii. Long Term Care

viii. Rehabilitation

The provision of primary podiatric care includes the following:

a) Assessment and Examination

b) Nail Diseases and Disorders

c) Skin Diseases and Disorders

d) Hyperkeratotic Disorders

e) Foot Orthopedic, Biomechanical and Pathomechanical Changes

f) Foot Deformities Associated with Diabetes and Aging

g) Management

h) Interdisciplinary Considerations

i) Diseases that put an older person at risk for foot and related

j) Diseases that put an older person at risk for complications such as:

k) Diabetes Mellitus, Arthritis, Gout, Vascular Insufficiency and

l) Others

m) Foot Health Education – Professional, Interdisciplinary, and Patient

n) Footwear, Foot Covering, and Related Consideration

o) Care Delivery – Ambulatory, Acute Hospital and Institutional Considerations, Rehabilitation, Long Term Care, Mental Health and the Mentally Challenged

p) A Long Term Care Management Planshould also be discussed and include the following:

q) Improving the individual experience of care.

r) Improving the health of populations.

s) Reducing the per capita cost of care for populations.

t) Maintaining the quality of life.

u) Respecting the rights of the older patient.

v) Maintaining clinical and operational quality.

w) Access to care and resource allocation.

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x) Maintaining confidentiality and privacy.

y) Respecting autonomy, consent, legal, and end of life issues

z) Providing care that is safe, effective, in an appropriate setting, ordered and furnished by licensed personnel, and meets the patient's medical and social needs.

Additional considerations include the following:

i. Cognitive Function

ii. Signs of Dementia-Cognitive Impairment

iii. Decision Making Capacity

iv. Alcohol-Substance Abuse

v. Delirium

vi. Cardiac Function

vii. Pulmonary Function

viii. Mobility

ix. Fall Risk

x. Frailty

xi. Nutritional Status

xii. Medication Management

xiii. Patient Counseling

xiv. Laboratory and Other Testing

xv. The Patient's Family and Social Support System

A summary of the important related clinical signs and symptoms include the following elements of the patient's history include a history of ulceration, amputation, prior vascular surgery, or angioplasty. Evidence of past cigarette smoking, poor medical management, and suboptimal living conditions are also important, as is the effectiveness of past therapeutic management.

Neuropathic considerations include a history of burning, shooting pains, electrical or sharp sensations, and the objective loss of protective sensation (LOPS). Claudication, rest pain, and non-healing ulcers are additional vascular considerations. The primary medical comorbidities include end state renal diseases, kidney dialysis or transplant, visual blurring or impairment, and cardiovascular disease risk factors such as hypertension, hyperlipidemia, angina, myocardial infarction, strokes, and peripheral vascular disease (PVD). The essential dermatologic elements include skin color, thickness, dryness, cracking, hyperhidrosis and maceration, infection (bacterial and fungal), ulceration, blisters and hyperkeratotic lesions.

The essential biomechanical or pathomechanical elements include gross deformities, claw toes, hammertoes, hallux valgus, Charcot neuroarthropathy, and musculoskeletal changes such as podalgia, restricted range of motion and ambulatory dysfunction including pododynia dysbasia. The essential elements of the neurological elements include vibration sensation (C-128 Hz Tuning Fork and VPT > 25 V), tip-therm reaction, touch sensation (pinprick, Monofilament (10 gram force), Ipswich Touch Test, and Achilles tendon reflex. The essential vascular elements include pulse palpation (Dorsalis Pedis and Posterior Tibial arteries, Doppler ultrasound and Ankle Brachial Index (ABI) pressure tests. The stratification of risk should determine the frequency of re-assessment or examination ranging in time from monthly to annually.

Conclusion

Foot health is both basic and needed. The changes in functional parameters, impairment, multiple morbidities, co-morbidities, ambulatory speed, physical function, and organ system deficits modify the quality of life. Maintaining foot health is a catalyst to help older individuals retain their mobility, dignity, and help maintain a quality of life so that they may live their lives to the end of life. The great baseball player, Satchel Paige had a marvelous statement on aging. "How old would you be if you didn't know how old you were?"

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