PODIATRY
Know and understand:

• How common structural foot deformities and certain systemic diseases affect the foot over time

• How to recognize and treat problems of the foot, ankle, and the skin and nails of the foot

• Which patients are candidates for surgery for foot deformities
• Foot Care: An Important Part of Geriatric Care
• Common Deformities of the Foot
• Common Disorders of the Foot
• Skin and Nail Disorders
• Systemic Diseases Affecting the Foot and Ankle
Foot problems can have a significant effect on the functional capacity of older adults and negatively impact their quality of life.

Many older adults are not in the habit of inspecting their feet or lack the flexibility to do so.

Clinicians should regularly assess their patients’ feet and refer them for podiatric care if needed.

About one third of older adults have foot pathology: Incidence is higher in hospitals and nursing home care.
COMMON DEFORMITIES OF THE FOOT

• Most foot deformities derive from the longstanding effects of a pathologic foot
  ➢ An abnormal distribution of weight during walking and other movement, creating stress on the musculoskeletal structure of the foot and often resulting in pain

• Over an extended period, this physical stress on the foot may result in arthritis, tissue atrophy, and subluxation of foot joints
COMMON DEFORMITIES: COLLAPSING PES PLANO VALGUS

• Generally seen in a foot with an unstable medial longitudinal arch, which leads to “flat feet”

• When the patient stands, the longitudinal arch collapses on the weight-bearing surface, resulting in subluxation of joints and leading to arthrosis

• With age, the foot becomes rigid; an accommodative orthosis can absorb the abnormally high pressure

• Associated deformities can include posterior tibial tendon dysfunction, bunions, chronic dislocation of the toe joints, hammertoes, and neuromas
COMMON DEFORMITIES: CAVUS FOOT (HIGH ARCH)

- Generally rigid and a very poor shock absorber
- Often associated with metatarsus adductus (inward orientation of the metatarsal bones)
- Older adults generally lose the fat pad in both the heel and the submetatarsal head region or ball of the foot
- Associated deformities include cocked hallux (hammertoe of the great toe), sagittal dislocation of the metatarsal phalangeal joints, metatarsalgia, mid-foot dorsal exostoses (bone spurs), and rigid hammertoe deformities
A higher than normal arch (cavus deformity) can lead to pes cavus, which is commonly associated with neurologic change. In older adults, excessive pressure is usually placed on the metatarsal heads. With atrophy of the plantar fat pad and displacement, pressure is increased, which can predispose to pain and ulceration.

A flat arch (pes planus) can lead to collapsing pes plano valgus, ie, a flattening of the medial longitudinal arch (flat feet) along with pronation, demonstrated by a lateral deviation of the Achilles tendon and an outward and rotational deformity of the foot.
COMMON DEFORMITIES:
EQUINUS (TIGHT ACHILLES TENDON)

• Commonly seen in a pes planus or cavus foot, but can also be seen in a foot that appears normal

• Patients bear most of their weight on the toes when walking because the deformity prevents weightbearing on the ball or heel of the foot

• May involve a tightness of either the gastrosoleal complex or the gastrocnemius muscle complex

• Can cause various conditions, including Achilles tendinitis, plantar fasciitis, metatarsalgia, hammertoe deformities
<table>
<thead>
<tr>
<th>Forefoot Disorders</th>
<th>Definition or description</th>
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</thead>
<tbody>
<tr>
<td>Bunion</td>
<td>Prominent and dorsal medial eminence of the first metatarsal; associated with hallux valgus, ie, deviation of the tip of the great toe, or main axis of the toe, toward the outer or lateral side of the foot</td>
</tr>
<tr>
<td>Digiti quinti varus</td>
<td>Valgus displacement or splaying of the fifth metatarsal, with a resulting varus or inward deviation of the fifth toe</td>
</tr>
<tr>
<td>Dislocation of lesser metatarsal phalangeal joint</td>
<td>Toe joint is out of its socket</td>
</tr>
<tr>
<td>Hallux abducto valgus</td>
<td>An alternative clinical diagnosis for hallux valgus, or bunion. There is a varus splaying of the first metatarsal with a valgus and rotational deformity of the phalanges of the great toe.</td>
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<tr>
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<tr>
<td>Hallux limitus and rigidus</td>
<td>Degenerative joint change involving the first metatarsal phalangeal joint, resulting from dorsal spurs, with marked limitation or absence of any range of motion. The difference between hallux limitus and rigidus is based on radiographic interpretation and difference in function.</td>
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<tr>
<td>Hammertoe</td>
<td>Muscle tendon imbalance causing contraction of the proximal or distal interphalangeal joint, or both</td>
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<tr>
<td>Tailor's bunion</td>
<td>Prominence of the dorsal lateral aspect of the fifth metatarsal head</td>
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<tr>
<td>Valgus position</td>
<td>Frontal plane position in which pressure is inwardly directed in the foot</td>
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<tr>
<td>Varus position</td>
<td>Frontal plane position in which pressure is outwardly directed in the foot</td>
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### Midfoot Disorders

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<tr>
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<tr>
<td>Metatarsalgia</td>
<td>Pain in the forefoot near the heads of the metatarsals</td>
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<tr>
<td>Morton neuroma/syndrome</td>
<td>A congenital shortening of the first metatarsal shaft, which creates an abnormal metatarsal arc. Excessive weight is placed on the second metatarsal head during gait and stance. The dynamics and pathomechanics of the foot are modified and can lead to hallux valgus, abducto valgus, or rotational deformity of the hallux.</td>
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<tr>
<td>Tibialis posterior dysfunction</td>
<td>Chronic rupture or weakening of the tibialis posterior tendon secondary to long-term pes planus</td>
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<tr>
<td>Rearfoot Disorders</td>
<td>Definition or description</td>
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<tr>
<td>Calcaneal spur/heel spur</td>
<td>A calcification of the attachment of the plantar fascia, usually at the medial plantar tuberosity of the calcaneus. The spur projects anteriorly and is the consequence of chronic repetitive trauma or stress resulting from biomechanical and pathomechanical change. When ligamentous calcification occurs, inflammation and associated pain at the attachment result. This may be referred to as heel pain syndrome and may be related to plantar fasciitis.</td>
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<tr>
<td>Equinus</td>
<td>Tight Achilles tendon</td>
</tr>
<tr>
<td>Haglund deformity</td>
<td>A hyperostosis of the posterior and superior portion of the calcaneus, enlarging the calcaneus, which can in turn place pressure on the attachment of the Achilles tendon. The presence of the deformity also can produce a pressure area for the heel counter of the shoe. It is easily demonstrated on a lateral radiograph of the foot and can be associated with tendinitis or bursitis.</td>
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<tr>
<td>Rearfoot Disorders</td>
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<tr>
<td>Plantar fasciitis</td>
<td>Inflammation and pain involving repetitive microtrauma to the plantar fascia, particularly at its posterior calcaneal attachment; associated with biomechanical and pathomechanical changes in the function of the foot. Related to calcaneal spurs, ligamentous calcification, tissue atrophy.</td>
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<tr>
<td>Tarsal tunnel syndrome</td>
<td>An entrapment neuropathy of the posterior tibial nerve</td>
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<tr>
<td>Disorder</td>
<td>Definition or description</td>
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<td>Cystic erosion</td>
<td>Areas of radiolucency usually noted with arthritic changes, such as rheumatoid arthritis, and usually seen in the metatarsal heads with associated joint changes</td>
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<tr>
<td>Entrapment syndrome</td>
<td>Occurs when a nerve is compressed by ligamentous or other soft-tissue inflammation, resulting in pain and possibly numbness and neuropathic symptoms; most common sites are the posterior tibial nerve and the intermetatarsal nerve, plantarly.</td>
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<tr>
<td>Periostitis</td>
<td>Inflammation of the periosteum</td>
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<tr>
<td>Subluxation</td>
<td>Deviation of a joint’s position</td>
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<tr>
<td>Tenosynovitis</td>
<td>Inflammation of the synovial sheath of a tendon complex; sometimes associated with a tendon tear</td>
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ASSOCIATED DEFORMITIES: Dislocated Metatarsal Phalangeal Joint

- The end stage of a hammertoe is a chronically dislocated MPJ, generally on top of the metatarsal head.
- A source of chronic pain, can cause plantar ulcerations.
- **Treatment:** Shoes with high toe box, or surgery.

When this condition occurs on the second toe, it is usually associated with hallux valgus and can result in a crossover toe deformity.
ASSOCIATED DEFORMITIES: HALLUX LIMITUS

- Arthritic condition of the first metatarsal phalangeal joint, including crepitus and decreased range of motion
- Joint essentially functions as if it were fused
- **Conservative treatment:** orthoses that prevent motion at the first metatarsal phalangeal joint, thereby relieving pain
- **Surgery** ranges from removal of bone spurs (cheilectomy) and joint implants to osteotomies and arthrodesis of the joint
  - Surgery can successfully reduce symptoms and increase function
ASSOCIATED DEFORMITIES: HALLUX VALGUS (BUNION)

- Affects one third of people >65 years old

- Subluxation of the first metatarsal phalangeal joint, resulting from the adduction of the first metatarsal and the abduction of the hallux

- Can be painful and frequently is arthritic

- **Conservative management**: Instruct patient to wear shoes with a wider toe box and use padding

- **Surgery** if the deformity is symptomatic and unresponsive to conservative management
ASSOCIATED DEFORMITIES: HAMMERTOES

• Buckling or contraction at the proximal interphalangeal joint or the distal interphalangeal joint of the lesser toes

• Can be flexible and easily reducible or rigid and nonreducible

• Can cause foot pain by creating a callus or corn where they press against the shoe

• **Treatment** may include padding of the affected area, a wide toe box in shoes, custom shoes, debridement of calluses, or surgical correction
ASSOCIATED DEFORMITIES: NEUROMAS

- Benign growth of a peripheral nerve, caused by chronic entrapment

- Often seen in the foot between the third and fourth metatarsal heads (Morton neuromas)

- **Conservative treatment:** Metatarsal pads, orthoses, corticosteroid injections, cryotherapy, or alcohol injections

- **Surgery:** Release of the intermetatarsal ligament or primary excision of the neuroma
ASSOCIATED DEFORMITIES:
POSTERIOR TIBIAL TENDON DYSFUNCTION

- Gradual tearing and/or rupturing of the tibialis posterior tendon
- Causes collapse of the longitudinal arch, which leads to subluxation of the rear-foot tarsal joints and eventually the ankle joint

Stage 3 tibialis posterior dysfunction
### TREATMENT OF POSTERIOR Tibial Tendon Dysfunction

- **Conservative treatment:** Orthoses, or bracing with an ankle-foot orthosis or custom brace
- **Surgery:** Varies by stage; can improve function and symptoms in stages I and II

<table>
<thead>
<tr>
<th>Stage and characteristics</th>
<th>Surgical treatment</th>
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<tr>
<td>I — tendinitis without foot deformity</td>
<td>Synovectomy and repair of tendon</td>
</tr>
<tr>
<td>II — tearing or rupturing of the tendon; deformity is flexible and fully reducible</td>
<td>Calcaneal osteotomies and tendon transfers</td>
</tr>
<tr>
<td>III — deformity is rigid and arthritic</td>
<td>Arthrodesis of the rearfoot</td>
</tr>
<tr>
<td>IV — valgus ankle deformity</td>
<td>Plantar arthrodesis</td>
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</tbody>
</table>
- **Plantar fasciitis**: A painful heel on waking or after rest
  - **Initial treatment**: Oral NSAIDs, steroid injections, and/or physical therapy
  - **Second and preventive therapies**: Reducing ligament strain with inserts, night splints, stretching exercises

- **Heel pain while walking**: Symptoms increase during barefoot ambulation and decrease with the use of cushioned shoes or inserts
  - The only treatment is accommodative shoes and inserts, which act as external shock absorbers
GENERAL TREATMENT STRATEGIES: ORTHOSES

- Accommodate a foot deformity or alter foot function to relieve physical stress on a certain portion of the foot

- **Placed on the foot:** Temporary felt padding or silicone/putty spacers

- **Placed in the shoe**
  - **OTC devices** — generally made of lightweight polyethylene foam, soft plastics, or silicone; produced for a certain size of foot
  - **Custom-made device** — constructed from an impression of a person’s foot through computerized assessment or a foam box

- Orthotics require a prescription, which allows for the rigidity, materials, posting (angle degree of foot correction), and accommodative modifications
GENERAL TREATMENT STRATEGIES: SHOES

• Feet flatten and widen with age; about 75% of adults ≥65 years old wear shoes that are too small

• Advise older adults to have their feet measured routinely and purchase shoes that:
  - Fit well
  - Have a sturdy heel counter
  - Have a firm beveled sole
  - Provide good traction
  - Have a heel <6 cm (<2.5 inches) high

• A wide heel that is <6 cm high can be appropriate for women who have tight heel cords and have been wearing high-heeled shoes all their lives. Older adults wearing heels that are >6 cm high are at a greater risk of falls
GENERAL TREATMENT STRATEGIES: SURGERY

• May be indicated for foot problems not alleviated by conservative methods, when the goals are relief of pain and restoration of function

• Most podiatric surgeries for older adults can be performed under local anesthesia with monitored sedation
• Keratotic lesions — Calluses or corns over sites of pressure

• Plantar verruca — HPV infection of the plantar aspect

  ▶ Lesions are circular, punctated, flat, and commonly contain thrombosed vessels

  ▶ Differentiate from keratotic lesions: verrucae demonstrate interrupted skin lines, pinpoint bleeding with debridement, and increased lateral compression pain

  ▶ Treatments: topical salicylic acid, bleomycin injections, cryotherapy, CO₂ laser treatment, or surgical excision, which must be used with caution in patients with reduced circulation and impaired healing
• **Epidermal inclusion cysts** — created by a portion of the epidermis proliferating in the dermis

• **Dermatofibromas** — Flat-topped, raised, firm lesions, generally not treated unless located across a joint or irritated by shoes
  
  ➢ Recurrence rate after excision is high

• **Hemangioma** — common vascular tumors that manifest as flat-topped, red lesions, typically seen on the plantar aspect of the foot
MALIGNANT SKIN LESIONS OF THE FOOT

• Uncommon in the foot but can easily go undiagnosed and generally have a poor outcome

• Include basal cell carcinoma, Bowen disease, squamous cell carcinoma, malignant acral lentiginous melanoma

• Characteristics of a potentially malignant lesion: new lesion in a patient ≥60 years old, or one that changes in shape, color, or diameter.

• Biopsy lesions that do not respond to conservative therapy and slow or nonhealing ulcerations of the foot
SKIN LESIONS OF THE FOOT: XEROSIS

- Plantar skin lacks sebaceous glands, so it is common for fissures to develop on the heel, resulting in dryness and increased stress.

- Treatment goals: Prevent infections and other complications

  - 10%, 20%, or 40% urea solution, or 12% ammonium lactate, applied daily after bathing.

  - Heel sleeve or pad made of silicone impregnated with mineral oil, or heel cup, to minimize trauma.
SKIN LESIONS OF THE FOOT: ECZEMA

- Inflamed skin that is not infected
- Most common types in older adults are xerotic eczema, venous stasis eczema, and drug-induced eczema

**Treatment** – combination of emollients and steroid creams, with or without occlusive dressings
NAIL DISORDERS: INGROWN NAILS AND PARONYCHIA

- **Onychocryptosis** — incurvation of the edge of the nail plate into the nail groove, generally the distal portion
  - Best treated with partial nail avulsion or permanent matricectomy

- **Paronychia** — localized infection caused by the nail embedding into the nail groove
  - Requires incision and drainage of the abscess with removal of the nail spicule and infected granulation tissue
  - Antibiotic treatment may be needed
  - Toes with chronic paronychiae should be radiographed to exclude underlying osteomyelitis, especially in patients with diabetes or peripheral arterial disease
NAIL DISORDERS: ONYCHOMYCOSIS

- Fungal infection of the nail plate that can result in yellow, thickened, friable nail
- Can be a source of nail bed ulcerations in patients with neuropathy
- Consider treating if there is pain, cosmetic concern, or comorbidity (especially diabetes mellitus, in which the break in the epidermal barrier can serve as a route for bacterial infections)
TREATMENT OF ONYCHOMYCOSIS

- **Topical antifungal agents** (eg, amorolfin, ciclopirox, tioconazole) have exhibited efficacy
  - Require **24-48 weeks** of treatment, often at considerable out-of-pocket expense
  - Cure rates are <50%

- **Oral antifungal agents** (eg, terbinafine, fluconazole, and itraconazole) are effective
  - Duration of treatment (3–4 months), adverse-event profile, and high rate of relapse warrant careful consideration for use in older adults
  - Primarily metabolized by the liver; many drug-drug interactions

- **Comorbidities such as diabetes, secondary fungal infections, and quality of life** should be considered before starting treatment
The most important disease affecting foot health in older people

50%–75% of amputations in patients with diabetes could be prevented by periodic assessment, early intervention, foot health education

Ocular complications reduce ability to see ingrown toenails, corns, and ulcers

Delayed wound healing is a factor
DIABETIC FOOT COMPLICATIONS

- **Vascular impairment:** Pallor, loss or decrease in pulses, dependent rubor, decreased capillary filling time in toes, venous swelling, rest pain (typically at night), loss of plantar metatarsal fat pad

- **Neuropathy:** Insensitivity, loss of protective sensation, paresthesias, diminished or lost Achilles and patellar reflexes, decreased vibratory sense, motor weakness

- **Foot ulcers**
FOOT ULCERS

• **Most common causes:** Pressure, venous insufficiency, arterial insufficiency, neuropathy

• **Other causes:** Tumors, polycythemia vera, improper self-care

• **Other systemic conditions can impact feet:** Hypothyroidism, heart failure, renal failure, lymphedema
FOOT ULCER PREVENTION IN DIABETES

• Foot examination
  ➢ By clinician at each visit, or at least annually
  ➢ Daily inspection by patient or caregiver is ideal

• Prevention
  ➢ Management of underlying disease
  ➢ Treatment of peripheral neuropathy, arterial disease, limited joint mobility, elevated plantar pressures, bony deformities, shock, and shear

• Education: For patient and caregiver, available through national/regional diabetes associations
• History and examination:

- Assess location, duration, inciting event or trauma, prior ulcerations, infection, ischemia, neuropathy, wound care, edema, and Charcot joints

- Evaluate vascular, neurologic, dermatologic systems

- Identify structural deformities and exclude osteomyelitis by imaging studies

- Optional further studies: plain radiography, CT, bone scan, MRI, Doppler, transcutaneous oxygen tension
FOOT ULCER MANAGEMENT IN DIABETES (2 of 2)

- Debridement
- Pressure relief
- Wound management
- Treat infection (early antibiotics)
- Treat ischemia
- Manage comorbidities
- Hospitalization and surgery if needed
Older adults with peripheral arterial disease demonstrate many of the same signs and symptoms as those with diabetes mellitus.

In contrast to neuropathic ulcers, vascular ulcers are extremely painful.
• **Osteoarthritis** — affects weight-bearing joints

• **Gouty arthritis**
  - Monoarticular, most common in the first metatarsal phalangeal joint
  - Early — intense pain and erythema; later — joint damage

• **Rheumatoid arthritis**
  - Affects hands and feet equally; usually symmetric
  - Metatarsophalangeal joints become dislocated or subluxed, causing increased protrusion of metatarsal heads and painful walking
Foot problems cause some of the most distressing and disabling conditions affecting older people.

The ability to remain pain-free and ambulatory is key to successful aging.

Long-term effects of common structural foot deformities—including collapsing pes plano valgus, cavus foot, and equinus deformity—cause significant disability in older adults.
• Skin disorders of the foot are common in older adults. Complete assessment of the skin of the foot is necessary to identify skin conditions and potential malignancies.

• Systemic diseases can have long-term effects on the foot and ankle.

• Surgical intervention for treatment of foot deformities can alleviate pain and improve function in older adults who are appropriate surgical candidates. Most surgical interventions in older adults can be performed under local anesthesia.
A 90-year-old woman has pain in the right heel.

- She is in rehabilitation after open reduction and internal fixation of left femoral neck fracture 25 days ago.
- She has been lying on her back for extended periods since surgery.
- She has difficulty walking because of pain and generalized osteoarthritis.

History: CHF, osteoarthritis, diabetes mellitus (well controlled)
• Examination
  - Normal temperature
  - 3 cm × 3 cm blood-filled bulla on posterior right heel
    - No surrounding erythema, warmth, drainage, or swelling
  - Pedal pulses are fully palpable.
  - Feet are warm.

• Normal CBC and C-reactive protein level

• Radiography of right heel: no density changes in soft tissue; completely normal calcaneus
Which one of the following is the most appropriate next step?

A. Incision and drainage of the bulla
B. MRI of the right foot
C. Offloading the heel
D. Obtaining ankle–brachial index
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