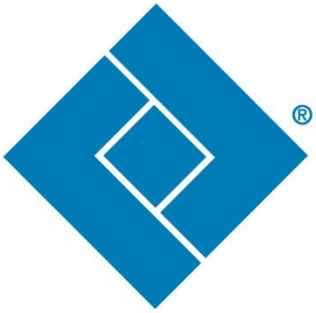
Venous, Arterial, and Neuropathic Lower-Extremity Wounds: Clinical Resource Guide



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The Wound, Ostomy and Continence Nurses Society™ suggests the following format for bibliographic citations:

Wound, Ostomy and Continence Nurses Society. (2019). *Venous, arterial, and neuropathic lower-extremity wounds: Clinical resource guide.* Mt. Laurel, NJ: Author.

Contents

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Original Publication Date: November 2009

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Introduction

This Clinical Resource Guide (CRG) updates the previous document, *Venous, Arterial, and Neuropathic Lower-Extremity Wounds: Clinical Resource Guide* (WOCN®, 2017). The guide is a synopsis of content derived from the WOCN Society's Clinical Practice Guideline Series for managing lower-extremity wounds due to venous, arterial, or neuropathic disease. The relevant section of the CRG is updated along with each publication of a new/updated Clinical Practice Guideline.

Refer to the complete version of each of the WOCN Society's Clinical Practice Guidelines for more detailed, evidence-based information about the management of wounds in patients with lower-extremity venous, arterial, or neuropathic disease (WOCN, 2012, 2014, 2019): The guidelines are available in print or as an electronic mobile app from the WOCN Society's Bookstore (www.wocn.org/bookstore):

- *Guideline for Management of Wounds in Patients with Lower-Extremity Neuropathic Disease* (2012).
- *Guideline for Management of Wounds in Patients with Lower-Extremity Arterial Disease* (2014).
- *Guideline for Management of Wounds in Patients with Lower-Extremity Venous Disease* (2019).

Purpose

This guide provides an overview of common assessment findings and key characteristics of the three most common types of lower-extremity wounds (i.e., venous, arterial, neuropathic). In addition, it includes a summary of the following information: measures to improve venous return and tissue perfusion; measures to prevent trauma; goals, considerations, and options for topical therapy; adjunctive therapies; and indications for referral to other health-care providers for additional evaluation and treatment.

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Lower-Extremity Venous Disease (LEVD) Wounds (WOCN, 2019)	Lower-Extremity Arterial Disease (LEAD) Wounds (WOCN, 2014)	Lower-Extremity Neuropathic Disease (LEND) Wounds (WOCN, 2012)
Assessment: History/Risk Factors		
• Older age (> 50 years of age). • High BMI; obesity. • Female sex; pregnancies (multiple or close together). • Simultaneous insufficiency of two out of three venous systems; venous reflux/obstruction. • Previous leg surgery; leg fractures. • Impaired calf muscle pump. • Restricted range of motion of the ankle; greater dorsiflexion of the ankle. • Varicose veins. • Family history of venous disease. • Previous venous leg ulcer (VLU). • Systemic inflammation. • Venous thromboembolism (VTE): pulmonary embolus (PE), deep vein thrombosis (DVT), thrombophlebitis, post-thrombotic syndrome. • Injection drug use. • Sedentary lifestyle or occupation; reduced mobility; prolonged sitting or standing. • Triggers for VLUs: Cellulitis; trauma (penetrating injury, burns); contact allergic dermatitis; rapid onset of leg edema; dry skin/itching; insect bites.	• Advanced age. • Tobacco use. • Diabetes. • Hyperlipidemia. • Hypertension. • Elevated homocysteine. • Chronic renal insufficiency. • Family history of cardiovascular disease. • Ethnicity. • Persistent *Chlamydia pneumoniae* infection. • Periodontal disease.	• Advanced age; heredity. • Alcoholism. • Diabetes mellitus (diabetes) longer than 10 years; poor diabetes control; impaired glucose tolerance. • Hansen's disease (leprosy); Charcot-Marie-Tooth (Charcot) disease. • Tobacco use. • Human immunodeficiency virus/acquired immunodeficiency syndrome and related drug therapies. • Hypertension. • Obesity. • Raynaud's disease; scleroderma. • Hyperthyroidism; hypothyroidism. • Chronic obstructive pulmonary disease. • Spinal cord injury; neuromuscular diseases. • Abdominal, pelvic, and orthopedic procedures. • Paraneoplastic disorders. • Acromegaly/height. • Exposure to heavy metals (e.g., lead, mercury, arsenic). • Malabsorption syndrome due to bariatric surgery; celiac disease; vitamin deficiency (B_{12}, folate, niacin, thiamine); pernicious anemia. • Loss of protective sensation; rigid foot deformities; gait abnormalities; history of previous ulcer/amputation.
Assessment: Comorbid Conditions		
• Cardiovascular disease. • Hypertension. • Lymphedema. • Rheumatoid arthritis. • Lower-extremity arterial disease (LEAD). • Diabetes.	• Cardiovascular disease; cerebrovascular disease; vascular procedures or surgeries. • Sickle cell anemia. • Obesity; metabolic syndrome. • Arthritis. • Spinal cord injury. • Migraine. • Atrial fibrillation. • Human immunodeficiency virus. • Low testosterone.	• Lower-extremity arterial disease (LEAD). • Kidney disease.

Lower-Extremity Venous Disease (LEVD) Wounds (WOCN, 2019)	Lower-Extremity Arterial Disease (LEAD) Wounds (WOCN, 2014)	Lower-Extremity Neuropathic Disease (LEND) Wounds (WOCN, 2012)
Assessment: Wound Location		
The most typical location is superior to the medial malleolus, but wounds can be anywhere on the lower leg including back of the leg/posterior calf.	Areas exposed to pressure, repetitive trauma, or rubbing from footwear are the most common locations: • Lateral malleolus. • Mid-tibial area (shin). • Phalangeal heads, toe tips, or web spaces. • Heels.	• Plantar foot surface is the most typical location. • Other common locations include: ○ Pressure points/sites of painless trauma/repetitive stress, over bony prominences (e.g., heels). ○ Metatarsal head (e.g., first metatarsal head and inter-phalangeal joint of great toe). ○ Dorsal and distal aspects of toes, inter-digital areas, inter-phalangeal joints. ○ Midfoot or forefoot: Collapse of midfoot structures with "rocker-bottom foot" suggests Charcot fracture.
Assessment: Wound Characteristics		
• Base: Ruddy red; granulation tissue and/or yellow adherent fibrin or loose slough may be present. • Size: Variable; can be large. • Depth: Usually shallow. • Edges: Irregular; epibole (rolled edges) may be present; undermining or tunneling are uncommon. • Exudate: Moderate to heavy; character of exudate varies. • Infection: Not common.	• Base: Pale; granulation rarely present; necrosis common; eschar may be present. • Size: Variable; often small. • Depth: May be deep. • Edges: Rolled; smooth; punched-out appearance; undermining may be present. • Exudate: Minimal. • Infection: Frequent (signs may be subtle). • Pain: Common. • Nonhealing; wound often precipitated by minor trauma.	• Base: Pale or pink; necrosis/eschar may be present. • Size: Variable. • Depth: Varies from shallow to exposed bone/tendon. • Edges: Well-defined; smooth; undermining may be present. • Shape: Usually round or oblong. • Exudate: Usually small to moderate; foul odor and purulence indicate infection.
Assessment: Surrounding Skin		
• Edema: Pitting or nonpitting; worsens with prolonged standing or sitting with legs dependent. • Scarring from previous wounds. • Ankle flare; varicose veins. • Hemosiderosis (i.e., brown staining); hyperpigmentation • Lipodermatosclerosis. • Atrophie blanche (smooth white plaques). • Maceration; crusting; scaling; itching. • Temperature: Normally warm to touch. • Localized elevation of skin temperature (1.2 °C higher), measured with a noncontact infrared thermometer, may indicate inflammation.	• Pallor on elevation. • Dependent rubor. • Shiny, taut, thin, dry, and fragile. • Hair loss over lower extremity. • Atrophy of skin, subcutaneous tissue, and muscle. • Edema: Atypical of arterial disease; localized edema may indicate infection. • Temperature: Skin feels cool to touch.	• Normal skin color. • Anhidrosis; xerosis; fissures; maceration; tinea pedis. • Callus over bony prominences (might cover a wound) and periwound; hemorrhage into a callus indicates ulceration underneath. • Musculoskeletal/structural foot deformities. • Erythema and induration may indicate infection/cellulitis. • Edema: Unilateral edema with increased erythema, warmth, and a bounding pulse may indicate Charcot fracture. • Temperature: Skin warm to touch; localized elevation of skin temperature greater than 2 °C indicates inflammation. • Diabetic skin markers: Dermopathy, necrobiosis lipoidica, acanthosis nigricans, bullosis diabeticorum.

Lower-Extremity Venous Disease (LEVD) Wounds (WOCN, 2019)	Lower-Extremity Arterial Disease (LEAD) Wounds (WOCN, 2014)	Lower-Extremity Neuropathic Disease (LEND) Wounds (WOCN, 2012)
Assessment: Nails		
N/A	• Dystrophic.	• Dystrophic; hypertrophy. • Onychomycosis; paronychia.
Assessment: Complications		
• Venous eczema/dermatitis (e.g., erythema, itching, vesicles, weeping, scaling, crusting, afebrile). • Infection/Cellulitis (e.g., pain, erythema, swelling, induration, bullae, desquamation, fever, leukocytosis); tinea pedis. • Variceal bleeding. • VTE, DVT. • Mixed venous and arterial disease.	• Infection/Cellulitis (e.g., pain, edema, periwound fluctuance; or only a faint halo of erythema around the wound). • Osteomyelitis (e.g., probe to bone). • Gangrene (wet or dry).	• Infection/Cellulitis. • Arterial ischemia. • Osteomyelitis. • Charcot fracture (e.g., swelling, pain, erythema, localized temperature elevation of 3–7 °C compared to an unaffected area). • Gangrene.
Assessment Perfusion/Sensation of the Lower Extremity: Pain		
• Leg pain may be variable (e.g., severe, throbbing). ○ Pain may be accompanied by complaints of leg heaviness, tightening, or aching. ○ Leg pain worsens with dependency. ○ Elevation relieves pain. • Differentiate venous claudication from arterial, ischemic claudication: ○ Venous claudication: Exercise-related leg pain due to venous outflow obstruction; occurs in the absence of arterial disease; is relieved by leg elevation. ○ Arterial, ischemic claudication/pain: Reproducible cramping, aching, fatigue, weakness, and/or frank pain in the calf, thigh, or buttock that occurs after walking/exercise, and is typically relieved with 10 minutes rest; pain is increased by leg elevation and alleviated by dependency of the limb.	• Intermittent claudication is a classical sign and indicates 50% of the vessel is occluded (i.e., cramping, aching, fatigue, weakness, and/or pain in the calf, thigh, or buttock that occurs after walking/exercise and typically is relieved with 10 minutes rest). • Resting, positional, or nocturnal pain may be present; resting pain indicates 90% of the vessel is occluded. • Elevation exacerbates pain. • Dependency relieves pain. • Neuropathy and paresthesia may occur from ischemic nerve dysfunction. • Acute limb ischemia: A sudden onset of the 6 P's (i.e., pain, pulselessness, pallor, paresthesia, paralysis, and polar [coldness]) indicates an acute embolism; warrants an immediate referral to a vascular surgeon. • Critical limb ischemia (CLI): Chronic rest pain; rest pain of the forefoot/toes. Ischemic nonhealing wounds or gangrene are limb threatening with a high mortality rate and warrant referral to a vascular surgeon.	• Pain may be superficial, deep, aching, stabbing, dull, sharp, burning, or cool. • Decreased or altered sensitivity to touch occurs. • Altered sensation not described as pain (e.g., numbness, warmth, prickling, tingling, shooting, pins and needles; "stocking-glove pattern") may be present. • Pain may be worse at night. • Allodynia (i.e., intolerance to normally painless stimuli such as bed sheets touching feet/legs) may occur.

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Assessment Perfusion/Sensation of the Lower Extremity: Peripheral Pulses		
• Pulses are present and palpable.	• Pulses are absent or diminished (i.e., dorsalis pedis, posterior tibial). • Femoral or popliteal bruits may be heard.	• Pulses are present and palpable. • If coexisting LEAD is present: Pulses are absent or diminished (i.e., dorsalis pedis, posterior tibial); and femoral or popliteal bruits may be heard.
Assessment Perfusion/Sensation of the Lower Extremity: Common Noninvasive Vascular Tests		
• Capillary refill: Delayed capillary refill may be present (> 3 seconds). • Venous refill time may be prolonged (> 20 seconds). • Ankle-brachial index (ABI): Commonly within normal limits (1.0–1.3). • Duplex scanning with ultrasound: Most reliable noninvasive test to diagnose anatomical and hemodynamic abnormalities and detect venous reflux.	• Capillary refill: Abnormal (> 3 seconds). • Venous refill time: Prolonged (> 20 seconds). • ABI values/interpretation: ○ Noncompressible arteries: Unable to obliterate the pulse signal at cuff pressure greater than 250 mmHg. ○ Elevated: > 1.30. ○ Normal: ≥ 1.00 ○ LEAD: ≤ 0.90. ○ Borderline perfusion: ≤ 0.60–0.80. ○ Severe ischemia: ≤ 0.50. ○ Critical ischemia: ≤ 0.40. • Transcutaneous oxygen (TcPO2): Less than 40 mmHg is hypoxic; less than 30 mmHg is CLI. • Toe brachial index (TBI): Less than 0.64 indicates LEAD. • Toe pressure (TP): Less than 30 mmHg (less than 50 mmHg if diabetes present) indicates CLI.	• Capillary and venous refill times: Normal. • ABI: LEAD, which often coexists with neuropathic disease and diabetes should be ruled out. • The ABI can be elevated greater than 1.30 or arteries can be noncompressible (i.e., unable to obliterate the pulse signal at cuff pressure greater than 250 mmHg), which indicates calcified ankle arteries. In such cases, a TP or TBI is indicated. ○ TBI: Less than 0.64 indicates LEAD. ○ TP: Less than 50 mmHg (if diabetes is present) indicates CLI and failure to heal. • TcPO2: Less than 40 mmHg is hypoxic; less than 30 mmHg is CLI.
Assessment Perfusion/Sensation of the Lower Extremity: Screen for Loss of Protective Sensation		
• Assess light pressure sensation using a 5.07/10 g Semmes- Weinstein monofilament. • Assess vibratory sensation using a 128 Hz tuning fork. • Check deep tendon reflexes at the ankle and knee with a reflex/percussion hammer. • Inability to feel the monofilament, diminished vibratory perception, and diminished reflexes indicate a loss of protective sensation and an increased risk of wounds.	• Assess light pressure sensation using a 5.07/ 10 g Semmes-Weinstein monofilament. • Assess vibratory sensation using a 128 Hz tuning fork. • Check deep tendon reflexes at the ankle and knee with a reflex/percussion hammer. • Inability to feel the monofilament, diminished vibratory perception, and diminished reflexes indicate a loss of protective sensation and an increased risk of wounds.	• Assess light pressure sensation using a 5.07/10 g Semmes-Weinstein monofilament. • Assess vibratory sensation using a 128 Hz tuning fork. • Check deep tendon reflexes at the ankle and knee with a reflex/percussion hammer. • Inability to feel the monofilament, diminished vibratory perception, and diminished reflexes indicate a loss of protective sensation and an increased risk of wounds.

Lower-Extremity Venous Disease (LEVD) Wounds (WOCN, 2019)	Lower-Extremity Arterial Disease (LEAD) Wounds (WOCN, 2014)	Lower-Extremity Neuropathic Disease (LEND) Wounds (WOCN, 2012)
Measures to Improve Venous Return	**Measures to Improve Tissue Perfusion**	
• Use compression therapy: 30–40 mmHg compression at the ankle if ABI is equal to/or greater than 0.80: ○ Multicomponent compression systems are more effective than single-component systems. ○ Multicomponent systems with an elastic bandage are more effective than those with only inelastic components. ○ Use highest level of compression that patients can tolerate and with which they can comply. ○ Use life-long compression to reduce/prevent VLUs and VLU recurrence. ○ Consider intermittent pneumatic compression for patients who are immobile, need higher levels of compression than can be provided by wraps or stockings, or are intolerant of stockings or bandaging systems. ○ Do not rely on antiembolism stockings or hose that provide low pressure (≤ 20 mm Hg) and are not designed for therapeutic compression to prevent or treat LEVD or VLUs. • Elevate legs above heart level: 30 minutes, 4 times per day; increase exercise (e.g., walking, calf muscle exercise, toe lifts, ankle flexion). • Avoid constricting garments, crossing legs, prolonged standing, and high-heeled shoes. • Stop tobacco use. • Manage weight; healthy nutrition. • Consider medications to promote VLU healing: pentoxifylline, simvastatin, sulodexide, or doxycycline. • Consider invasive and noninvasive surgical procedures to improve VLU healing and reduce VLU recurrence (i.e., surgery; subendoscopic perforator surgery; skin grafts; biological dressings; human skin equivalents; hair follicle grafts; thermal or nonthermal ablation of varicose veins).	• Revascularize if possible. • Change lifestyle: Stop tobacco use; avoid secondhand smoke, restrictive garments, and cold temperatures. • Maintain proper hydration/nutrition. • Maintain legs in a neutral or dependent position. • Increase physical activity: Walking; supervised exercise 30–45 minutes, 3 times per week. • Use medications to control hypertension, hyperlipidemia, homocysteine levels, and diabetes; antiplatelets to improve blood cell movement through narrowed vessels. • Control or reduce weight if obese.	• Revascularize if ischemic. • Stop tobacco use. • Maintain tight glucose/glycemic control; control hypertension. • Engage in exercise that is adapted to prevent injury. • Consider medications, as indicated.

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Measures to Prevent Trauma		
• Screen patients for LEAD by Doppler-derived ABI prior to application of compression stockings/bandages/wraps. • Mixed venous/arterial disease: ○ Use reduced compression (23–30 mmHg) for patients with LEVD, wounds, and edema if ABI is less than 0.80 and equal to/or greater than 0.50. ○ Do not apply compression if ABI is less than 0.50, ankle pressure is less than 70 mmHg, or TP is less than 50 mmHg.	• Use proper footwear; wear socks/stockings with shoes; obtain professional nail/callus care. • Use pressure redistribution/offloading products/devices for heels, toes, and bony prominences, especially if bedbound or chairbound. • Avoid chemical, thermal, and mechanical injury (e.g., no bare feet even in the house; no hot soaks or heating pads; no medicated corn pads). • Self-inspect the lower extremities daily; promptly report injuries to the health-care provider. • Use reduced compression (23–30 mmHg) for mixed venous/arterial disease if the ABI is less than 0.80. • Do not apply compression if ABI is less than 0.50, ankle pressure is less than 70 mmHg, or TP is less than 50 mmHg.	• Reduce shear stress and offload the at-risk neuropathic foot, and/or foot with wounds (e.g., bedrest, total contact casts, walking splints, orthopedic shoes); use assistive devices for support, balance, and additional offloading. • Use proper footwear; obtain routine professional nail/callus care. • Use pressure redistribution/offloading products/devices for heels, toes, and bony prominences, especially if in bed or chairbound. • Avoid chemical, thermal, and mechanical injury (e.g., no bare feet even in the house; no hot soaks or heating pads; no medicated corn pads; wear socks/stockings with shoes). • Self-inspect the lower extremities on a daily basis.
Topical Therapy: Goals		
• Reduce and control edema. • Promote wound healing. • Maintain moist wound surface. • Attain/maintain intact skin: Protect the periwound skin from drainage; absorb/manage exudate. • Prevent trauma/injury. • Prevent, promptly identify, and manage complications (e.g., venous eczema/dermatitis, infection/cellulitis, variceal bleeding, etc.). • Reduce pain. • Improve functional status and quality of life. • Prevent VLU recurrence.	• Prevent trauma/injury. • Prevent, promptly identify, and manage complications (e.g., infection/cellulitis, etc.). • Promote wound healing. • Minimize pain. • Preserve limb.	• Prevent trauma/injury. • Prevent, promptly identify, and manage complications (e.g., infection/cellulitis, osteomyelitis, etc.). • Promote wound healing. • Keep the periwound dry while maintaining a moist wound bed. • Minimize pain. • Preserve limb.

Lower-Extremity Venous Disease (LEVD) Wounds (WOCN, 2019)	Lower-Extremity Arterial Disease (LEAD) Wounds (WOCN, 2014)	Lower-Extremity Neuropathic Disease (LEND) Wounds (WOCN, 2012)
Topical Therapy: Considerations/Options		
• Treat infection: Use culture-guided antibiotic/antimicrobial therapy. ○ Consider topical antimicrobial/antiseptics for localized, superficial infection (i.e., silver-based dressings; cadexomer iodine). ○ Deep tissue infection/cellulitis warrants culture-guided systemic treatment. • Remove devitalized tissue with an appropriate method of debridement. • Consider debridement if biofilm is suspected. • Cleanse wound and skin with noncytotoxic cleansers. • Use absorptive dressings to control exudate. • Avoid known skin irritants and allergens, tapes, and adhesives in patients with venous eczema/ dermatitis. • Patch test individuals with known sensitivities and delayed healing prior to use of new products. • Consider use of barrier products to protect the periwound skin from excessive drainage and maceration. • Identify and treat venous eczema/dermatitis (i.e., topical steroid 1–2 weeks). • Use emollients to manage dry, scaly skin. • Consider topical anesthetics for painful wound care/debridement (i.e., lidocaine; lidocaine and prilocaine mixture). • Consider use of analgesic-containing dressings to reduce wound pain such as ibuprofen-releasing dressings.	• Avoid occlusive dressings: Use dressings that permit easy, frequent visualization of the wound. • Aggressively treat infection. • Dry, noninfected wounds with stable, fixed eschar, necrosis; or a stable blister: ○ Maintain, keep dry, protect, no debridement. ○ Assess perfusion status and signs of infection. • Infected, necrotic wounds: ○ Refer for revascularization/surgical removal of necrotic tissue and antibiotic therapy. ○ Do not rely on topical antibiotics as the sole therapy to treat infected, ischemic wounds. ○ Promptly institute culture-guided systemic antibiotics for patients with CLI and evidence of limb infection or cellulitis, and/or infected wounds. • Open/draining wounds with necrotic tissue: ○ Consider a closely monitored trial of autolytic or enzymatic debridement. • Open/draining wounds with exposed bones or tendons: ○ Consider a carefully monitored trial of moist, nonocclusive, absorbent, dressings. • Open/draining, nonnecrotic wounds: ○ Consider moist wound healing with nonocclusive, absorbent dressings.	• Use dressings that maintain a moist surface, absorb exudate, and allow easy visualization. • Use occlusive dressings cautiously. • Aggressively treat infection/cellulitis, including fungal infection. • Do not rely on topical antimicrobials alone to treat cellulitis, but they could be used in conjunction with systemic antimicrobials; use of antimicrobials should be culture-guided. • Debride focal callus to reduce pressure. • Debride avascular/necrotic tissue in nonischemic wounds.

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Adjunctive Therapy		
• Electrical therapy. • Negative pressure wound therapy. • Ultrasound (high-frequency ultrasound; noncontact low-frequency ultrasound).	• Arterial flow augmentation (i.e., intermittent pneumatic compression). • Electrotherapy. • Low-frequency ultrasound. • Hyperbaric oxygen therapy. • Spinal cord stimulation, lumbar sympathectomy, or peridural anesthesia for intractable pain in patients not suitable for surgery. • Bone-marrow-derived, mononuclear cell therapy for pain relief/limb salvage in patients not suitable for surgery. • Immune modulation therapy for patients with claudication or CLI.	• Hyperbaric oxygen therapy. • Skin substitutes. • Negative pressure wound therapy. • Growth factor therapy. • Surgery to correct structural deformities. • Surgical debridement/implantation of antibiotic beads, spacers, or gels. • Pain management specialists.
Indications for Referral to Other Health-Care Providers for Additional Evaluation and Treatment		
• Dermatology referral for unresponsive eczema/ dermatitis after 1–2 weeks of treatment with a topical steroid. • Vascular/surgical referral for: ○ Infection/Cellulitis. ○ Nonhealing wound after 4 weeks of appropriate therapy. ○ VTE, DVT. ○ Variceal bleeding. ○ Intractable pain. ○ Atypical appearance or location of wound.	• Vascular/surgical referral: ○ Infected, ischemic wounds: Clinical signs of infection/cellulitis or suspected osteomyelitis. ○ Atypical appearance or location of wound. ○ Intractable pain. ○ Wounds and/or edema in mixed venous/arterial disease that fail to respond to compression therapy or worsens. ○ Absence of both dorsalis pedis and posterior tibial pulses. ○ ABI less than 0.90 plus one or more of the following: Wound fails to improve with 2 to 4 weeks of appropriate therapy; severe ischemic pain; and/or intermittent claudication. ○ ABI less than 0.50. ○ ABI greater than 1.30 or noncompressible arteries. • Urgent vascular/surgical referral for symptoms of acute limb ischemia; CLI (ABI less than 0.40; ankle pressure less than 50 mmHg; TP less than 30 mmHg or less than 50 mmHg if diabetes present; TcPO2 less than 30 mmHg); and/or gangrene.	• Refer patients who use tobacco and have a loss of protective sensation to foot care specialists and for tobacco cessation education/counselling. • Refer patients with gait abnormalities to a qualified pedorthic professional for shoe or device customization. • Vascular/surgical referral: ○ Infection/Cellulitis or suspected osteomyelitis (i.e., probe to the bone). ○ Atypical appearance or location of wound. ○ Symptoms/new onset of Charcot fracture. ○ Musculoskeletal/structural foot deformities. ○ ABI less than 0.90 and no response to 2 to 4 weeks of conservative wound care. ○ ABI less than 0.50. ○ ABI greater than 1.30 or noncompressible arteries. • Urgent vascular/surgical referral for symptoms of acute limb ischemia, CLI, and/or gangrene.

References

Wound, Ostomy and Continence Nurses Society. (2012). *Guideline for management of wounds in patients with lower-extremity neuropathic disease*. WOCN Clinical Practice Guideline Series 3. Mt. Laurel, NJ: Author.

Wound, Ostomy and Continence Nurses Society. (2014). *Guideline for management of wounds in patients with lower-extremity arterial disease*. WOCN Clinical Practice Guideline Series 1. Mt. Laurel, NJ: Author.

Wound, Ostomy and Continence Nurses Society. (2017). *Venous, arterial, and neuropathic lower-extremity wounds: Clinical resource guide.* Mt. Laurel, NJ: Author.

Wound, Ostomy and Continence Nurses Society. (2019). *Guideline for management of wounds in patients with lower-extremity venous disease*. WOCN Clinical Practice Guideline Series 4. Mt. Laurel, NJ: Author.