

# Leaky veins vs. blocked arteries: Does it impact hard-to-heal leg ulcers?

Chronic leg ulcers are a significant clinical challenge, affecting millions worldwide. They result from various underlying pathophysiological mechanisms, primarily categorized into arterial ulcers, caused by blocked arteries, and venous stasis ulcers, resulting from leaky veins. Distinguishing between these ulcer types is critical, as management strategies differ substantially. This article examines the role of arterial versus venous insufficiency in wound healing and explores evidence-based diagnostic and treatment approaches.

For proper recognition and treatment, it is important to understand the prevalence of leg ulcers in the general population. Venous leg ulcers constitute most leg ulcers, while arterial ulcers are less common but still important to differentiate and treat accordingly. Venous ulcers account for 70% of all leg ulcers (Kolluri et al, 2022; Gloviczki et al, 2024), and arterial ulcers account for 10–15% of leg ulcers (Federman et al, 2024).

Leg ulcers are not only detrimental to the patient's health and well-being, but they also present a significant cost not only for the patient, but for the healthcare system at large. Costly treatment involves outpatient care, hospital stays, procedures, medications and more. The mean total cost of treatment of one venous leg ulcer (VLU) is \$15,732, with expenses reaching up to \$33,629 (Kolluri et al, 2022; Gloviczki et al, 2024). Venous leg ulcers are associated with disability, psychosocial concerns, pain, and high recurrence rates. Chronic wounds cost billions annually in healthcare expenditures. Additionally, the indirect costs of chronic wounds include loss of productivity and reduced quality of life. Delayed healing of leg ulcers increases the risk of considerable challenges for the patient including infection, amputation, along with long-term economic and social stress.

Leg ulcers are challenging because up to 20% of leg ulcers have mixed venous and arterial components (O'Donnell et al, 2014). As mismanagement can cause harm, it is important to have correct diagnosis of aetiology, like using compression in severe arterial disease, can worsen outcomes, so proper diagnosis is crucial. Multiple studies have shown that accurate diagnosis and tailored therapy improve healing rates (Federman et al, 2024). The early involvement of primary care physicians, vascular surgeons, wound care specialists, and physical

therapists in close communication is crucial for successful treatment outcomes. For all the above reasons, starting appropriate ulcer diagnosis and care is critical for treatment, and prevention of worsening outcomes and cost. This article examines proper leg ulcer diagnosis, differentiation, treatment, guidelines, and case studies to aid in the management of ulcers.

## History and physical examination

A detailed history and physical examination of the patient and their situation is necessary for accurate diagnosis in order to establish successful treatment of leg ulcers and to prevent the disease course advancing. The factors stated below are important indicators pointing towards a leg ulcer diagnosis.

- Demographic factors, such as advanced age and increased BMI, are important to consider because both place greater strain on venous return and are associated with increased amount of arteriosclerosis.
- Symptoms such as limb heaviness, pruritus, pain, aching, throbbing, burning, cramping, draining, tiredness or oedema that worsens throughout the day and improves with elevation, may increase the chances of developing leg ulcers.
- Systemic symptoms, such as dyspnoea and claudication, are also important to consider.
- History of wounds and varicose veins points towards suspicion of leg ulcers.
- History of obesity, diabetes, congestive heart failure, chronic obstructive pulmonary disease, deep vein thrombosis, pulmonary embolism, autoimmune diseases or malignancies are risk factors for leg ulcers.
- Surgical history of lower extremity surgeries or inferior vena cava filters is important to consider.
- Family history of deep vein thrombosis, venous leg ulcers, diabetes and congestive heart failure may increase the likelihood of

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## Key words

- Anti-infective agents
- Cost-effectiveness analysis
- QALYs
- Venous leg ulcers
- Wound healing

- leg ulcers in the patient.
- Social history of tobacco or alcohol use, work history and decreased exercise are important to consider.
- Medications, including disease-modifying antirheumatic drugs, steroids, anticoagulants, statins and beta-blockers, may slow the ulcer healing process.

### Key differentiators of ulcer types

Anatomic locations and symptomology can help to differentiate between the diagnosis of venous, arterial, and diabetic neuropathic ulcers.

Venous ulcers often occur proximal to the malleolus of the foot, and in the gaiter area of the leg. Irregular edges, and lipodermatosclerosis point towards venous ulcers.

Arterial ulcers often occur distal to the malleolus of the foot, and on the tibial region of the leg. Dependent rubor, cyanosis, ischemia, edge necrosis, eschar, and digital involvement indicate an arterial ulcer.

Diabetic neuropathic ulcers usually occur in the plantar area of the foot.

### CEAP classification

The Clinical, Etiological, Anatomical, and Pathophysiological (CEAP) classification provides a structured approach to grading venous disease, with the grades as follows (Lurie et al, 2020).

Clinical classification (C):

- C0: no visible or palpable signs of venous disease.
- C1: telangiectasias or reticular veins.
- C2: varicose veins – distinguished from reticular veins by a diameter of 3 mm or more.
  - C2r: recurrent varicose veins.
- C3: oedema.
- C4: changes in the skin and subcutaneous tissue secondary to chronic venous disease
  - C4a: pigmentation and/or eczema.
  - C4b: lipodermatosclerosis and/or atrophie blanche.
  - C4c: corona phlebectatica.
- C5: healed venous ulcer.
- C6: active venous ulcer.
  - C6r: recurrent active venous ulcer.

Each clinical class is subcategorised by the presence or absence of symptoms as symptomatic (s) or asymptomatic (a).

Aetiological classification (E):

- Ec: congenital.
- Ep: primary.
- Es: secondary (postthrombotic).
- Esi: Secondary (intravenous).

- Ese: secondary (extravenous).
- En: no venous aetiology identified.

Anatomical classification (A) grades the superficial veins:

- As: superficial.
- Ad: deep.
- Ap: perforator.
- An: no venous anatomic location identified.

Pathophysiological classification (P):

- Pr: reflux.
- Po: obstruction.
- Pro: reflux and obstruction.
- Pn: no venous pathophysiology identified.

### Diagnostic evaluation

Diagnosis of venous versus arterial ulcers requires imaging techniques and tests that are performed to distinguish the two. The modalities needed to diagnose each are outlined below, along with important laboratory values that need to be considered for appropriate management.

### Venous ulcers

Comprehensive venous duplex ultrasonography is first line for venous ulcer diagnosis and is a 1B level evidence recommendation (Kolluri et al, 2022). Doppler/reflux studies provide additional evidence (O'Donnell et al, 2014). Ankle-brachial index (ABI) measurement is needed to check for the presence of additional arterial disease.

### Arterial ulcers

ABI is crucial for the diagnosis of arterial ulcers. The following values help to estimate the extent of the disease:

- 1.2 show non-compressible vessels.
- 0.9–1.2 show normal vessels.
- 0.5–0.9 show mixed arterial and venous disease.
- <0.5 show critical stenosis.
- <0.2 indicates that ischaemic gangrene is likely (Federman et al, 2024).

Additional tests that may aid diagnosis include transcutaneous oxygen studies, infra-red spectrography, Doppler studies, plethysmography, magnetic resonance angiography and arteriography.

### Laboratory tests

Blood glucose, coagulation profile, haemoglobin, serum albumin, and inflammatory markers need to be checked to identify factors that may complicate treatment. Microbiology and histopathology are additional considerations for non-healing ulcers.

Differential diagnosis of leg ulcer

There are several diseases that may present in a similar manner to leg ulcers. These diseases should be considered in differential diagnoses for patients with leg ulcers [Table 1].

Case studies

These two cases demonstrate arterial and venous ulcers.

Case study 1: Arterial ulcer

A 52-year-old man with type 2 diabetes, coronary artery disease, and peripheral vascular disease presented with dry gangrene of the second, third, and fourth toes. Transcutaneous oxygen measurement indicated severe hypoxia. Following bypass surgery, oxygenation improved, leading to complete healing post-debridement and negative pressure wound therapy [Figure 1].

Case study 2: Venous ulcer

A 60-year-old woman with a history of venous stasis and hypertension developed an ulcer on her left ankle due to prolonged standing in her job as a cashier. She was treated with compression therapy and topical antimicrobials. Due to an infection with multidrug-resistant Pseudomonas, she required IV antibiotics and hospital admission. The wound gradually improved with the use of collagen silver dressing and compression therapy [Figure 2].

Evidence-based treatment guidelines

Arterial ulcers

Revascularisation including surgical bypass, and endovascular procedures may be necessary (Federman et al, 2024). Pharmacotherapy such as antiplatelet agents (aspirin, clopidogrel) are important medical treatments for arterial ulcers (Federman et al, 2024).

Wound care, including dry dressing, and infection prevention, is necessary for a successful healing process (Shah and Milne, 2021). Pain management may require opioids for severe ischaemic pain (Federman et al, 2024).

In mixed disease cases, arterial disease should be addressed first (Mosti et al, 2012).

A guideline for arterial ulcer management is outlined in Figure 3.

Venous ulcers

Compression therapy, such as graduated stockings, may be an effective conservative treatment for venous ulcers (O'Donnell et al, 2014). Topical wound care, such as alginates, silver dressing, foam or hydrocolloid dressings, helps to prevent infection and further disease progression (Shah and Milne, 2021). Advanced

| Table 1. Diseases with a similar presentation to leg ulcers (O'Donnell et al, 2014). |           |
|--------------------------------------------------------------------------------------|-----------|
|                                                                                      | Incidence |
| Venous reflux                                                                        | 47.6%     |
| Arterial insufficiency                                                               | 14.5%     |
| Mixed arterial and venous reflux                                                     | 17.6%     |
| Vasculitis                                                                           | 5.1%      |
| Exogenous factors                                                                    | 3.8%      |
| Pyoderma gangrenosum                                                                 | 3.0%      |
| Infection                                                                            | 1.4%      |
| Neoplasia                                                                            | 1.1%      |
| Calciphylaxis                                                                        | 1.1%      |
| Drug induced                                                                         | unknown   |
| Bullous skin disease                                                                 | unknown   |
| Autoimmune                                                                           | unknown   |



Figure 1

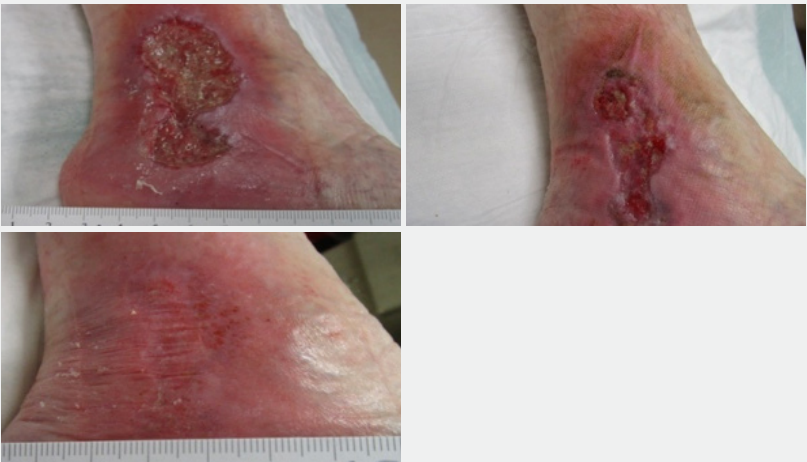


Figure 2

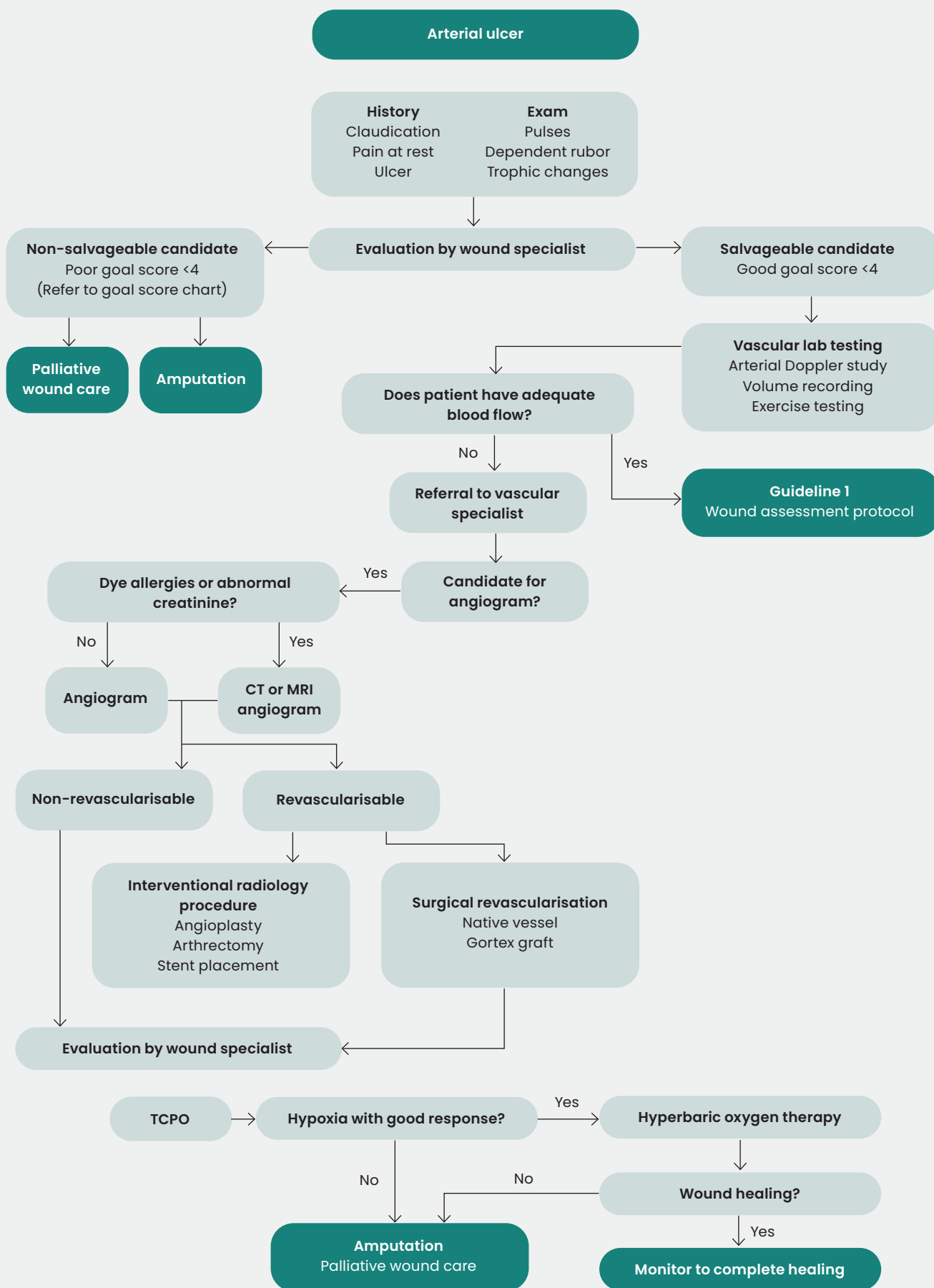


Figure 3

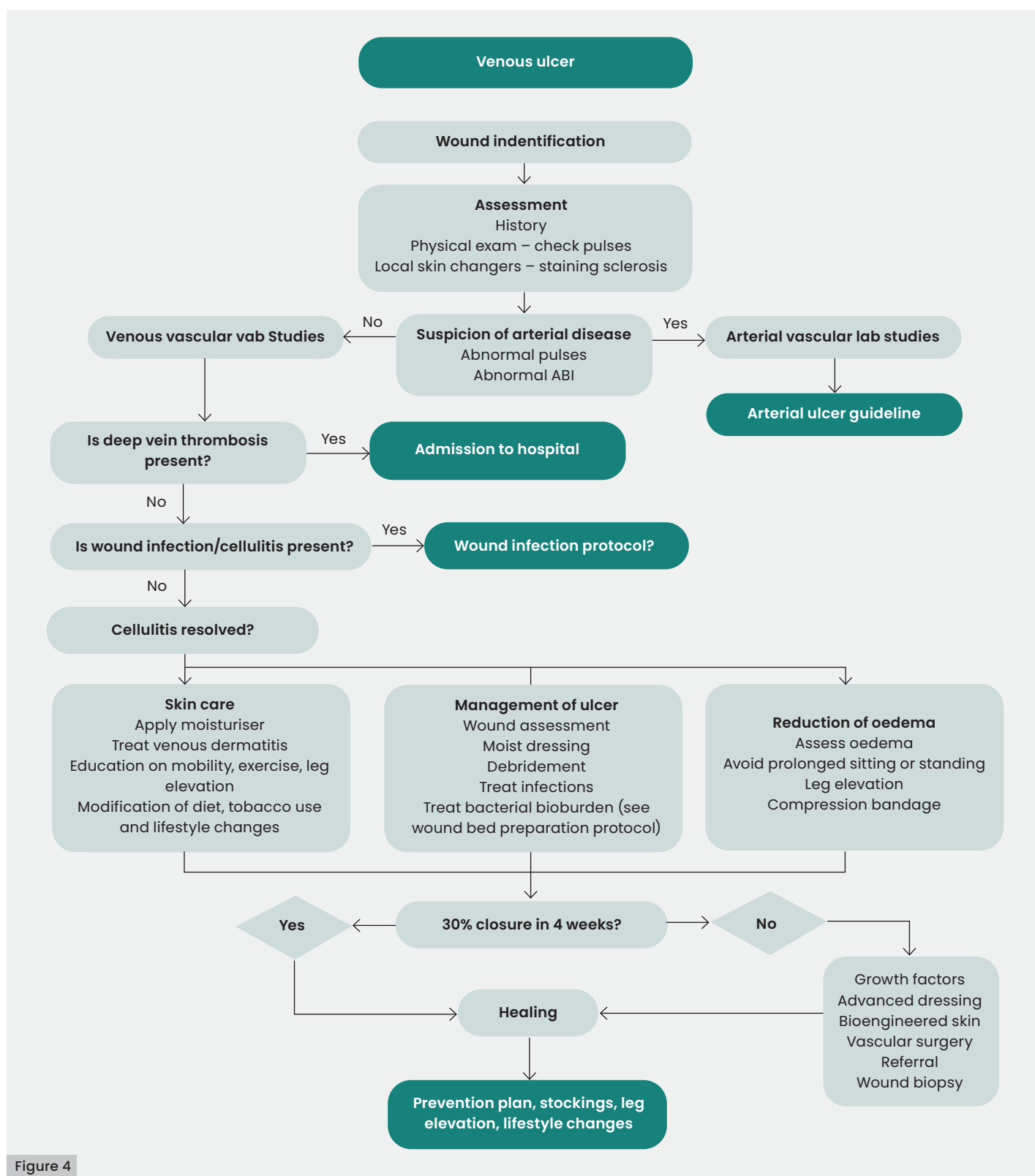


Figure 4

therapies, such as bioengineered skin substitutes or negative pressure wound therapy, may be necessary. Medication such as pentoxifylline can help to decrease claudication. (Kolluri et al, 2022; Gloviczki et al, 2024). Vein ablation may treat chronic venous reflux (Barwell et al, 2004; Gohel et al, 2018). A guideline for managing a venous ulcer is outlined in [Figure 4](#).

### Prevention strategies

Arterial ulcer prevention includes risk factor modifications, such as increased exercise levels, and regular foot inspections (Wound Healing Society).

Venous ulcer prevention includes weight management, compression therapy and early vein ablation (Kabnick and Scovell, 2025).

**Figure 3.** Guideline for managing an arterial ulcer (Shah and Milne, 2021).

**Figure 4.** Guideline for managing a venous stasis ulcer (Shah and Milne, 2021)

## Conclusion

This review serves as a guide for clinicians managing hard-to-heal leg ulcers, ensuring evidence-based decision-making and improved patient care. Differentiating between arterial and venous ulcers is critical for effective management. A tailored, evidence-based approach incorporating accurate diagnosis, targeted treatment, and preventive strategies significantly improves patient outcomes. In mixed disease cases, arterial disease should be addressed first. A mini vascular exam, including pulse check and ABI, should be performed on all leg ulcer patients. If a wound is not healing with standard therapy, consider biopsy. ●

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