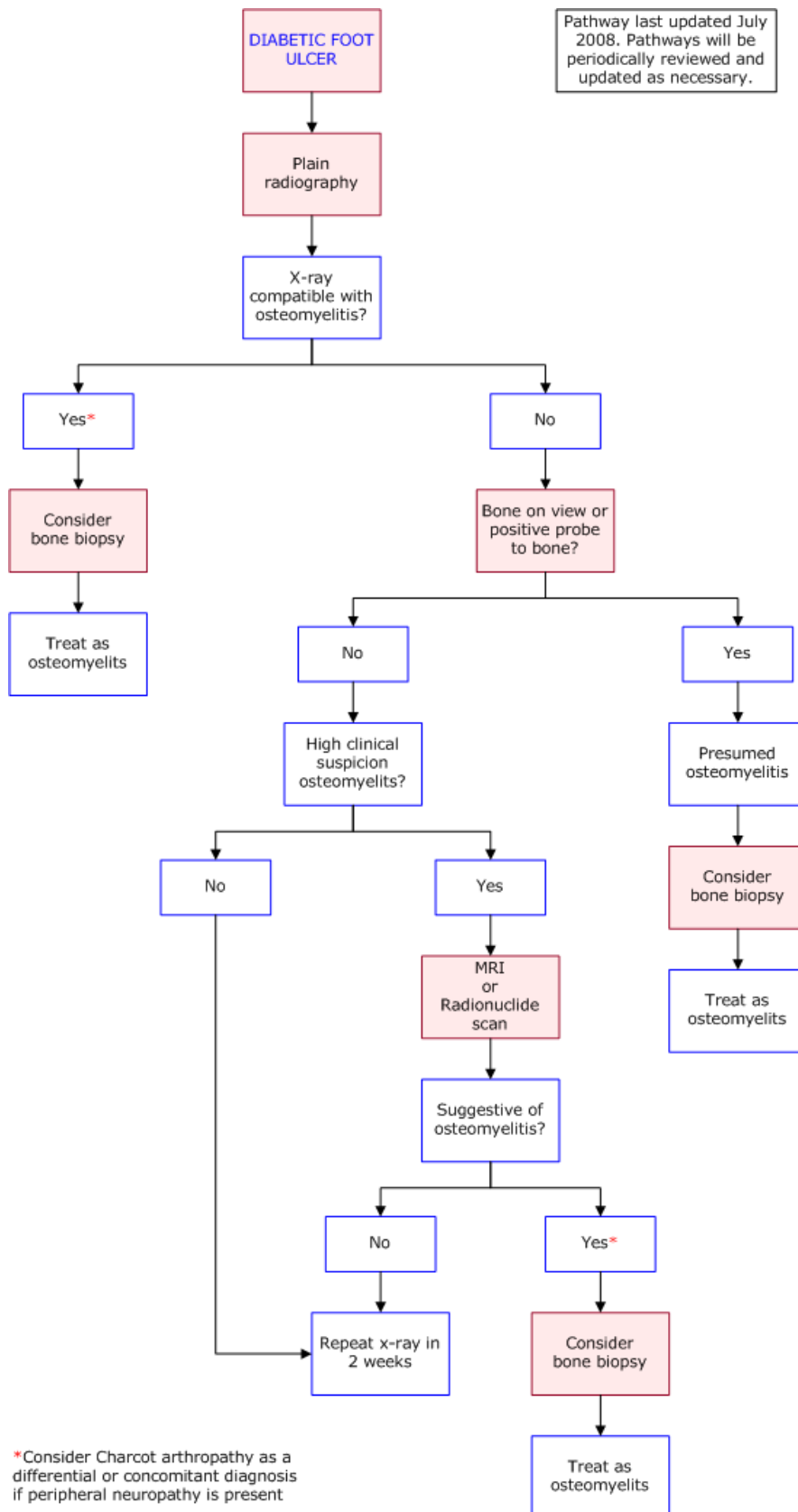




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This pathway focuses on the algorithm used to diagnose infection or osteomyelitis underlying a diabetic foot ulcer. Other important considerations when evaluating a diabetic foot is whether neuroarthropathy and/or peripheral vascular disease is present.

DIABETIC FOOT ULCER

- Diabetic foot complications are the most common cause for non-traumatic lower limb amputation. [1-6](#)
- An estimated 15% of patients with diabetes will develop a foot ulcer during the course of their disease, with 85% of diabetes related lower limb amputations preceded by a foot ulcer. [7,8](#)
- Foot disorders are the most common diabetic complication requiring hospitalisation, and are associated with the longest length of stay. [7](#)
- Approximately 20% of diabetic inpatients will have foot related complications which require acute care and/or management. [1,4](#)
- Osteomyelitis in the diabetic foot generally occurs by the direct extension of infection from underlying soft tissue ulcers, with bacteria penetrating cortical bone to access the marrow cavity. [9](#)
- Osteomyelitis is a diagnostic challenge, and imaging is commonly utilised.
- The presence of osteomyelitis increases the risk of amputation. [1,5,10](#)

CLINICAL FINDINGS

- The signs and symptoms of infection may be absent or masked by the coexistence of vascular disease or neuropathy. [1](#)
- Clinical evaluation should include an assessment of the patient's diabetes.
- The physical examination and laboratory findings which have shown to be likelihood of osteomyelitis include:
 - Bone exposure - direct visualisation of bone or the ability to probe the base of the wound to bone. Depending on prevalence (sensitivity 38-87%; specificity 85-91%; positive likelihood ratio 6.4; negative LR 0.39). [11-13](#)
 - Ulcer area larger than 2cm² (sensitivity 56%; specificity 92%). [2](#)
 - Deep (>3mm depth) ulcer (sensitivity 74%, specificity 77%). [2](#)
 - ESR >70mm/h (sensitivity 90%; specificity 100%). [14](#)
 - ALP >135U/L (specificity 100%). [2](#)
 - "Sausage toe" appearance (i.e. red swollen digit) in instances of toe ulceration. [15](#)
- Factors that did not modify the probability of osteomyelitis:
 - Presence or absence of ulcer inflammation. [2](#)
 - Elevated white blood cell count, regardless of cut off applied. [16](#)
 - Result of swab culture. [17](#)





PLAIN RADIOGRAPHY

- Initial procedure for imaging suspected osteomyelitis in the diabetic patient.
- Characteristic signs of osteomyelitis on plain radiograph include focal loss of trabecular pattern, periosteal reaction and frank bone destruction. [1](#)
- Plain radiographs can also reveal presence of foreign bodies, gas in soft tissues, fractures or bony abnormalities. [4](#)
- Poor sensitivity (22-75%) as osteomyelitic changes are delayed for 10-21 days following infection. [4,5,18](#)
- 30-50% loss of bone density is required before a radiograph will demonstrate osteomyelitis. [19,20](#)
- False positive results may be found in patients with neuroarthropathy (Charcots arthropathy). [3,10,18](#)

RADIONUCLIDE SCAN

- Nuclear imaging scans are more sensitive than radiographs for detecting osteomyelitis during early stages of the disease.
- Three phase technetium bone scan (Tc-99 MDP) is sensitive 90% but not specific 46% for osteomyelitis. [21](#)
- Focal hyperperfusion, hyperaemia and bony uptake on delayed images are signs of osteomyelitis on bone scan. These signs may also be seen in other conditions such as fracture, neuroarthropathy and chronic soft tissue infection. [3,7,21](#)
- A negative bone scan effectively excludes osteomyelitis. [7](#)
- Labelled leucocyte scintigraphy with either indium-111 or technetium-99, improves specificity (74-85% respectively) for diagnosing acute infections. [21](#)
- Chronic infections are not well imaged as poorly labelled lymphocytes predominate at the site of infection. [7](#)
- A combined dual study of Tc-99 MDP and labelled leucocyte scintigraphy (Indium-111) has been reported to increase sensitivity and specificity. [7](#)

MAGNETIC RESONANCE IMAGING

- Most sensitive and specific imaging modality for diagnosing osteomyelitis.
- Can delineate the extent of osteomyelitis and assist in the planning of surgery if indicated.
- Features of osteomyelitis on MRI include a focal area of decreased marrow signal intensity on T1 images and a increased signal intensity on T2-weighted images. [3,18](#)
- Pooled sensitivity of 93% (100% sensitivity in 6 out of 9 studies) and specificity of 83% (range 40-100%) in a recent metaanalysis. [18](#)
- False positives can occur with fractures, osteonecrosis and neuroarthropathy. [3,18](#)
- Disadvantages of MRI include its availability and high cost.





BONE BIOPSY

- The gold standard for diagnosis of osteomyelitis.
- Bone biopsy has a role not only in the diagnosis of osteomyelitis, but also the isolation of causative pathogen(s) and their antibiotic sensitivities to guide therapy.
- Bone biopsy is performed under sterile conditions either during surgical debridement or percutaneously through uninvolved skin under fluoroscopic or CT guidance. [10](#)
- Ideally bone specimens should be sent for both histopathology and microbiology. [1,10,23](#)
- Diagnosis of osteomyelitis is based on isolation of bacteria and findings of osteonecrosis and infiltration of the bone with inflammatory cells on histopathology. [10](#)
- Superficial swab culture does not reliably predict the bacteria causing osteomyelitis. Swab culture identified the identical pathogen as bone culture in only 22.5% of isolates. [22](#)
- Disadvantages of bone biopsy include cost, availability of equipment and expertise, interference by antibiotics in culture results and potential for sampling error (false negative), contamination (false positive), invasiveness of the procedure and patient discomfort.
- Bone biopsy should be avoided in patients with advanced vascular disease as the incision for bone biopsy may not heal. [1,2](#)
- There have been no published reports of complications associated with bone biopsy of the foot. [10](#)

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