Peripheral arterial disease: diagnosis and management

NICE guideline: short version

Draft for consultation, November 2017

This guideline covers diagnosing and managing peripheral arterial disease in people aged 18 and over. It aims to resolve uncertainty and variation in practice.

Who is it for?

- Healthcare professionals
- Commissioners and providers
- Adults with peripheral arterial disease, their families and carers

This guideline will update NICE guideline CG147 (published August 2012).

We have updated or added new recommendations on diagnosing peripheral arterial disease in people with diabetes.

You are invited to comment on the new and updated recommendations in this guideline. These are marked as **[2018]** if the evidence has been reviewed.

We have not updated recommendations shaded in grey, and cannot accept comments on them.

See Update information for a full explanation of what is being updated.

This version of the guideline contains the draft recommendations, context and recommendations for research. Information about how the guideline was developed is on the guideline's page on the NICE. The supporting information and evidence for the 2018 recommendations is contained in the evidence reviews on determining the diagnosis and severity of peripheral arterial disease in people with

diabetes. Evidence for the 2012 recommendations is in the full version of the 2012 guideline.

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Contents

Recommendations

People have the right to be involved in discussions and make informed decisions about their care, as described in your care.

Making decisions using NICE guidelines explains how we use words to show the strength (or certainty) of our recommendations, and has information about prescribing medicines (including off-label use), professional guidelines, standards and laws (including on consent and mental capacity), and safeguarding.

1.1 Information requirements

1.1.1 Offer all people with peripheral arterial disease oral and written information about their condition. Discuss it with them so they can share decision-making, and understand the course of the disease and what they can do to help prevent disease progression. Information should include:

- the causes of their symptoms and the severity of their disease
- the risks of limb loss and/or cardiovascular events associated with peripheral arterial disease
- the key modifiable risk factors, such as smoking, control of diabetes, hyperlipidaemia, diet, body weight and exercise (see also recommendation 1.2.1)
- how to manage pain
- all relevant treatment options, including the risks and benefits of each
- how they can access support for dealing with depression and anxiety.

Ensure that information, tailored to the individual needs of the person, is available at diagnosis and subsequently as required, to allow people to make decisions throughout the course of their treatment. **[2012]**

1.1.2 NICE has produced guidance on the components of good patient experience in adult NHS services. Follow the recommendations in NICE's guideline on patient experience in adult NHS services. **[2012]**

1.2 Secondary prevention of cardiovascular disease in people with peripheral arterial disease

1.2.1 Offer all people with peripheral arterial disease information, advice, support and treatment regarding the secondary prevention of cardiovascular disease, in line with published NICE guidance on:

- smoking cessation
- diet, weight management and exercise
- lipid modification and statin therapy
- the prevention, diagnosis and management of diabetes
- the prevention, diagnosis and management of high blood pressure
- antiplatelet therapy. **[2012]**

1.3 Diagnosis

1.3.1 Assess people for the presence of peripheral arterial disease if they:

- have symptoms suggestive of peripheral arterial disease **or**
- have diabetes, non-healing wounds on the legs or feet or unexplained leg pain **or**
- are being considered for interventions to the leg or foot **or**
- need to use compression hosiery. **[2012]**

1.3.2 Assess people with suspected peripheral arterial disease by:

- asking about the presence and severity of possible symptoms of intermittent claudication and critical limb ischaemia
- examining the legs and feet for evidence of critical limb ischaemia, for example ulceration
- examining the femoral, popliteal and foot pulses
- measuring the ankle brachial pressure index (see recommendation 1.3.3). **[2012]**

1.3.3 Measure the ankle brachial pressure index in the following way:

- The person should be resting and supine if possible.

- Record systolic blood pressure with an appropriately sized cuff in both arms and in the posterior tibial, dorsalis pedis and, where possible, peroneal arteries.
- Take measurements manually using a Doppler probe of suitable frequency in preference to an automated system.
- Document the nature of the Doppler ultrasound signals in the foot arteries.
- Calculate the index in each leg by dividing the highest ankle pressure by the highest arm pressure. **[2012]**

1.3.4 Diagnosing PAD in people with diabetes:

- Do not exclude a diagnosis of peripheral arterial disease in people with diabetes based on a normal or raised ankle brachial pressure index alone. **[2018]**

- Do not use pulse oximetry for diagnosing peripheral arterial disease in people with diabetes. **[2018]**

To find out why the committee made the [2018] recommendations on diagnosis and how they might affect practice, see rationale and impact.

1.4 Imaging for revascularisation

1.4.1 Offer duplex ultrasound as first-line imaging to all people with peripheral arterial disease for whom revascularisation is being considered. **[2012]**

1.4.2 Offer contrast-enhanced magnetic resonance angiography to people with peripheral arterial disease who need further imaging (after duplex ultrasound) before considering revascularisation. **[2012]**

1.4.3 Offer computed tomography angiography to people with peripheral arterial disease who need further imaging (after duplex ultrasound) if contrast-enhanced magnetic resonance angiography is contraindicated or not tolerated. **[2012]**

1.5 Management of intermittent claudication

Supervised exercise programme

1.5.1 Offer a supervised exercise programme to all people with intermittent claudication. **[2012]**

1.5.2 Consider providing a supervised exercise programme for people with intermittent claudication which involves:

- 2 hours of supervised exercise a week for a 3-month period
- encouraging people to exercise to the point of maximal pain. **[2012]**

Angioplasty and stenting

1.5.3 Offer angioplasty for treating people with intermittent claudication only when:

- advice on the benefits of modifying risk factors has been reinforced (see recommendation 1.2.1) **and**
- a supervised exercise programme has not led to a satisfactory improvement in symptoms **and**
- imaging has confirmed that angioplasty is suitable for the person. **[2012]**

1.5.4 Do not offer primary stent placement for treating people with intermittent claudication caused by aorto-iliac disease (except complete occlusion) or femoro-popliteal disease. **[2012]**

1.5.5 Consider primary stent placement for treating people with intermittent claudication caused by complete aorto-iliac occlusion (rather than stenosis). **[2012]**

1.5.6 Use bare metal stents when stenting is used for treating people with intermittent claudication. **[2012]**

Bypass surgery and graft types

1.5.7 Offer bypass surgery for treating people with severe lifestyle-limiting intermittent claudication only when:

- angioplasty has been unsuccessful or is unsuitable **and**
- imaging has confirmed that bypass surgery is appropriate for the person. **[2012]**

1.5.8 Use an autologous vein whenever possible for people with intermittent claudication having infra-inguinal bypass surgery. **[2012]**

Naftidrofuryl oxalate

1.5.9 Consider naftidrofuryl oxalate for treating people with intermittent claudication, starting with the least costly preparation, only when:

- supervised exercise has not led to satisfactory improvement **and**
- the person prefers not to be referred for consideration of angioplasty or bypass surgery.

Review progress after 3–6 months and discontinue naftidrofuryl oxalate if there has been no symptomatic benefit. **[2012]**

1.6 Management of critical limb ischaemia

1.6.1 Ensure that all people with critical limb ischaemia are assessed by a vascular multidisciplinary team before treatment decisions are made. **[2012]**

Revascularisation

1.6.2 Offer angioplasty or bypass surgery for treating people with critical limb ischaemia who require revascularisation, taking into account factors including:

- comorbidities
- pattern of disease
- availability of a vein
- patient preference. **[2012]**

1.6.3 Do not offer primary stent placement for treating people with critical limb ischaemia caused by aorto-iliac disease (except complete occlusion) or femoro-popliteal disease. **[2012]**

1.6.4 Consider primary stent placement for treating people with critical limb ischaemia caused by complete aorto-iliac occlusion (rather than stenosis). **[2012]**

1.6.5 Use bare metal stents when stenting is used for treating people with critical limb ischaemia. **[2012]**

1.6.6 Use an autologous vein whenever possible for people with critical limb ischaemia having infra-inguinal bypass surgery. **[2012]**

Management of critical limb ischaemic pain

1.6.7 Offer paracetamol, and either weak or strong opioids depending on the severity of pain, to people with critical limb ischaemic pain. **[2012]**

1.6.8 Offer drugs such as laxatives and anti-emetics to manage the adverse effects of strong opioids, in line with the person's needs and preferences. **[2012]**

1.6.9 Refer people with critical limb ischaemic pain to a specialist pain management service if any of the following apply:

- their pain is not adequately controlled and revascularisation is inappropriate or impossible
- ongoing high doses of opioids are required for pain control
- pain persists after revascularisation or amputation. **[2012]**

1.6.10 Do not offer chemical sympathectomy to people with critical limb ischaemic pain, except in the context of a clinical trial. **[2012]**

Major amputation

1.6.11 Do not offer major amputation to people with critical limb ischaemia unless all options for revascularisation have been considered by a vascular multidisciplinary team. **[2012]**

Recommendations for research

In 2012 the guideline committee has made the following recommendations for research. The committee's full set of research recommendations is detailed in the full guideline.

As part of the 2017 update, the standing committee made research recommendations on the effectiveness and reliability of tools for diagnosing peripheral arterial disease in people with diabetes. Details can be found in the evidence reviews [insert hyperlink when preparing for publication].

1 Effectiveness of tools for diagnosing peripheral arterial disease in people with diabetes

What is the most clinically and cost-effective tool for diagnosing peripheral arterial disease in people with diabetes?

Why this is important

People with diabetes are at higher risk of cardiovascular events and foot problems such as diabetic neuropathy (nerve damage or degeneration), foot ulcer and limb loss. So it is important to have an effective test for diagnosing peripheral arterial disease in this group. At present there are only studies of very low quality (retrospective and prospective cross-sectional studies) containing small sample sizes. Diagnostic accuracy studies are needed to address this issue, ideally containing cost-utility analysis, comparing diagnostic tools with imaging. In order to explore the importance of early diagnosis, different clinical settings where diagnostic tests are performed should be explored **[2018]**

2 Effectiveness of tools for establishing the severity of peripheral arterial disease in people with diabetes

What is the most clinically and cost-effective tool for establishing the severity of peripheral arterial disease and the impact of mortality, morbidity and limb amputation in people with diabetes?

Why this is important

Limited evidence suggests that Doppler ankle brachial pressure index, toe brachial index and oscillometric ankle brachial index, accurately diagnose severity of peripheral arterial disease. However, further research is needed using a robust diagnostic study design (such as a randomised controlled trial) to explore the clinical and cost effectiveness of tools in establishing the severity of disease and outcomes in people with diabetes. Studies should also explore the use of tools in different populations, such as those with neuropathy, and in different settings, for example, nursing homes, where access to services and diagnostic equipment may differ. **[2018]**

3 Inter- and intra-rater reliability of assessment tools in the diagnosis of peripheral arterial disease in people with diabetes

What is the inter- and intra-rater reliability of assessment tools in the diagnosis of peripheral arterial disease in people with diabetes?

Why this is important

Identifying peripheral arterial disease can be a challenge because diagnostic tests are conducted in a number of different settings by healthcare professionals with varying experience of using assessment tools. Data on inter- and intra-rater reliability of point-of-care assessment tools are needed to inform future recommendations for practice. The study should compare diagnostic tests with gold standard imaging. Different clinical and community settings, such as UK primary care setting, should also be taken into account. **[2018]**

4 Angioplasty versus bypass surgery for treating people with critical limb ischaemia caused by disease of the infra-geniculate arteries

What is the clinical and cost effectiveness of a ‘bypass surgery first’ strategy compared with an ‘angioplasty first’ strategy for treating people with critical limb ischaemia caused by disease of the infra-geniculate (below the knee) arteries?

Why this is important

Many people with critical limb ischaemia, especially those with diabetic vascular disease, also have disease of the infra-geniculate (below the knee) arteries in the calf. For many years, the standard of care has been bypass surgery. Although such surgery may be associated with significant morbidity, the resulting long-term amputation-free survival rates are generally good. In recent years there has been a trend towards treating infra-geniculate disease with angioplasty, on the grounds that it is associated with less morbidity than surgery. However, this change in practice is not evidence-based, and serious concerns remain about the durability of angioplasty in this anatomical area. A multicentre, randomised controlled trial with a full health economic analysis is required to address this. The primary endpoint should be amputation-free survival, with secondary endpoints including overall survival, health-related quality of life, healing of tissue loss, and relief of ischaemic pain. **[2012]**

5 Supervised exercise programmes for treating people with intermittent claudication

What is the clinical and cost effectiveness of supervised exercise programmes compared with unsupervised exercise for treating people with intermittent claudication, taking into account the effects on long-term outcomes and continuing levels of exercise?

Why this is important

Research has shown that taking part in exercise and physical activity can lead to improvements in symptoms in the short term for people with intermittent claudication. However, the benefits of exercise are quickly lost if it is not frequent and regular. Supervised exercise programmes have been shown to produce superior results when compared with advice to exercise (unsupervised) in the short term, but they are more expensive, and there is a lack of robust evidence on long-term effectiveness. A community-based randomised controlled trial is required to compare the long-term clinical and cost effectiveness of a supervised exercise programme and unsupervised exercise. The trial should enrol people with peripheral arterial disease-related claudication, but exclude those with previous endovascular or surgical interventions. The primary outcome measure should be maximal walking

distance, with secondary outcome measures including quality of life, function, levels of uptake of exercise programmes and long-term engagement in physical activity. **[2012]**

6 Patient attitudes and beliefs about peripheral arterial disease

What is the effect of people's attitudes and beliefs about their peripheral arterial disease on the management and outcome of their condition?

Why this is important

The evidence reviewed suggested that, among people with peripheral arterial disease, there is a lack of understanding of the causes of the disease, a lack of belief that lifestyle interventions will have a positive impact on disease outcomes, and unrealistic expectations of the outcome of surgical interventions. Much of the research has been conducted on the subpopulation of people with peripheral arterial disease who have been referred for surgical intervention, but little evidence is available for the majority of people diagnosed with peripheral arterial disease in a primary care setting. Research is required to further investigate attitudes and beliefs in relation to peripheral arterial disease, interventions that might influence these and how these may have an impact on behavioural changes in relation to risk factors for peripheral arterial disease, attitudes to intervention and clinical outcomes. **[2012]**

7 Primary versus secondary stenting for treating people with critical limb ischaemia caused by disease of the infra-geniculate arteries

What is the clinical and cost effectiveness of selective stent placement compared with angioplasty plus primary stent placement for treating people with critical limb ischaemia caused by disease of the infra-geniculate arteries?

Why this is important

Studies comparing angioplasty plus selective stent placement with primary stent placement have been limited to the aorto-iliac and femoro-popliteal segment. There is also a significant group of people with critical ischaemia caused by disease of the infra-geniculate vessels in which there is a potential for endovascular treatment.

Infra-geniculate disease is more complex to treat by endovascular means, and the risks and benefits of different treatment options may differ from those for the more proximal vessels. A multicentre, randomised controlled trial with a full health economic analysis is required to address the optimum policy as regards the choice of method for angioplasty and stent placement for the infra-geniculate arteries. The primary endpoint should be amputation-free survival, with secondary endpoints including overall survival, re-intervention rates, health-related quality of life, healing of tissue loss, and relief of ischaemic pain. **[2012]**

8 Chemical sympathectomy for managing critical limb ischaemic pain

What is the clinical and cost effectiveness of chemical sympathectomy in comparison with other methods of pain control for managing critical limb ischaemic pain?

Why this is important

Approximately 1 in 5 people with critical limb ischaemia cannot be offered procedures to improve the blood supply to their leg because of either the pattern of their disease or other comorbidities. In this group the therapeutic options are pain control or primary amputation. Chemical lumbar sympathectomy, which involves the destruction of the lumbar sympathetic chain (usually the L2 and L3 ganglia), has been suggested to reduce pain and improve wound healing, and may prevent amputation in some patients. Initially achieved surgically, it is now most commonly performed using chemical agents such as phenol to destroy the lumbar sympathetic chain. Despite having been used for over 60 years, the role of chemical lumbar sympathectomy remains unclear. Improvement in skin blood flow and modification of pain perception control have been demonstrated, and this has prompted the use of chemical lumbar sympathectomy for treating a range of conditions such as regional pain syndrome, vasospastic conditions and critical limb ischaemia. However, in critical limb ischaemia the use of chemical lumbar sympathectomy varies widely between units in England, the mode of action and indications are unclear, and there is currently no randomised controlled trial evidence demonstrating its clinical value. Therefore a randomised control trial comparing chemical lumbar sympathectomy with other methods of pain relief is recommended. **[2012]**

Rationale and impact

Diagnosis

Why the committee made recommendations

Evidence showed that Doppler ankle brachial pressure index below an agreed cut-off increased the probability of diagnosing peripheral arterial disease. However, people with diabetes and peripheral arterial disease may have a normal or raised index because of hardening of the arteries. The committee agreed that it was important to highlight this so that healthcare professionals do not exclude peripheral arterial disease in people with diabetes based on a normal or raised ankle brachial pressure index alone.

There was a lack of evidence on the use of pulse oximetry for diagnosing peripheral arterial disease in people with diabetes. The committee noted that a universal cut-off point for the presence of peripheral arterial disease had not been established. This could lead to variation in the interpretation of results. Furthermore, it was noted that pulse oximetry is rarely used in clinical practice for the assessment of peripheral arterial disease and there was general clinical agreement that it is not a useful test in this context. Therefore, the committee recommended against the use of pulse oximetry for this purpose.

There was not enough evidence on the use of other tests (Doppler waveform analysis and toe brachial index) for diagnosing peripheral arterial disease in people with diabetes. However, the committee agreed it was not appropriate to make recommendations against the use of these tests, as there were good theoretical arguments as to why these tests might provide useful diagnostic value. The committee therefore agreed to make research recommendations to inform future practice and any further update of this guidance.

Full details of the evidence and the committee's discussion are in evidence reviews A: determining the diagnosis and severity of peripheral arterial disease in people with diabetes.

How the recommendations might affect practice

The new recommendation should improve the holistic assessment of peripheral arterial disease in people with diabetes. This is important because this group has a higher risk of cardiovascular events and foot problems such as diabetic neuropathy, foot ulcer and limb loss. The recommendation clarifies the use of ankle brachial pressure index and highlights the importance of interpreting pulse measurements in relation to clinical context, including symptoms.

Putting this guideline into practice

[This section will be finalised after consultation]

NICE has produced tools and resources [link to tools and resources tab] to help you put this guideline into practice.

[Optional paragraph if issues raised] Some issues were highlighted that might need specific thought when implementing the recommendations. These were raised during the development of this guideline. They are:

- [add any issues specific to guideline here]
    - [Use 'Bullet left 1 last' style for the final item in this list.]

Putting recommendations into practice can take time. How long may vary from guideline to guideline, and depends on how much change in practice or services is needed. Implementing change is most effective when aligned with local priorities.

Changes recommended for clinical practice that can be done quickly – like changes in prescribing practice – should be shared quickly. This is because healthcare professionals should use guidelines to guide their work – as is required by professional regulating bodies such as the General Medical and Nursing and Midwifery Councils.

Changes should be implemented as soon as possible, unless there is a good reason for not doing so (for example, if it would be better value for money if a package of recommendations were all implemented at once).

Different organisations may need different approaches to implementation, depending on their size and function. Sometimes individual practitioners may be able to respond to recommendations to improve their practice more quickly than large organisations.

Here are some pointers to help organisations put NICE guidelines into practice:

1. **Raise awareness** through routine communication channels, such as email or newsletters, regular meetings, internal staff briefings and other communications with all relevant partner organisations. Identify things staff can include in their own practice straight away.

2. **Identify a lead** with an interest in the topic to champion the guideline and motivate others to support its use and make service changes, and to find out any significant issues locally.

3. **Carry out a baseline assessment** against the recommendations to find out whether there are gaps in current service provision.

4. **Think about what data you need to measure improvement** and plan how you will collect it. You may want to work with other health and social care organisations and specialist groups to compare current practice with the recommendations. This may also help identify local issues that will slow or prevent implementation.

5. **Develop an action plan**, with the steps needed to put the guideline into practice, and make sure it is ready as soon as possible. Big, complex changes may take longer to implement, but some may be quick and easy to do. An action plan will help in both cases.

6. **For very big changes** include milestones and a business case, which will set out additional costs, savings and possible areas for disinvestment. A small project group could develop the action plan. The group might include the guideline champion, a senior organisational sponsor, staff involved in the associated services, finance and information professionals.

7. **Implement the action plan** with oversight from the lead and the project group. Big projects may also need project management support.

8. **Review and monitor** how well the guideline is being implemented through the project group. Share progress with those involved in making improvements, as well as relevant boards and local partners.

NICE provides a comprehensive programme of support and resources to maximise uptake and use of evidence and guidance. See our into practice pages for more information.

Also see Leng G, Moore V, Abraham S, editors (2014) Achieving high quality care – practical experience from NICE. Chichester: Wiley.

Context

Lower limb peripheral arterial disease (or peripheral arterial disease for short) is a marker for increased risk of cardiovascular events even when it is asymptomatic. The most common initial symptom of peripheral arterial disease is leg pain while walking, known as intermittent claudication. Critical limb ischaemia is a severe manifestation of peripheral arterial disease, and is characterised by severely diminished circulation, ischaemic pain, ulceration, tissue loss and/or gangrene.

The incidence of peripheral arterial disease increases with age. Population studies have found that about 20% of people aged over 60 years have some degree of peripheral arterial disease. Incidence is also high in people who smoke, people with diabetes and people with coronary artery disease. In most people with intermittent claudication the symptoms remain stable, but approximately 20% will develop increasingly severe symptoms with the development of critical limb ischaemia.

Mild symptoms are generally managed in primary care, with referral to secondary care when symptoms do not resolve or deteriorate. There are several treatment options for people with intermittent claudication. These include advice to exercise, management of cardiovascular risk factors (for example, with aspirin or statins) and vasoactive drug treatment (for example, with naftidrofuryl oxalate).

People with severe symptoms that are inadequately controlled are often referred to secondary care for assessment for endovascular treatment (such as angioplasty or stenting), bypass surgery, pain management and/or amputation.

Rapid changes in diagnostic methods, endovascular treatments and vascular services, associated with the emergence of new sub-specialties in surgery and interventional radiology, has resulted in considerable uncertainty and variation in practice. This guideline aims to resolve that uncertainty and variation.

In 2017 we reviewed the evidence on tests for diagnosing peripheral arterial disease in people with diabetes and added a new recommendation on the use of ankle brachial pressure index in this group.

More information

[The following sentence is for post-consultation versions only – editor to update hyperlink with guideline number]You can also see this guideline in the NICE pathway on [pathway title]. [Note: this should link to the specific topic pathway, not to the overarching one.]

To find out what NICE has said on topics related to this guideline, see our web page on peripheral circulatory conditions.

[The following sentence is for post-consultation versions only – editor to update hyperlink with guideline number]See also the guideline committee's discussion and the evidence reviews (in the full guideline), and information about how the guideline was developed, including details of the committee.

Update information

[For final version amend text to remove references to 'propose' 'draft' etc']

New recommendations have been added for the diagnosis of peripheral arterial disease in people with diabetes.

Recommendations are marked as **[2018]** if the recommendation is new or the evidence has been reviewed.

Where recommendations are shaded in grey and end **[2018]**, the evidence has not been reviewed since the 2012 guideline.