

Provision of Services for People with Vascular Disease 2021



*“Person centred care, delivered
by specialist vascular teams”*

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Vascular surgery team, Oxford University Hospitals
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1. FOREWORDS



Michael Jenkins, *President*
Vascular Society of Great Britain and Ireland

In 2012 the Vascular Society published a document entitled 'The Provision of Services for Patients with Vascular Disease'. This was mainly in response to the then need to centralise vascular services based on the results of the publication of the 2011 VASCUNET report (concerning outcomes for aortic aneurysm repair) and the growing evidence regarding volume/outcome relationships in surgery.

This seminal document was welcomed by commissioners and became a very important lever to drive change and encourage best practice. Now, in its 4th edition, the same holds true of 'POVS 2021' today.

Much has changed in the last decade – we are now a distinct specialty, we work in teams, our trainees have a new curriculum and exam, and of course, we work in the Covid era. POVS 2021 encompasses the wider remit of our practice and therefore includes more emphasis on the services of our partner organisations – BSIR, SVT, SVN, and BACPAR.

Most of the difficult work to create vascular networks has been completed and this gives us an opportunity to look at services from a patient's perspective. The subtle, but important, change from the word patient to person in the title of POVS highlights a more individualised approach to vascular care, with an emphasis on prevention, screening, and surveillance of vascular disease alongside acute 'time critical' vascular care provision.

We have concentrated on the concept of 'best practice' and illustrated this with exemplars from around the UK and Ireland. Encouraging good practice, rather than penalising poor practice, is emphasised throughout, which should chime with the new style of Care Quality Commission (CQC) hospital visits.

The document has been endorsed widely and will be valued by commissioners and anyone looking to evaluate contemporary UK and Irish vascular practice. I would encourage everyone to use it to level up services where one believes things could be done better locally.

I am sure everyone will appreciate how much work has gone into the production of POVS 2021. and I would like to congratulate and thank all those who have contributed and been involved.



Ian McCafferty, *President*
British Society of Interventional Radiology

As the President of the British Society of Interventional Radiology, I would like to congratulate the Vascular Society for publishing POVS 2021.

Sharing specialist society recommendations, based on best practice, such as this, is essential to ensure that services are provided at a consistent level of excellence, and helps reduce the geographic variations in care. Moreover, POVS 2021 can act as a powerful and persuasive instrument for hospitals Trusts in negotiations with commissioners for funding for the provision of vascular services within their integrated care system (ICS).

The document approaches vascular care in a bespoke manner and now refers to treating 'the person' rather than 'the patient'. POVS 2021 acknowledges the multidisciplinary nature of providing excellent vascular care, with exemplars of teams delivering best practice from across the UK and Ireland. POVS 2021 identifies how different specialists brings additional skills to vascular management, and that care is always provided in collaboration between professionals. as a team with mutual respect.

Finally, I commend the Vascular Society for involving authors from other professional societies in the writing of this document.



Ronelle Mouton, *President*
Vascular Anaesthesia Society of Great Britain and Ireland

VASGBI is delighted to have been involved in this work. The theme of collaboration to deliver patient-centred care by specialist vascular teams runs strongly through this document. We embrace the contribution of vascular anaesthesia in pre-operative assessment, multidisciplinary vascular teams, and shared decision making.

We look forward to work together on the mutual aim to achieve the best possible outcomes for all patients with vascular disease.



Rachel Bell, *Chair*
Circulation Foundation

As Chair of the Circulation Foundation, I would like to congratulate the authors of this excellent, comprehensive document describing the provision of vascular services in the United Kingdom and Ireland. It covers all aspects of vascular surgery and the service delivery required to deliver high quality and safe specialist care to our patients.

It recognises the vital contribution to services that come from our nursing teams, podiatrists, clinical scientists, and allied health professionals. It also demonstrates the tremendous breadth of our specialty and underlines the importance of good leadership, team working and joint working with many teams from other specialities.

It will provide an excellent resource for clinical, managerial, and commissioning teams to help ensure that we continue to provide excellent services across the country.

As vascular specialists our aim has to be to deliver patient centred care in the right place, with the right specialist teams, every time. This document gives us a strong foundation to make that happen.



Louise Allen, *President*
Society of Vascular Nurses

On behalf of the Society of Vascular Nurses (SVN) I would like to thank the Vascular Society for their support and encouragement for the associated vascular societies of the UK and Ireland, including the SVN, to be equally involved in this collaborative update of 'POVS'.

We are excited that the emphasis of POVS 2021 is the integrated care of people with vascular disease, with the involvement of the vascular multi-disciplinary team (MDT).

I anticipate that POVS 2021 will have a positive effect on the progression of vascular nursing nationally. It provides an excellent resource to enable the role of vascular nurses to develop and grow, in particular the role of the Vascular Nurse Specialist within modern vascular networks.



Lee Smith, *President*
The Society for Vascular Technology of Great Britain and Ireland

This document is a true collaboration between representatives of all aspects of vascular services and highlights the multi-profession nature of vascular care and the importance of a strong working relationship between all disciplines.

The provision of high-quality vascular diagnostics is a key component of vascular services of which clinical vascular scientists play a vital role. The SVT is dedicated to promoting and maintaining high standards of practice amongst its members, while also working together with the other vascular societies to help deliver the specialised care our vascular patients deserve.

I would like to thank the Vascular Society for the invitation to be part of the writing group and thank the other members of the writing group, and section authors, for giving their time to produce this document.



Julia Earle, *Chair*
British Association of Chartered Physiotherapists in Amputee Rehabilitation

BACPAR is a relative newcomer to the vascular societies of Great Britain and Ireland. We are very pleased to support this update of 'POVS' which from the outset focuses on the importance of the vascular multi-disciplinary team (MDT). This includes physiotherapy, particularly within the management of intermittent claudication and prehabilitation/rehabilitation in vascular surgery and amputation.

This well evidenced document places patients at the centre of their care, promoting timely intervention to support prevention as well as post-surgical treatment. The vital input of the full MDT ensures excellent outcomes.



Paul Chadwick, *Clinical Director*
Royal College of Podiatry

The Royal College of Podiatry wholeheartedly welcomes and endorses POVS 2021, to help build on our existing Vascular – Podiatry collaborations and give key guidance for future partnership working, between all our respective members.

We are focussed on ensuring that podiatry, in partnership with vascular teams, nurses, GPs and others will play a leading role in the early detection, diagnosis and best treatment of people with peripheral arterial disease, throughout the UK and Ireland, to help save more lives and limbs.

2. EXECUTIVE STATEMENT

Overview

- 2.1 The vascular societies of Great Britain and Ireland* represent the views and aspirations of United Kingdom (UK) and Ireland vascular services.
- 2.2 Together they actively promote world class care for patients with vascular disease.
- 2.3 The aim of this document is to assist commissioners, providers and clinicians to deliver this ambition, in a time of great change, including the move to Integrated Care Systems (ICSs) in England:
- Care should be patient centred
 - Best outcomes for people with vascular diseases require a multi-disciplinary team (MDT) approach
 - Most treatments are 'time critical' and are best delivered by specialist teams with adequate annual case volumes
 - Vascular specialists regularly assist colleagues in other specialities
- 2.4 To be both safe and clinically effective vascular service must be person centred and integrated into local health care systems (see [section 6](#)).
- 2.5 We must educate and train new staff and retain the workforce we have (see [section 12](#)).
- 2.6 Research and innovation are key to meet the dual challenges of increasing demand and rising treatment costs (see [section 15](#)).
- 2.7 We must continuously monitor and improve the quality of our services, using the National Vascular Registry and targeted Quality Improvement Programmes (see [sections 10](#) and [11](#)).

Person centred care

- 2.8 This means providing the vascular care that people need:
- Delivered by the right multidisciplinary teams (MDTs)
 - Delivered at the right time and in the right place
 - Care tailored to a person's individual clinical circumstances, and guided by them making an informed choice
 - Doing this consistently (reducing healthcare inequalities)
 - Collecting the supporting data and metrics that provide evidence of this

- 2.9 To be both clinically and cost-effective vascular services should deliver the care that their patients want, and need:

- The age of people being treated for vascular disease is increasing, as is the complexity of their disease
- Even 'young' vascular patients (<60 years) can be frail or multi-morbid

- 2.10 Important to patients are reducing complications, length of stay, and unplanned readmissions, all of which are frequent occurrences.^{1,2}

Reducing inequalities

- 2.11 There is rightly an NHS focus, enshrined in law by the Health and Social Care Act³, on reducing health inequalities.
- 2.12 POVS 2021 will focus on 4 areas:
- **Access to vascular services**
Network hospital services ([section 9](#))
 - **Vascular disease prevention**
Supervised exercise ([section 18](#))
 - **Time to treatment**
Peripheral arterial disease ([section 18](#))
 - **Treatment variation**
Aortic aneurysm repair ([section 23](#))

Multi-disciplinary team (MDT) care

- 2.13 A theme running through POVS 2021 is the composition of the vascular MDTs needed to deliver the best patient outcomes.
- 2.14 In high functioning teams staff work and learn together; in such teams' traditional roles and responsibilities become blurred.

Specific areas for improvement

- 2.15 Six key areas for improvement over the next 3-5 years have been identified:

Vascular network delivery

- 2.16 There should be staff appointed to network roles to provide vascular services with leadership and management.
- 2.17 'Real time' data is needed to monitor the timeliness, safety, and quality of services.

* BACPAR, BSET, BSIR, SVN, SVT, VASGBI and VS (see [section 3](#)).

Specialist aortic services

- 2.18 One driver for service reconfiguration has been the relationship between case volumes and outcomes in vascular surgery.⁴
- 2.19 Some more complex aortic procedures are performed in too small numbers in too many UK arterial centres.
- 2.20 Vascular networks should work together to develop supra-regional specialist aortic MDTs to deliver these treatments in fewer higher volume aortic centres.

Leg and foot ulceration

- 2.21 Lower limb ulceration constitutes the major workload, by patient numbers, of most vascular services.
- 2.22 Too often there are delays in referral for specialist vascular assessment. This can result in chronicity, which makes it more difficult to achieve ulcer healing.
- 2.23 We need to improve the care that people with leg and foot ulceration receive, as highlighted by:
- NICE Guidance^{5,6,7}
 - All-Party Parliamentary Group^{8,9}
 - National Wound Care Strategy Programme (commissioned by NHSEI)¹⁰
 - VS Peripheral Arterial Disease Quality Improvement Programme¹¹
 - Legs Matter coalition¹²

Peri-operative care

- 2.24 Much work has already been done by the Royal College of Anaesthetists and its partners to improve peri-operative medicine.¹³
- 2.25 VASGBI have produced guidance for both healthcare professionals and for patients on getting the best outcomes from vascular surgery.¹⁴⁻¹⁵
- 2.26 People with vascular disease should have access to a comprehensive geriatric assessment (CGA) by a suitably trained specialist to address issues of frailty and multi-morbidity both before and after they have vascular surgery.¹⁶

Medical devices

- 2.27 The Cumberledge review (*'First do no harm'*) highlighted concerns over the potentially harm caused by medical devices.¹⁷
- 2.28 In the last 3 years, 2 aortic stent graft systems have been voluntarily withdrawn and NICE has questioned the clinical and cost effectiveness of EVAR for intact AAA.¹⁸
- 2.29 Introduction of new medical devices and techniques whilst encouraged should be performed in a safe way.
- 2.30 Patients with a medical device implanted should be entered into registries with mid-term (minimum 5 year) follow up.

Advance care planning

- 2.31 The vascular patient population is aging with a high proportion of frail patients.
- 2.32 Work is needed to improve end of life care planning for this patient group.
- 2.33 Improvement in each area should follow from developing better integrated vascular specialist multidisciplinary teams (MDTs), working with medical device companies (and regulators) and palliative care teams.
- 2.34 Monitoring of improvement is key. In addition to current National Vascular Registry (NVR) indicators, new key performance indicators (KPIs) are needed for this (see [section 29](#)).

Summary

- 2.35 Networks are the best model to safely deliver specialist vascular care.
- 2.36 To be most effective vascular services should be integrated into the healthcare system to provide anyone with vascular disease equal access.
- 2.37 Patients should be given the support and information they need to make the right treatment decisions for them.
- 2.38 Best vascular care is achieved with a culture of flexible teamworking across specialities, training together and looking after the well-being of all staff.
- 2.39 Only if healthcare staff listen to their patients, monitor the quality and safety of their care, learn, research, and innovate will people with vascular disease achieve the best outcomes.

Celebrating success

2.40 It is important to recognise that whilst improvement is always needed, there is much that we do well:

- **The vascular GIRFT report (2018) highlighted many areas of good vascular practice across England**¹
- **The overall picture of vascular surgery from the 2020 NVR report is of high-quality care**²
- **AAA screening programmes in men are preventing deaths in England, Wales, Scotland, and Northern Ireland**¹⁹

2.41 In this document you will read about work being done by exceptional multi-disciplinary healthcare teams across the UK and Ireland:

- Imperial College, London, embedded vascular physician model
- Royal Free, London, My Integrated Lifestyle and Exercise (MILE) Prehabilitation
- West Yorkshire, WYVaS, Virtual Ward
- North Bristol Trust 'Purple Butterfly'
- Leicester Vascular Limb Salvage Clinic (VaLS)
- Bristol Bath Weston Vascular Network leadership and management team
- Newcastle joint vascular and interventional radiology training programme
- Hull Academic Vascular Nurse Specialist led service
- Greater Manchester Specialist (MARS) podiatry services
- Northern Ireland varicose vein surgery
- Greater Manchester amputation reduction strategy (MARS)
- Royal Free, London, Vascular Anomalies MDT

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3. ABBREVIATIONS

BACPAR	British Association of Chartered Physiotherapists in Amputee Rehabilitation		
BSET	British Society for Endovascular Therapies		
BSIR	British Society of Interventional Radiology		
COP	Royal College of Podiatry		
SVN	Society of Vascular Nurses		
SVT	Society for Vascular Technology		
VASBI	Vascular Access Society of Britain and Ireland		
VASGBI	Vascular Anaesthesia Society of GB and Ireland		
VASIG	Vascular Anomalies Special Interest Group		
VS	Vascular Society of Great Britain and Ireland		
AAA	Abdominal Aortic Aneurysm	NDFA	National Diabetes Foot Care Audit
ABPI	Ankle Brachial Pressure Index	NHSEI	National Health Service England and Improvement
ACP	Advance Clinical Practitioner	NICE	National Institute of Health and Care Excellence
ACP	Advance Care Planning	NVR	National Vascular Registry
AHCS	Academy for Healthcare Science	NWCSP	National Wound Care Strategy Programme
AHP	Advanced Healthcare Professional	PACU	Post Anaesthesia Care Unit
ALI	Acute Limb Ischaemia	PAD	Peripheral Arterial Disease
AMI	Acute Mesenteric Ischaemia	PARC	Prosthetic and Amputee Rehabilitation Centre
ANP	Advanced Nurse Practitioner	PE	Pulmonary embolus
AVF	ArterioVenous Fistula	PET-CT	Positron Emission Tomography – Computed Tomography
BMI	Body Mass Index	POAC	Pre-Operative Assessment Clinic
CAS	Carotid Artery Stent	POPS	Peri-Operative Medicine for Older People
CCG	Clinical Commissioning Groups	POVS	Provision of Vascular Services
CCT	Certificate of Completion of Training	PROM	Patient Reported Outcome Measure
CEA	Carotid EndArterectomy	PTS	Post Thrombotic Syndrome
CF	Circulation Foundation	QIF (QIP)	Quality Improvement Framework (Programme)
CFS	Clinical Frailty Scale	SAC	Specialist Advisory Committee
CGA	Comprehensive Geriatric Assessment	SDEC	Same Day Emergency Care
CLTI	Chronic Limb Threatening Ischaemia	SIG	Special Interest Group
CTA	Computed Tomogram Angiogram	SPA	Supporting Professional Activity
CVC	Central Venous Catheter	ST	Speciality Training
CVD	CardioVascular Disease	SVT	Superficial Venous Thrombosis
DOAC	Direct Oral AntiCoagulant	TAA	Thoracic Aortic Aneurysm
DVT	Deep Vein Thrombosis	TAVI	Transcatheter Aortic Valve Implant
ECG	Electrocardiogram	TBAD	Type B Aortic Dissection
EVAR	EndoVascular Aneurysm Repair	TBI	Toe Brachial Index
GIRFT	Getting It Right First Time	TEVAR	Thoracic EndoVascular Aneurysm Repair
GMC	General Medical Council	TIA	Transient Ischaemic Attack
HbA1c	Glycosylated haemoglobin	TOS	Thoracic Outlet Syndromes
HDU	High Dependency Unit	TVN	Tissue Viability Nurse
HES	Hospital Episode Statistics	UK	United Kingdom
ICS	Integrated Care Systems	US	Ultrasound
ICU	Intensive Care Unit	VASCUNET	Collaboration of clinical and administrative vascular registries
ISDN	Integrated Stroke Delivery Network	VERN	Vascular and Endovascular Research Network
IT	Information Technology	VNS	Vascular Nurse Specialist
JCST	Joint Committee on Surgical Training	VSQIP	Vascular Society Quality Improvement Programme
JVSGBI	Journal of the Vascular Societies of Great Britain and Ireland	VTE	Venous Thrombo-Embolism
KPI	Key Performance Indicators	WIFI	Wound-Ischaemia-foot Infection score (Society of Vascular Surgery)
M&M	Morbidity and Mortality	WTE	Whole Time Equivalent
MDM	Multi-Disciplinary team Meeting		
MDT	Multi-Disciplinary Team		
MHRA	Medicines and Healthcare products Regulatory Agency		
MRA	Magnetic Resonance Angiogram		
MTC (MTN)	Major Trauma Centre (Network)		
NAAASP	NHS AAA Screening Programme		
NCEPOD	National Confidential Enquiry into Patient Outcome and Death		

4. IMPACT OF COVID-19

Overview

- 4.1 During the Covid-19 pandemic flexible inter-disciplinary working, with frontline healthcare staff deployed to other areas, became a focus within the NHS to maintain the capacity for acute patient care. ¹
- 4.2 This change was supported by staff gaining access to better IT to support remote working and telemedicine.
- 4.3 The pandemic highlighted the need to standardise surgical prioritisation to match supply and demand. ²
- 4.4 The indications for treatment, and the timeframes in which it should be delivered, were re-considered.
- 4.5 Shared decision making with patients came to the fore, 'doing nothing' or a less invasive endovascular option, were more often considered to avoid the risk of open surgery.
- 4.6 A spotlight was shone on the safety, health, and welfare of NHS staff. ³

Vascular Society (VS) response

- 4.7 VS Executive Committee met regularly online and gave regular updates to members.
- 4.8 Regular dialogue took place between the VS executive and NHSEI commissioners.

Impact on activity

- 4.9 NVR ⁴ and VERN ^{5,6} monitored, in real time, the impact of the Covid-19 pandemic.
- 4.10 In most Trusts, activity for chronic limb threatening ischaemia and acute diabetic foot was maintained.
- 4.11 Significant reductions were observed in other vascular activity: ⁴
 - Carotid endarterectomy - 33%
 - Intact AAA repair - 40%
- 4.12 The risk of in-hospital death was higher after surgery among people with Covid-19 infection, particularly when a patient developed a respiratory complication. ⁴

Training and Education

- 4.13 Training and continuing professional development (CPD) were both disrupted:
 - Consultant study leave was cancelled
 - No face-to-face meetings were held
 - Examinations were delayed

Health care inequalities

- 4.14 There is evidence that the pandemic has widened health inequalities. People living in the most deprived areas of the UK, and people with disabilities, have been disproportionately disadvantaged. ⁷

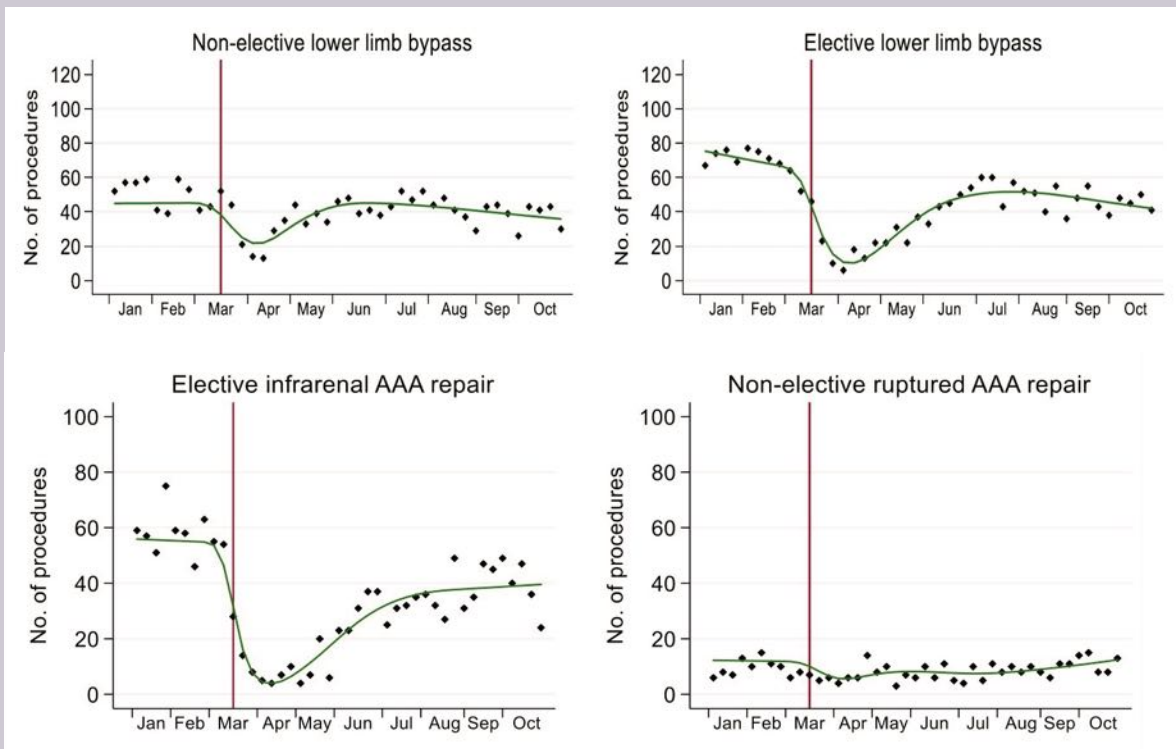
Recovery phase

- 4.15 To deliver activity that was deferred needs additional capacity, and most networks don't have the staff for this.
- 4.16 It is also important to consider the diagnostic, pre-operative assessment clinic, anaesthetic team and ward and critical care. bed capacity to deliver additional work.
- 4.17 It may be necessary to deliver care at another local vascular network with spare capacity to prevent harmful treatment delay.

Lessons learned

- 4.18 We have learnt a great deal during the Covid-19 pandemic and our response to it:
 - We must look after our staff, they are our greatest asset
 - Commissioners and providers should be aware that most vascular activity is 'time-critical'
 - Having 'real time' data and regular dialogue between clinicians and commissioners' benefits patients
 - Remote working benefits network-based models of care, including for multidisciplinary team meetings

Figure 1. Weekly number of procedures performed in NHS vascular units from 5th January to 31st October 2020. The red line denotes the week of the UK national lockdown (15-21 March). (Copyright Healthcare Commission Partnership, May 2021).



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5. VASCULAR SERVICES

Scope

- 5.1 Vascular services manage disorders of arteries, veins and lymphatics.
- 5.2 The NHSEI service specification for vascular specialised services¹ includes treatment of the following conditions:
- Limb ischaemia
 - Stroke and transient ischaemic attack
 - Aortic aneurysm and dissection
 - Mesenteric artery occlusive disease
 - Renovascular disease
 - Arterial/vascular graft infections
 - Vascular trauma
 - Vascular control
 - Venous access for haemodialysis
- 5.3 The following conditions are outside of the scope of specialist vascular services:
- **Intra-cranial arterial disease**
- managed by neuro-radiology
 - **Aortic root and/or arch aneurysm and/or type A aortic dissection**
- managed by cardiac surgery
- 5.4 Treatment of venous disease including varicose veins and/or venous leg ulceration is commissioned in England by CCGs or ICSs.
- 5.5 Venous disease also includes:
- Superficial venous reflux (SVT)
 - Deep vein thrombosis (DVT)
 - Post-thrombotic syndrome (PTS)
- 5.6 Vascular surgeons are taking a lead role in the management of acute diabetic foot problems, as part of multi-disciplinary diabetic foot care teams (see [section 19](#)).²
- Sepsis drainage and/or debridement
 - Revascularisation for ischaemia
 - Major lower limb amputation
- 5.7 Specialist vascular services are often also asked to assess people with lower limb swelling and/or leg and foot ulceration.
- 5.8 Several less common conditions also fall within the remit of the vascular surgeon (working closely with other specialities):
- Vascular anomalies
 - Thoracic outlet syndrome
 - Carotid body tumour
 - Paediatric vascular surgery
 - Lymphoedema (and Lipoedema)
 - Vasospasm and the Vasculitides
 - Exercise-induced limb discomfort

Vascular multidisciplinary team (MDT)

- 5.9 The vascular MDT comprises vascular surgeons, vascular nurse specialists, interventional radiologists, vascular anaesthetists, care of the elderly physicians, rehabilitation consultant, clinical vascular scientists, ward nurses, allied healthcare professionals (physiotherapists, podiatrists, occupational therapists, healthcare assistants and radiographers), managers, secretaries, administrative staff and doctors in training (see [section 12](#)).
- 5.10 Core activities of the MDT include:
- Promoting cardiovascular health
 - Communication and shared decision making with patients and families
 - Preventing limb loss due to peripheral arterial disease and/or complications of diabetes
 - Preventing stroke due to carotid artery stenosis
 - Preventing death from aortic diseases
 - Improving quality of life for people with venous disease

An urgent service

- 5.11 Some people require **immediate** life or limb saving intervention (i.e., for ruptured aneurysm or for acute limb ischaemia).
- 5.12 The majority of vascular referrals are **time-critical**, requiring either inpatient admission or a well organised pathway for outpatient assessment and imaging (i.e., for CLTI with managed rest pain).
- 5.13 The minority of patients go on a **waiting list** to be treated in turn at a time that suits the patient, hospital and staff (i.e., people with varicose veins without ulcer or bleed).
- 5.14 **People with venous ulcers should not wait 'in turn' for intervention.**³
- 5.15 It is not infrequent that vascular patients under follow-up may also need urgent review and/or hospital readmission.

5.16 Most service specifications and clinical guidelines include timeliness standards for vascular care (see KPIs, section 29):

- NHSEI vascular services specification
- National Institute for Health and Care Excellence (NICE) guidance
- Getting It Right First Time (GIRFT) reports
- National Stroke Strategy Programme
- UK AAA Screening Programmes
- VS Quality Improvement Frameworks

5.17 Meeting timeliness standards is a major challenge, as delay can occur at any step in the patient pathway to treatment:



5.18 Commissioners should develop real-time 'dash boards' to monitor activity, with vascular services developing action plans for improvement when standards are not being met.

IMMEDIATE or URGENT ⁴

Life, limb or organ saving
Operate within 'minutes to hours'

- Ruptured aortic aneurysm
- Acute 'complicated' aortic syndromes
- Acute limb ischaemia
- Acute mesenteric ischaemia
- Major vascular injury
- Foot ulcer **with** systemic sepsis, deep tissue injury and/or deep infection
- Phlegmasia cerulea dolens

EXPEDITED ⁴

'Time-critical' to prevent deterioration
Operate within days

With same day admission to hospital

- Symptomatic aortic aneurysm
- Very large aortic aneurysm
- Acute aortic dissection
- Stroke
- Chronic limb threatening ischaemia **with** uncontrolled pain or superficial infection
- Diabetic foot ulcer with superficial infection

With time-critical outpatient pathway

- Large aortic aneurysm (including aortic dissection with aneurysmal degeneration)
- Chronic limb threatening ischaemia **with** minor tissue injury or controlled rest pain
- Minor stroke or TIA
- Peripheral aneurysm
- Lower limb ulcer
- Planned lower limb amputation
- Venous bleed
- Digital ischaemia
- Iliofemoral* or upper limb DVT

* If meets NICE guideline criteria for venous thrombolysis

ELECTIVE ⁴

'Active conservative management and/or Surveillance
OR 'Treat in turn / Goes on waiting list'

Symptomatic

- Varicose veins (without ulceration or bleed) ¹
- Intermittent claudication ²
- Hyperhidrosis ^{1,2}
- Chronic leg swelling²

Asymptomatic

- Asymptomatic carotid stenosis

1. Often subject to local CCG (ICS) exceptional funding policies.

2. Diagnosis and initial management (i.e., supervised exercise programme for intermittent claudication and compression for leg swelling) in primary care.

Aging and Frailty

- 5.19 The average age of vascular patients is increasing year on year; one third of people treated are over 75 years of age.
- 5.20 This increases both the demand for and the complexity of vascular treatments:
- Older people present with more comorbidities and disabilities
 - They spend longer in hospital and are more likely to then have ongoing care needs and to be readmitted
- 5.21 The Southwest (22%), Wales (21%), the Northeast (20%) and the East (20%) have the highest percentage of their population aged 65 years and over.⁵
- 5.22 **The importance of frailty, over and above age, is recognised as predicting worse outcomes and longer hospital length of stay after vascular surgery.**⁶

Cardiovascular disease

- 5.23 Cardiovascular disease (CVD) refers to diseases of the heart and circulation.⁷
- 5.24 The underlying pathology in most people is atherosclerosis (arterial wall inflammation with narrowing and/or thrombosis and/or occlusion).
- 5.25 CVD includes conditions that are inherited, and those that develop later:
- **Coronary heart disease**
 - **Heart failure**
 - **Peripheral arterial disease**
 - **Stroke**
 - **Vascular dementia**
 - **Chronic kidney disease**
 - **Aortic aneurysm or dissection**
- 5.26 By 2022, the number of people at more than 20% risk of CVD could rise to 4.2 million (from 3.5 million in 2010) in the UK.^{8,9}
- 5.27 **Opportunities for CVD prevention are often missed. This results in reduced quality of life and life expectancy.**¹⁰

Cigarette smoking

- 5.28 Cigarette smoking results in death and ill health. It is the leading cause of health inequalities in England.¹¹
- 5.29 Although there was a rapid decline in the proportion of smokers during the 1980s, (when 39% of English adults smoked), the rate of decline has slowed.

5.30 In 2019, 14% of UK adults smoked tobacco (6.9 million people):^{12,13}

- 14% England
- 16% Wales
- 15% Scotland
- 16% Northern Ireland

5.31 Smoking rates in Ireland are higher than in the UK (17%):^{12,13}

Proportion of current or active smokers (NVR Annual Report 2020¹⁴)

Elective AAA repair	85%
Lower limb bypass	89%
Lower limb angioplasty	80%

- 5.32 People who smoke are at increased risk of complications following interventions because of cardiac and respiratory disease.
- 5.33 The longer-term success of vascular intervention is also reduced.
- 5.34 The risk of adverse health effects from vaping products (used by around 6% of adults in England) is expected to be much lower than from smoking cigarettes.¹¹
- 5.35 **Public health measures should promote smoking cessation, with a government ambition to go ‘smoke free’ in England by 2030.**

Diabetes mellitus

- 5.36 4.8 million people have diabetes in the UK. If nothing changes, over 5 million people will have diabetes in the UK by 2025.¹⁵
- 5.37 **Over 40% of admitted vascular patients with peripheral arterial disease (PAD) have diabetes.**¹⁴ **People with PAD should be screened for diabetes.**

Deprivation

- 5.38 There is wide regional variation in the premature death rate from CVD with more than twice as many people from the 10% most deprived populations in the UK dying of CVD than do people from the 10% most affluent populations.⁸
- 5.39 Cigarette smoking, eating less healthily and being less physically active are commonest in the more disadvantaged groups of society.

Mental health

- 5.40 People with mental health conditions have higher rates of CVD and premature death.⁸

Ethnic group

- 5.41 A person's ethnicity can influence their risk of developing CVD.⁸
- 5.42 **Vascular networks should understand the health needs of their population and help address health care inequalities.**

Vascular disease

5.43 Just over 40,000 vascular procedures are performed in England each year:

Aortic aneurysm or Aortic dissection

5.44 The NVR reported 3,445 people as having an elective AAA repair in 2019, of which 61% had EVAR (estimated case ascertainment rate of 94%).

5.45 This excludes more complex aneurysm repairs, of which 2,577 (89% endovascular) were reported to the NVR from 2017-19.

5.46 The NHS screening programme, which enrolls men at age 65 years of age, detected an AAA ≥ 3 cm in 0.9% of screened men.¹⁶

5.47 This number reflects a steady decline in thoracic and abdominal aortic aneurysm deaths in the 21st century.

5.48 Around 3,900 people each year suffer an acute aortic dissection. This incidence is increasing, in part due to increased awareness, improved diagnosis and population aging.¹⁷

Peripheral arterial disease (PAD)

5.49 Twenty percent of people aged > 60 years are estimated to suffer with PAD:¹⁸

- 1 in 5 (4% of total UK population) will experience intermittent claudication
- 1 in 5 symptomatic patients (<1% of UK population) will develop CLTI (500-1000 per 1 million population)

5.50 The NVR reported on 18,090 people having lower limb arterial bypass in 2017-19 (estimated case ascertainment rate of 90%).

5.51 Hospital episode statistic (HES) data shows around 18,000 lower limb angioplasties were performed in 2019.

5.52 NVR ascertainment rate for angioplasty increased from 16% in 2016 to 47% in 2019.

5.53 Peripheral arterial disease remains the largest single cause for lower limb amputation:

- Between 2017-19 the NVR reported 10,022 major lower limb amputations (case ascertainment rate of 80%)
- 5,204 were performed below the knee
- 43% of people had diabetes

5.54 The mortality risk for people aged >70 years following lower limb amputation is as high as 44%, 59% and 63% at 1,3 and 5 years respectively.¹⁹

Stroke and Transient Ischaemic Attack

5.55 Up to 15% of embolic strokes are caused by atherosclerotic narrowing of the carotid arteries.²⁰

5.56 In 2019, 4,141 carotid endarterectomies were performed (>90% case ascertainment).

5.57 This number is decreasing, in 2011 nearly 6,000 procedures were performed (31% reduction).

Leg ulceration

5.58 730,000 adults (1.5% of the adult population) of the UK have a leg ulcer in one year:²¹

- 1 in 170 adults had a venous leg ulcer (278,000 people)
- 1 in 20 people with diabetes had a foot ulcer (169,000 people).

Venous thrombo-embolism (VTE)

5.59 VTE occurs in 1-2 in 1000 adults per year.²²

5.60 Sixty percent of these events occur in people aged > 65 years.

Vascular trauma

5.61 In a study based in a single MTC, vascular injuries accounted for 4% of trauma admissions.²³

5.62 People with arterial injuries were severely injured, with a high associated mortality and morbidity.

Standards

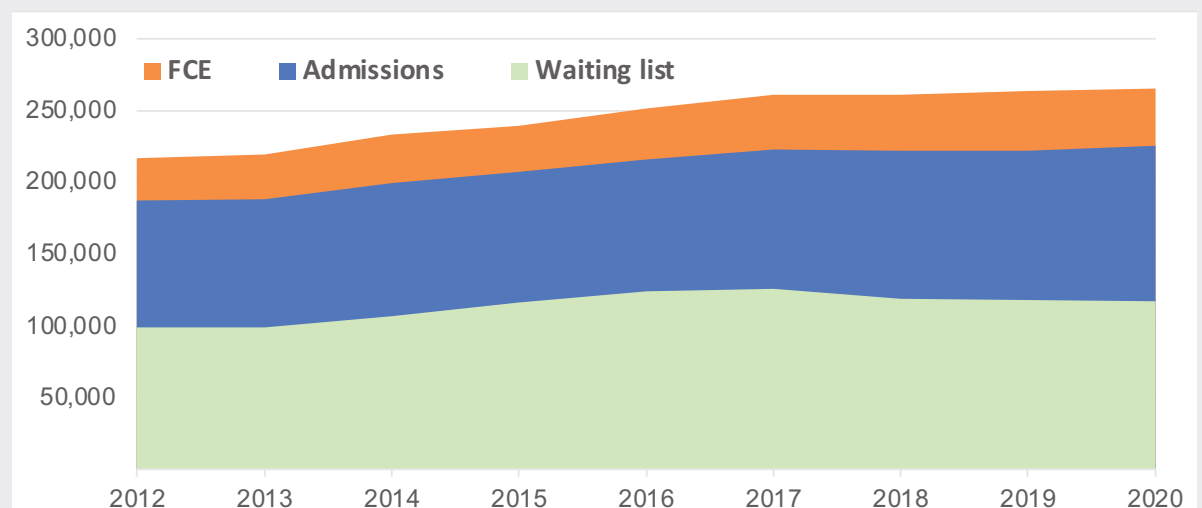
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Figure 2. NHS Digital hospital admitted patient care activity (England) shows increases in vascular activity for Finished Consultant Episodes (FCEs), Admissions, and Waiting Lists from 2012-2020.



6. INTEGRATED CARE

Introduction

- 6.1 Vascular disease management involves multiple medical specialties and allied health professionals; **the specialist vascular multi-disciplinary team (MDT)**.
- 6.2 POVS 2021 places the person at the centre of their care, with vascular services providing them with the support and information they require to self-manage and make choices about their treatment. ¹

VASCULAR DISEASE CARE

Prevention

Diagnosis

Screening

Cardiovascular disease management

Supervised exercise / Prehabilitation

Specialist care

- Clinical assessment
- Imaging
- Additional investigations
- Shared decision making
- Multidisciplinary team meeting (MDM)
- Treatment
- Recovery

Rehabilitation

Surveillance

End of life care

Prevention

- 6.3 Every contact should be used to support people to lead healthier lives.
- 6.4 NHSEI Health Check Programme is offered to adults aged 40-74 years. The programme is designed to detect early signs of CVD. ²
- 6.5 **The diagnosis of CVD, or of increased risk for CVD should trigger interventions available equally to people in all parts of the UK and Ireland:**
- Screening for diabetes (or optimisation of blood glucose levels in a person with diabetes)
 - Consideration of statin therapy
 - Optimisation of blood pressure
 - If a smoker, access to smoking cessation services
 - Nutrition and dietetics advice to target healthy body weight and nutrition
 - Access to exercise programmes to improve functional capacity

- 6.6 People should have access to additional bespoke, targeted programmes (e.g., supervised exercise for people with intermittent claudication).
- 6.7 Optimal medical management for CVD is summarised in **section 17** and is on the Royal College of Nursing website. ³

Self help

- 6.8 NHSEI provides information on healthy living; www.nhs.uk/live-well.
- 6.9 The Circulation Foundation website is a useful source of self-help advice and provides a CVD risk predictor. ⁴

Screening

Abdominal aortic aneurysm

- 6.10 Men in their 65th year are invited by the UK AAA screening programmes for a screening ultrasound of their aorta. ⁵
- 6.11 Opportunistic screening should also be considered for first degree relatives of a person with AAA and in women ≥ 65 years who smoke.

Aortic dissection

- 6.12 First degree relatives of a person with aortic dissection at a young age (< 60 years) should be offered clinical assessment (imaging) and genetic testing.

High risk diabetic foot

- 6.13 People with diabetes should have an annual foot check, including foot perfusion. ⁶

NHSEI health checks

- 6.14 These focus on overall cardiovascular health, but with no assessment for peripheral arterial disease. ²

Genetic (genomic) testing

- 6.15 Genetic testing should be considered for people in whom their vascular disease is thought to relate to a genomic change: ⁷
- Connective tissue disease (i.e., Marfan's syndrome)
 - Thoracic aortic disease (aneurysm or dissection)
 - Paraganglioma
 - Vascular anomaly

- 6.16 Offering genomic testing to people is especially important for health conditions that might affect family members.

Primary Care

- 6.17 Primary care has responsibility for most diagnosis and initial management of cardiovascular disease (CVD):
- Prevention programmes (England 'NHS Health Check', Wales 'Add to your life', and Scotland 'Keep well')
 - CVD risk factor modification (see [section 17](#))
 - Supervised exercise therapy for people with intermittent claudication
 - Initial leg wound management
- 6.18 Referral pathways to secondary care are well established for people with AAA, stroke, or diabetic foot disease.
- 6.19 Referral pathways should be in place to ensure that people with non-diabetic lower limb (i.e., venous) and foot ulcers are appropriately referred to vascular services.
- 6.20 **Vascular networks should work with Clinical Commissioning Groups (or Integrated Care Systems) to ensure that referral advice and pathways are in place.**

Secondary Care

Clinical assessment

- 6.21 Assessment of the risk and benefit of a vascular procedures is often complex.
- 6.22 There should be input from members of the **vascular multidisciplinary team:**
- Vascular surgeon
 - Vascular nurse specialist
 - Interventional radiologist
 - Vascular anaesthetist
 - Perioperative medicine
 - Care of the elderly and frailty
 - Diabetes medicine
 - Stroke medicine
 - Cardiology
 - Respiratory medicine
 - Critical care
 - Renal medicine
 - Rehabilitation medicine
 - Physiotherapy
 - Occupational therapy
 - Podiatry
 - Pharmacist
 - Dietician

- 6.23 Planning surgery should also include:
- **Establishing the best treatment option for each individual person** (shared decision making)
 - **Planning surgery** (i.e., timing, facilities, and staffing)

- 6.24 This process should inform the level of support a person will be likely to need:

- Organ support (critical care)
- Medical support
- Physiotherapy
- Psychological support
- Occupational therapy
- Podiatry
- Social care
- Longer term inpatient rehabilitation or discharge to ongoing care

- 6.25 For people undergoing a planned limb amputation services should also consider mobility, housing, social history, wheelchair provision and prosthetic fitting.

Pre-operative assessment clinic (POAC)

- 6.26 **Preparation for planned major vascular surgery should be delivered through a dedicated pre-operative assessment clinic.**⁸
- 6.27 This allows a comprehensive review to be performed on a single hospital visit:
- Review by a vascular anaesthetist
 - Review by nurse trained in assessment and optimisation of pre-operative patients
 - Optimisation of coexisting medical conditions (time allowing)
 - Stratification of risk and triage into appropriate peri-operative pathway
 - CVD prevention measures

- 6.28 People attending POAC should be signposted to the Royal College of Anaesthetists' "Your anaesthetic for vascular surgery" leaflet.⁹

- 6.29 **An equivalent assessment to that provided in POAC should be available on the vascular ward for people awaiting unplanned vascular surgery.**

Risk assessments

- 6.30 Blood results, including haemoglobin, white cell count and albumin are used within the NVR to risk stratify patients.
- 6.31 Non-invasive (electrocardiogram and echocardiogram) and invasive (stress echocardiogram, perfusion imaging and coronary angiogram) may be of benefit in assessing coronary heart disease risk.

- 6.32 Perioperative risk scores (i.e., the ACS NSQIP Surgical Risk Calculator¹⁰) should only be utilised in tandem with the clinical opinion of the vascular MDT.
- 6.33 Recognition of frailty, cognitive impairment, and risk of post-operative delirium are aided by using screening tools (i.e., Montréal Cognitive Assessment 'MoCA' and Clinical Frailty Scale 'CFS').
- 6.34 Cardiopulmonary exercise testing using a static exercise bike provides physiological data. This can support pre-operative decision making but does not have the evidence base to replace assessment by experienced specialists within the MDT.
- 6.35 Each vascular network should have clinical guidelines to assist risk stratification, optimisation, and referral to the relevant medical specialists prior to surgery.

Comprehensive geriatric assessment

- 6.36 In vascular patients age is not an absolute indicator of need, medical specialists with an interest in the elderly and frail have a pivotal role in using CGA to:¹¹⁻¹³
- Assess risks of surgery
 - Support shared decision making
 - Guide pre-operative optimisation
 - Advise on post-operative management
- 6.37 The Centre for Perioperative Care (CPOC) and the British Geriatric Society (BGS) have worked together to develop a whole pathway guide on perioperative care for people living with frailty.¹⁴
- 6.38 Many vascular networks have adopted medical liaison services like the ortho-geriatric liaison model of care.^{15,16}



Imperial College Healthcare

A novel model of all age embedded medical care was pioneered within vascular surgery in 2017 by Dr Sriharan, that of the "Surgical physician". The model is a simple but elegant solution addressing the complexity of the vascular population and concomitant difficulty in risk stratification by historical precedents such as age.

All vascular surgical patients are seen by a surgical physician in tandem with the vascular surgical team daily. The vascular physician then leads a daily MDT board round ensuring every patient's therapy and social care needs are addressed holistically, taking into consideration their contemporaneous clinical care.

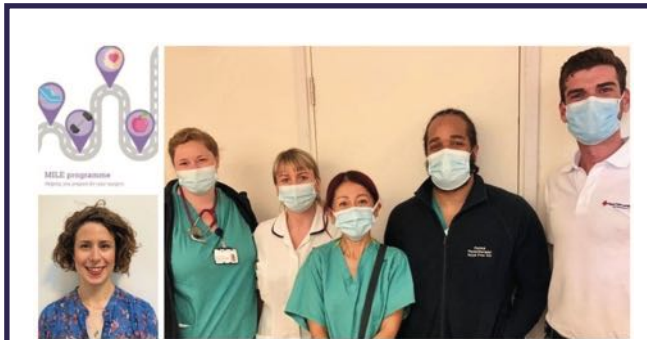
This resulted in an increase in discharges per week of 80% and a BMJ award for innovation in quality improvement.

Re-admission rates and length of stay were reduced, and the model has now been expanded to general surgery, neurosurgery & major trauma and is being recognised as its own clinical specialty of "Surgical physicians" within surgery.

- 6.39 **Vascular networks should have access to geriatrician support, as part of the vascular MDT.**

Prehabilitation

- 6.40 Prehabilitation is the practice of enhancing a patient's functional capacity before surgery.
- 6.41 This includes smoking cessation (if patient smokes), physical exercise, nutrition advice and/or supplements, and stress reduction.
- 6.42 Although yet to be evidenced as objectively improving patient outcomes in vascular surgery, benefit has been shown in orthopaedics and gastro-intestinal surgery and prehabilitation programmes in vascular surgery are recommended by GIRFT.¹⁷



My Integrated Lifestyle and Exercise (MILE) Prehabilitation, Royal Free, London

Our multi-modal prehabilitation programme aims to condition patients before major vascular surgery, and prepare them, physically and mentally, for the challenges of illness and undergoing treatment.

The multidisciplinary team of physiotherapists, occupational therapists, dietitians, and doctors target a range of aspects in the patient journey.

Participants attend six virtual exercise classes on a bi-weekly basis. Challenges relating to patient engagement have been overcome with supplementary telephone check-ins to motivate and encourage ongoing activity and the use of hospital-provided pedometers and step-count diaries.

Through prehabilitation, we can enhance a patient's functional capacity, thereby increasing the chances of post-operative recovery and decreasing strain on the NHS.

Recently we successfully prehabilitated a patient who was previously deemed unfit for an aortic aneurysm repair. The patient was able to have their surgery and was discharged home to an independent level of function, without NHS-funded care.

Rehabilitation

- 6.43 Effective rehabilitation can reduce mortality, improve quality of life and help prevent hospital readmission (i.e., cardiac rehabilitation programmes¹⁸).
- 6.44 The rehabilitation team should perform functional assessments to identify future care needs as early as possible during the patient's admission (ideally pre-operatively).
- 6.45 The greatest benefits to patients with vascular disease is gained from a holistic rehabilitation programme, tailored to their individual needs, to improve quality of life and lower risk of future CVD events.
- 6.46 There should be regular communication between surgical, medical and therapy teams regarding post-operative recovery and estimated discharge dates.

Early supported discharge

- 6.47 Referral to early supported discharge (enablement) services allows people to return home earlier in a safe, supported manner.
- 6.48 Some Trusts have extended this concept to running 'virtual wards' at home.

West Yorkshire Vascular Service | WYVaS

West Yorkshire Vascular Service (WYVaS) has created a 'virtual vascular ward'. This fulfils three main purposes:

- Tracking and shared view for 'time critical' patients, including new referrals
- Expedited outpatient work up, including cross sectional imaging
- Early supported discharge

The virtual ward improves the patient experience as people are out of hospital more, whilst also reducing inpatient bed pressure.

It is the responsibility of the vascular nurse specialists and vascular care coordinator, supported by the vascular consultant of the week, to 'review' these patients daily and progress their care.

- 6.49 Vascular services can support early discharge of patients with complex wounds with early review in clinic and liaison with community nurses or podiatrists.
- 6.50 **Patients should be given a telephone contact number for help and advice during the first few days at home.**

Complex rehabilitation needs

- 6.51 Patients with complex rehabilitation needs should be assessed by a consultant in rehabilitation medicine.
- 6.52 This approach has been shown to aid physical recovery, mental recovery, and reintegration into the community.
- 6.53 Referral to a rehabilitation unit may be required for patients who are medically fit for discharge but are unable to return home.
- 6.54 People with spinal cord injury following aortic repair should be discussed with a specialist spinal rehabilitation unit.

Enablement services

- 6.55 There are 43 prosthetic and amputee rehabilitation centres (PARCs) across the UK, each receiving 50-350 new referrals each year.
- 6.56 **Inequalities in amputee rehabilitation, including in provision of prosthetist services, have been identified, and should be addressed.** ¹⁹

Psychological support

Clinical psychologist

- 6.57 Vascular clinicians should be aware of the impact of depression, stress, anxiety, post-traumatic stress disorder (PTSD), loneliness and bereavement on recovery from surgery. ²⁰
- 6.58 **People undergoing a major amputation should have access to an amputee counsellor.** ²¹
- 6.59 Once discharged from hospital, unlike after a heart attack or a stroke, no support services are available to people with aortic or peripheral arterial diagnoses. Such support is needed to help people:

- Adjust to new circumstances
- Achieve positive behaviour change to improve their health and wellbeing

Patient support groups

- 6.60 A patient support group is defined as "a group of people with common experiences and concerns who provide emotional and moral support for one another."
- 6.61 Patient support groups (i.e.. Aortic Dissection Awareness UK & Ireland ²²) fulfil many functions:
- Educating patients/family
 - Sharing the illness experience
 - Providing strength to its members
 - Raising public awareness
 - Fundraising
- 6.62 **Vascular services should build relationships with patient support groups so that they can disseminate information and refer patients to them.**
- 6.63 The creation of network patient support groups, usually supported by vascular nurse specialist, for people under surveillance for a small AAA surveillance or people with leg ulceration ('leg clubs') is encouraged.

Surveillance

- 6.64 Surveillance is offered to people at risk of a future adverse event which is preventable with a health care intervention.
- 6.65 The most common indications for surveillance of vascular disease are:
- High risk diabetic feet
 - Small aneurysms (i.e., aortic, popliteal, mesenteric, or renal)
 - Post endovascular aortic procedures
 - Post aortic dissection
 - Post lower limb bypass graft
- 6.66 Surveillance is an area in need of service improvement as programmes, apart from the AAA screening programmes, are delivered in an 'ad hoc' manner with no dedicated funding or staff.
- 6.67 **Vascular networks should have written surveillance protocols and maintain up-to-date lists of the people that they are following up.**

End of life care

- 6.68 Prognostication for 'end of life' ²³ in people with vascular disease is made more difficult by unpredictable disease trajectory (i.e., CLTI progression) and comorbidities.
- 6.69 All vascular patients in hospital should have a treatment escalation plan (TEP) documented including their resuscitation status, even if to explicitly state full escalation in case of deterioration.
- 6.70 Planning for end of life should be considered with people who are at risk from dying suddenly or after a brief illness: ²⁴
- Person with large AAA who is unfit for surgical repair
 - Person with advanced stage CLTI or diabetic foot disease (i.e., significant tissue loss or major amputation)
- 6.71 There is benefit to both the patient and to the health service in recognising when a person is 'approaching end of life':
- Reduction in hospital and/or critical care unit admissions
 - Avoids over investigation
 - Explanation and understanding of disease trajectory and prognosis
 - Communicating the patient's wishes to other health care professionals
 - Assessment of physical, mental, social, and spiritual needs
- 6.72 **Access to a specialist palliative care team should be available 24/7 at both arterial centres and network hospitals.**



**Purple Butterfly (North Bristol NHS Trust)
delivered with the Point of Care
Foundation**

Purple butterfly is a framework which supports staff to deliver individualised and compassionate care to people in the last few days to weeks of life.

It assists health care professionals in appropriate decision making.

It guides assessment of the patient's needs to ensure that holistic care is provided for the patient and the needs of their family and carers are met:

- Stop non-essential medications, investigations, and interventions
- Anticipated medications are prescribed (i.e., for pain or anxiety)
- Specialist palliative care team input provided when needed
- Practical and emotional support

Advance Care Planning

6.73 The Gold Standard Framework and Supportive and Palliative Care Indicators Tool (SPICT) are available to start discussions with patients about ACP:

- Advance care planning (ACP) plans for the patients preferred place of care while anticipating physical deterioration
- ACP improves the quality of end-of-life care and results in higher utilisation of palliative care services.²⁵

Standards

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7. NETWORK ORGANISATION

Overview

- 7.1 **Vascular services should be organised such that anyone with vascular disease has equal access.**¹
- 7.2 People present with their vascular disease to doctors from many specialities; they should be treated by a specialist with vascular experience.²
- 7.3 Vascular services in the UK have been transformed since the creation of a separate vascular surgery speciality in 2013:³
- Vascular networks
 - Arterial centres
 - Shared pathways of care
 - Multidisciplinary team working
- 7.4 These changes were driven both by workforce considerations and the recognition that patient outcomes are better for vascular surgery performed in high volume centres by specialist multidisciplinary teams (MDTs).
- 7.5 While high volume arterial centres give better outcomes for most interventions, it is essential that vascular services provided outside of the arterial centre are not neglected; *“What can be done locally, should be done locally”* (see [section 9](#)).
- 7.6 Networks need good leadership, cross site MDT working, agreed clinical pathways, and robust governance to function well.
- 7.7 **The ideal is a vascular network configured to balance the needs of urgent patient access with the provision of safe and effective vascular interventions.**

Vascular networks

- 7.8 Whilst outpatient clinics and vascular diagnostic imaging should be offered in every hospital, inpatient arterial surgery should be undertaken in a specialist ‘arterial centre’ **except** when delivered jointly with other services (i.e., trauma, cardiac or cancer).
- 7.9 This network model for vascular care delivery with a single arterial centre within each vascular network has four key benefits:
- **Patient safety**
(body of evidence relating surgical volumes and outcomes)
 - **Workforce**
(24/7 availability of the vascular MDT)

- **Training**
(better training opportunities for both vascular surgery and interventional radiology trainees)
 - **Economic**
(avoiding replication of expensive technology and staff on multiple sites)
- 7.10 The centralisation of vascular services into arterial centres also carries risks:
- **Increased travel times**
(potential harm in the emergency setting)
 - **Inequalities in access to care**
(peoples’ willingness, and ability, to travel to access specialist vascular care)
 - **Arterial centre is overwhelmed**
(unable to deliver safe, high-quality, care)
- 7.11 **These factors are discussed more fully in the 2018 VS publication ‘Top Tips’ for Reconfiguring Vascular Services.**⁴

Population size

- 7.12 Eight hundred thousand people has become the established minimum population for UK vascular networks (an arbitrary figure from the AAA screening programme):
- Across most of the UK, a network population size of ≥ 1.2 million people is needed to provide the volume of aortic cases to drive better outcomes (see [sections 7.16-7.24](#))
 - At least 3 UK vascular networks serve populations of around 2 million people.

Smaller network sizes

- 7.13 A population size of <800,000 people may rarely be appropriate in geographically remote areas with poor road transport links (i.e., rural areas in Scotland, Wales, Ireland, and Southwest England).
- 7.14 Smaller networks should align with a larger network; this includes agreeing pathways of care, holding a joint MDM, and for governance and quality improvement.
- 7.15 All networks must provide 24/7 vascular surgery and interventional radiology, but some will have agreed pathways to send complex cases to another arterial centre.

Low Procedure Volumes

- 7.16 NHSEI sets a minimum volume of 60 aortic and 40 carotid procedures per year (POVS 2021 recommends that carotid procedures are reduced to 35), averaged over 3 years. ⁵
- 7.17 **POVS 2021 recommends that a minimum of 13 open intact AAA repairs per year, averaged over 3 years, should also be a minimum (see section 23).**

Volume and outcome relationships

- 7.18 There is a published body of evidence that patient outcomes from major vascular surgery are related to caseload. ⁶⁻⁸
- 7.19 Analysis (2012) of UK AAA repair in quartiles from the low volume units (mean 10 cases per year) through to the high-volume units (mean 150 cases per year) showed a consistent reduction in mortality across the quartiles from 4.4% to 1.9%. ⁹
- 7.20 In another published study, for both elective and emergency open AAA repair, increasing mortality benefit extends beyond 100 repairs per year. ¹⁰
- 7.21 Recent data from national vascular registries suggests a minimum threshold for open AAA repair of 13-16 cases per year. ¹¹
- 7.22 When procedure volumes at an arterial centre are close to these minimums:
- Outcomes must be closely monitored by data submission to NVR and HES
 - Network lead should discuss with commissioners if low-volume procedures would be more safely delivered at another arterial centre
- 7.23 In hospitals with a high volume of lower limb revascularisation procedures, bypass and/or angioplasty, it may be appropriate to consider a lower minimum for aortic or carotid procedures **only** if the unit meets all the other criteria in [section 8](#).
- 7.24 **The VS recognises that centralising of low-volume services is challenging. However, only in the most geographically remote regions do the risks outweigh the benefits centralisation brings to patients.**

More complex interventions

- 7.25 It is recognised that not every vascular intervention can be safely and effectively delivered in every arterial centre.
- 7.26 A patient should not be denied a choice simply because a procedure is not performed at their nearest arterial centre.

7.27 Regional services should develop care pathways across networks and deliver regional education programmes.

7.28 Complex interventions should only be performed by MDTs with adequate case volumes and specialist expertise:

- There should be a named lead consultant (vascular surgeon or interventional radiologist)
- More than one consultant working together is now routine

7.29 This recognises that some delay will result from patients being referred to the best team capable of offering the more complex interventions in the best facilities.

SPECIALIST SERVICES

Open thoracic and thoraco-abdominal aortic surgery

Complex endovascular aortic surgery
 Thoracic aortic stent graft (TEVAR)
 Fenestrated aortic stent graft (FEVAR)
 Branched aortic stent graft (BEVAR)
 Surgeon-modified or 'chimney' stent grafts

Thoracic outlet syndromes

Vascular anomalies

Carotid body tumour

Retroperitoneal tumour resection surgery

Paediatric vascular surgery

Connective tissue disease

Exercise induced limb discomfort

Deep venous interventions

Patient pathways

- 7.30 When reconfiguring services, the whole patient pathway, from diagnosis to rehabilitation, should be both defined and written down. ³
- 7.31 For 'time critical' vascular treatments pathways should include time-frame standards, and how these will be recorded and monitored. ⁴
- 7.32 National recommendations are needed for minimum service provision per capita utilising the data collated by GIRFT as an objective measure of disease burden. ¹²
- 7.33 Patients should not be denied timely access to vascular treatment due to:
- **Poor referral pathways** (i.e., booked into inappropriate clinic)
 - **Poorly organized or led network** (i.e., delayed review of inpatient referrals)

- **Inflexible working patterns** (i.e., unused theatre capacity)
- **Lack of staff** (i.e., unfilled posts)
- **Lack of facilities** (i.e., too few inpatient beds)

7.34 Pathways should include advice for primary care and network hospital clinicians on diagnosis, immediate management, and how to refer to the vascular service.

7.35 **The vascular network manager and MDM coordinator are important points of contact for all network staff.**

7.36 For every vascular network four key pathways for people presenting as vascular emergencies should be agreed and implemented:

EMERGENCY VASCULAR PATHWAYS

- Acute limb ischaemia
- Ruptured (symptomatic) aortic aneurysm
- Major vascular injury
- Foot sepsis with CLTI or diabetes

7.37 In addition, vascular networks should agree, and then publish, clinical pathways with clinicians across the network for the acute management of two other life-threatening vascular conditions:

- Mesenteric ischaemia (managed with gastro-intestinal surgery)
- Aortic dissection (managed with cardiac surgery)

Triage of referrals

7.38 Referrals are received by vascular services from many sources:

- **NHSEI e-Referral** (primary care including from community podiatry and ulcer clinics)
- **Letters to individual clinicians** (primary or secondary care)
- **Telephone call to the on-call team** (primary care, emergency departments, and other hospital specialties)
- **Ad-hoc referral** (from consultant colleagues)

7.39 Referral management should be robust and auditable with a clinical record-keeping system (written or electronic) including for emergency telephone calls, ad-hoc referrals and advice given.

7.40 Network wide co-ordination of the triage of referrals is important to:

- Ensure equality of network access
- Book patients into appropriate clinics
- Avoid inappropriate use of clinic time
- Avoid pathway delays

7.41 **A single point of contact for time-critical referrals (or advice) should be provided, usually a vascular speciality trainee or vascular consultant.**

Inter-hospital transfer

7.42 Written transfer agreements should be signed off between all networked Trusts, to minimise transfer delays within the network.

7.43 People requiring emergency vascular intervention should be transferred quickly to the network's arterial centre.

7.44 The transfer of critically ill adults should be subject to national guidance, with best practice standards for ambulance service pre-alerts.¹³

7.45 There is Royal College of Emergency Medicine guideline published for the transfer of people with ruptured AAA.¹⁴

7.46 An NHSEI 'tool kit' for aortic dissection is under development. This will include advice on patient transfer to specialist aortic centres.

7.47 Some areas have adult critical care transfer services, and these can assist with time-critical transfer for unstable patients.¹⁵

7.48 Infrequently, rather than transfer an unstable or anaesthetised patient, the on-call vascular surgeon should travel to a network hospital to operate.

Repatriation

7.49 It is the patients admitted urgently, or as an emergency, who most often have significant rehabilitation needs.

7.50 Health care system wide support is required to ensure patients only occupy specialist arterial centre ward beds when requiring tertiary level vascular input.

7.51 If repatriation to network hospitals does not happen the arterial centre will lose its capacity to admit time critical patients.

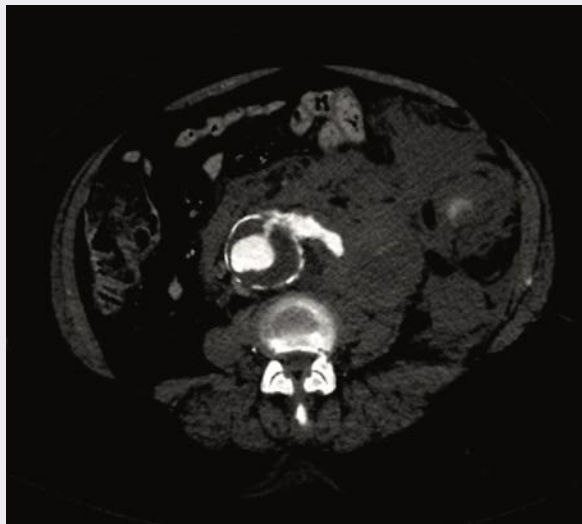
7.52 The correct approach to repatriation, should engender dual discharge planning with the patient's local Trust to consider repatriation to the local hospital, supported discharge home or discharge to a short- or long-term community rehabilitation bed.

- 7.53 Vascular networks should develop repatriation agreements between network trusts (this can follow the repatriation model developed for MTNs¹⁶).

Network cover

- 7.54 Clinical commitments across the vascular network should be shared between vascular surgeons and vascular nurse specialists, with most having sessions at both the arterial centre and at network hospitals:
- All vascular surgeons should take equal responsibility for network cover
 - Consistency of support is important to develop working relationships with consultant colleagues at network sites
- 7.55 Consideration should be given to other health care professionals working in a similar cross site manner (i.e., podiatrists, vascular scientists, and interventional radiologists).
- 7.56 Staff should be timetabled for whole days at hospitals when possible to avoid excess travelling time.
- 7.57 It is important to maintain the needed vascular MDT at each network hospital to maintain the service (see [section 9](#)).

Figure 3. CT scan showing ruptured abdominal aortic aneurysm (AAA) with large haematoma



On call (emergency cover)

- 7.58 There should be a vascular surgeon, interventional radiologist, and suitably skilled anaesthetist on call 24/7 at an arterial centre.
- 7.59 A middle grade, speciality trainee, vascular rota may be supported by non-consultant career grades (associate specialists, staff grades and/or fellows).

Outpatient clinics

- 7.60 Adequate outpatient capacity should be provided to allow patients to choose their preferred hospital (excluding for 'hot' and 'specialist' vascular clinics).¹⁷
- 7.61 Capacity to offer remote (online or telephone) clinics should be maintained.
- 7.62 Vascular nurse specialists can independently deliver clinics based on their clinical competencies and experience.
- 7.63 For each clinic scheduled in which people with leg or foot ulcers are seen the following resources are required:
- Sufficient rooms and nurses to prevent delay whilst wounds are redressed
 - Hand-held Doppler machines
 - Access to non-invasive vascular imaging (see [section 7.65](#))
- 7.64 Clinic schedules should recognise the additional time needed for:
- **One-stop clinics** (as patients are usually reviewed twice by the vascular specialist)
 - **Specialist clinics** (as shared decision making is often more complex)

'One-stop' clinics

- 7.65 Vascular scientist support for clinics can provide 'one-stop' clinical and perfusion assessment, with duplex imaging of patients with CLTI and/or diabetes.
- 7.66 This 'one-stop' approach is popular with patients, avoids pathway delay, reduces need for follow up appointments, and requires less administrative resource.

'Hot' clinics

- 7.67 Vascular 'hot' clinics deliver time-critical patient assessment by the vascular MDT without the need for hospital admission.
- 7.68 As for same day emergency care (SDEC), referrals are received direct from GPs and from emergency departments.¹⁴
- 7.69 Patients are usually seen ≤ 2 working days as vascular services do not have the capacity to deliver a 7-day 'hot' clinic service.
- 7.70 To be effective, a 'hot' clinic requires adequate resourcing and adequate capacity to meet demand:

- Consultant review for decision making
- Nursing support for advanced wound care and wound care plans
- Podiatry support for foot wounds

- Clinical vascular scientist support for non-invasive vascular imaging
- Agreed timely access to:
 - Cross-sectional imaging (CTA/MRI)
 - Physiotherapy
 - Occupational therapy
- Administrative support



Vascular Limb Salvage Clinic (VaLS), Leicester

VaLS is an 'open door' one-stop daily clinic for patients with CLTI that has been running for close to 4 years now. VaLS gives a very positive message, particularly where we have managed to sustain this service despite the pressures associated with Covid-19 pandemic.

The overall message of our experience during the first year of Covid is that the VaLS model has demonstrated strong resilience with 800 people seen through the VaLS clinic (482 with CLTI) between March 2020 and April 2021.

The average time from community referral to surgery (revascularisations) is 10 days.

REFERRALS SUITABLE FOR REVIEW IN A VASCULAR 'HOT' CLINICS

- People referred with CLTI **and** minor tissue loss **or** managed rest pain
- Acute limb ischaemia with no threat to the limb (Rutherford grade 1)
- Digital ischaemia
- People diagnosed with TIA or minor stroke and a significant carotid stenosis
- Asymptomatic aortic aneurysm above threshold for repair (≥ 5.5 cm)
- Venous leg ulcer or venous bleed
- Ilio-femoral or upper limb DVT for consideration of thrombolysis
- Wound care, including management of post-operative complications

Specialist clinics

- 7.71 Regional and supra-regional vascular services are best delivered via dedicated clinics run by specialist MDTs.
- 7.72 Patients may have had to travel further to access more specialist services so coordination with other workup for surgery should be the aim to provide the best patient experience (see [section 6](#)).

Supervised exercise therapy

- 7.73 These programmes are best delivered in the community by physiotherapist or exercise therapists with specialist vascular nursing support.
- 7.74 Some arterial centres have a nurse led claudication service that includes a supervised exercise programme, and these should be supported.

Multidisciplinary team meeting (MDM)

- 7.75 Hosting a single weekly network MDM organised by an MDM coordinator is a key component of the vascular network delivering high quality outcomes (and monitoring care).
- 7.76 Networks delivering regional or supra-regional services will host additional less-frequent MDMs (typically monthly).
- 7.77 Network clinical pathways should mandate discussion at the MDM of all major vascular cases; however, this discussion should not delay treatment, and can be in retrospect for patients already treated.
- 7.78 The full vascular MDT should be represented for an MDM to be quorate:

- Quorate with $\geq 50\%$ vascular surgeons, ≥ 2 interventional radiologists, vascular anaesthetist, vascular nurse specialist, clinical vascular scientist, and MDT coordinator in attendance

- MDM should be timetabled to allow maximum participation
- Remote access of high audio and image quality should be provided

- 7.79 MDMs should have a named chair to ensure that discussions are focussed, that a clear outcome is recorded and to help keep the meeting to time.
- 7.80 It is important that for each discussion the necessary information, including imaging, is available and that everyone gets an equal voice in the discussions.
- 7.81 Written outcomes should be documented in the patient's medical record and circulated for action.
- 7.82 The working of the MDM should be reviewed regularly (minimum annually) to look at areas for improvement and staff training needs.

'Consultant of the week'

- 7.83 Many vascular networks have adopted a 'Consultant of the week' model of care.
- 7.84 One consultant, on a rotational basis, manages all vascular inpatients, with a 7 day a week ward round, and daytime 'NCEPOD' operating.
- 7.85 This way of working provides both continuity of care for admitted patients and consultant delivered care for emergencies.

Information Technology (IT)

- 7.86 Network working is severely hampered when IT systems are incompatible as health-care delivery is so heavily dependent on IT.
- 7.87 Network staff should be able to access the following systems wherever they are based within the network (and for some staff remotely from home):

- Picture archiving and communication system (PACS)
- Patient administration system (PAS)
- Electronic patient record (EPR)
- Clinical communication and collaboration software
- Electronic prescribing
- Order communications
- Results reporting
- Business intelligence

7.88 Hospital IT systems should provide connectivity across network hospitals and primary care records.

Standards

NHS England. Specialised Vascular Services (Adults) 17004/S (2017).

NHS Abdominal Aortic Aneurysm Screening Programme. Guidance for Public Health and Commissioners (2009).

NHS England and Improvement (NHSEI). National Stroke Service Model. Integrated Stroke Delivery Networks (2021).

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15. NHS England. Adult Critical Care Transfer Services (2021).
16. Scottish Trauma Network North. North of Scotland Trauma Network Repatriation Policy (2020).
17. <https://www.england.nhs.uk/urgent-emergency-care/same-day-emergency-care/> (Accessed 02.10.21)

8. ARTERIAL CENTRES

Overview

- 8.1 Vascular inpatients should be cared for by a team of specialist clinical, nursing, and allied healthcare professionals, the vascular MDT.
- 8.2 At weekends and overnight, the same level of service support for time-critical care should be available.
- 8.3 The recognised arterial centres in the UK and Ireland are shown in [section 9](#), Figure 4.

Service provision

- 8.4 Arterial centres should provide, as a minimum, the following:
 - 24/7 Consultant vascular surgeon on call rota
 - 24/7 Consultant interventional radiologist on call rota
 - 24/7 Operating theatre, 'hybrid' theatre and interventional radiology room readily available, and appropriately staffed
 - Level 3 critical care beds ¹
 - Dedicated ward for vascular patients (GIRFT supports provision of monitored recovery beds on the vascular ward ²)
 - Access to sessions in a second theatre (GIRFT recommend that this is 7 days of the week ²)
 - Hybrid operating theatre compliant with MHRA guidance for performing aortic procedures ³
 - Dedicated interventional radiology suite with day care beds ⁴
 - Vascular laboratory (or equivalent) ⁵
 - Blood transfusion laboratory ⁶

Operating theatres

- 8.5 Theatre capacity should be allocated to reflect both the time-critical nature and duration of vascular procedures.
- 8.6 Scheduling usually averages around 1.5-1.6 vascular case per session (2-3 major vascular cases per day).
- 8.7 Where possible, time-critical vascular cases should be performed on daytime theatre lists by appropriately trained staff.
- 8.8 Services should adopt a team-based approach to theatre scheduling:
 - **Demand should be modelled to inform the theatre capacity needed to minimise delays to surgery**

- **All day theatre lists are more effective than half day**
- **Some capacity will come from the use of dedicated emergency operating theatres shared with other specialities** ⁷

- 8.9 Dedicated vascular lists are still needed for more complex procedure as:

- These can involve several consultants (sometimes from different specialties)
- The surgical team, and the patient, need time to prepare
- Special equipment may be needed

- 8.10 There should be access to cell salvage and a rapid infuser with warmer.

- 8.11 Theatre staff, especially those working in the hybrid theatre, should be familiar with open vascular surgery and endovascular techniques (including medical devices).

Hybrid theatre

- 8.12 To ensure efficient use of this theatre in addition to endovascular aortic procedures and 'hybrid' lower limb revascularisation these sessions should be used for:

- Open surgical cases
- Percutaneous angioplasty/stenting under general anaesthesia
- Deep venous interventions

- 8.13 **A vascular mobile C arm should be available (with radiographer) to be used when hybrid theatre is unavailable.**

Hybrid theatre specification

Hybrid theatres must meet the requirements of Health Building Notice (HBN) 6 "*Facilities for diagnostic imaging and interventional radiology*" and HBN 26 "*Facilities for surgical procedures*". ^{8,9}

Hybrid theatre location should facilitate 24/7 use; this means co-location with theatres and PACU.

Recommended floor space of around 75m² with fixed imaging equipment, a control room, scrub room and preparation room.

The choice of fixed imaging unit (ceiling or floor mounted) should be tailored to local needs, to achieve best image quality at lowest radiation dose.

Greater flexibility is possible with a dedicated interventional radiology table and a table designed for open surgery

There should be adequate storage cabinets for catheters, wires, balloons, and stents.

There should be the equipment to perform imaging with intravenous iodinated contrast medium, carbon dioxide (CO₂), and intravascular ultrasound (IVUS).

Interventional Radiology

- 8.14 These rooms will typically be used for both vascular and non-vascular work.
- 8.15 Case scheduling should be based around the time-critical nature of the intervention and staff available.
- 8.16 For vascular cases scheduling is facilitated by regular communication with the vascular consultant of the week.
- 8.17 An adjacent recovery unit, or protected day care beds, deliver a better patient experience and is more cost effective than inpatient admission.

Blood transfusion

- 8.18 There must be ready access to blood and blood products.
- 8.19 Having point of care coagulopathy testing in vascular theatre will help guide use of blood products in major haemorrhage.

Anaesthetic services

- 8.20 Anaesthesia for patients undergoing major vascular surgery should be provided by, or directly supervised by, an anaesthetist suitably qualified, trained and experienced in vascular anaesthesia.¹⁰
- 8.21 Anaesthetic cover for emergency vascular surgery should ideally be available from a vascular anaesthetist 24/7.

Out of hours provision

- 8.22 Staff involved providing care for out-of-hours vascular emergencies may differ from those involved in routine daytime care.
- 8.23 Staff who might be involved in perioperative care of an emergency vascular patient should:
- Be trained and competent in the aspects of patient care for which they are responsible
 - Attend and assist in the daytime care of routine major vascular cases to update their skills and knowledge

Post Anaesthesia Care Unit (PACU)

- 8.24 Most vascular patients will go through a PACU ('theatre recovery') post-surgery.

- 8.25 Recovery staff should receive training in managing post-operative vascular patients. This specifically includes the assessment of foot pulses.

Critical Care Unit (CCU)

- 8.26 Critical care level 3 ('ICU') and level 2 ('HDU') beds are needed for:

- Ruptured aortic aneurysm
- Acute aortic dissection (if accepted)
- Major vascular trauma (if MTC)
- Open aortic surgery
- Complex endovascular aortic surgery
- Some carotid endarterectomy cases
- Co-morbid or frail patients undergoing lower limb bypass or major amputation

- 8.27 A population of 800,000 people will require provision of a minimum of 1.2-2 critical care beds (0.15-0.25 per 100,000 population) for its vascular service.

- 8.28 **Planning changes to regional and supra-regional complex vascular services should involve consideration of the impact on critical care (HDU and/or ICU).**

Pre-operative assessment clinic (POAC)

- 8.29 Patients preparing for major vascular surgery should be seen and assessed in a dedicated a pre-operative assessment clinic (see [section 6](#)).

Vascular ward

- 8.30 A dedicated vascular ward is essential to ensure that admitted patients are cared for by the specialist vascular MDT.
- 8.31 Based on current experience, and depending on local case-mix, a population of 800,000 will require approximately 20-25 vascular beds (2.5-3.1 /100,000 population).
- 8.32 The following factors will increase the demand on inpatient beds:
- Poorly organised outpatient pathways for time-critical patient assessment
 - An older (or frailer) patient demographic in the population served
 - Serving areas with more socially deprived populations
 - If repatriation pathways are poorly conceived or delivered
 - When local rehabilitation and nursing home facilities are limited

- 8.33 The provision of space for assessment of selected new patients on the vascular ward can bypass the emergency department and be used to avoid assessment delays.
- 8.34 To reduce critical care utilisation GIRFT recommends the increased use of ward-based recovery, with monitored beds.²
- 8.35 **All vascular inpatients should be reviewed daily, with twice daily review for patients who are critically unwell.**

Physiotherapy gym

- 8.36 This is a specialist facility with equipment to rehabilitate people after major amputation to the stage where they can safely be discharged from hospital.

Vascular Laboratory

- 8.37 An adequately resourced clinical vascular scientist service (or sonographer service) should be available at the arterial centre.⁵
- 8.38 Urgent appointments should be made available to support stroke, diabetes, and renal access services.
- 8.39 Some ultrasound machines should be portable to allow people to be scanned on the ward, in the operating theatre or in PACU.
- 8.40 Rooms for physiology tests should include a treadmill exercise machine.

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9. NHS Estates. HBN 26 Facilities for surgical procedures (Volume 1) (2004)
10. <https://rcoa.ac.uk/gpas/chapter-15> (Accessed 02.10.2021)

Vascular Diagnostic Radiology

- 8.41 CTA and MRA are essential vascular diagnostic imaging modalities.
- 8.42 Timely access should be negotiated both at the arterial centre and at network hospitals.
- 8.43 Clinicians who plan endovascular aortic procedures should have access to a 3D planning workstation.

Office space

- 8.44 Network clinical, management and administrative staff require office space.
- 8.45 Office space should be provided for network research nurses, along with storage space for trial materials.
- 8.46 Some networks will also host their local AAA screening programme staff.
- 8.47 Home working can reduce some of the pressure on office space.

Standards

- NHS England. Specialised Vascular Services (Adults) 17004/S (2017).
- NHS England. Adult Critical Care 170118S.

9. NETWORK HOSPITALS

Overview

- 9.1 The number and type of hospitals in each vascular network will differ with local geography and population demographics.
- 9.2 A vascular network should provide equity of access to specialist vascular care irrespective of where a person lives, or the hospital to which they first present:
 - **Maintaining access to a vascular service close to where people live is central to the success of the network**
 - **The loss of local services will often result in inequalities of care provision**
- 9.3 **The benefit of having an arterial centre should be experienced by the whole network population.**

Service provision

- 9.4 The vascular service should provide to all network hospitals, as a minimum:
 - **Vascular outpatient clinics**
 - **Written pathways for the management of vascular conditions** (see section 7)
 - **24/7 Specialist vascular advice and on-call for emergencies**
 - **‘Time-critical’ local assessment with regular ward rounds**
- 9.5 The on-site vascular presence should be related to size of hospital covered and the specialties on that site.
- 9.6 It is not necessary to have a consultant vascular surgeon presence Monday to Friday 9am-5pm.

- 9.7 Each network hospital trust should provide for the vascular service:

- Outpatient clinic rooms with appropriate staff
- Diagnostic imaging
- Day case lists
- Interventional radiology facilities
- Diabetic footcare services
- Work up for intervention (cardiology, respiratory and renal)
- Office space
- Access to IT systems

Operating theatres

- 9.8 In network hospitals hosting specialist services related arterial surgery can be performed (see sections 23, 26 and 28):
 - **Major trauma** – Haemorrhage control including thoracic aortic stent (TEVAR) for traumatic aortic injury
 - **Cardiac surgery** – open and endovascular aortic procedures
 - **Cardiology** – access for transcatheter aortic valve implantation (TAVI)
 - **Specialised spinal surgery** – access for revision anterior spinal cases
 - **Cancer surgery** – vascular control and/or reconstruction
- 9.9 **This should be the only reason for a planned major vascular procedure to take place outside of an arterial centre.**
- 9.10 Day case vascular theatre activity should also take place in network hospitals:

- Superficial venous intervention (open and/or endovenous)
- Minor amputations
- Renal access fistula formation
- Vascular access (Hickmann line and Port-a-cath insertion)

Interventional Radiology

- 9.11 Low risk (predominantly day case) angioplasty can be safely performed in network hospitals.
- 9.12 Such activity is reported to the NVR from 21 non-arterial centres, see Figure 4.
- 9.13 Delivery of this activity close to where people live give a better patient experience.

REVIEW INPATIENT REFERRALS Arterial centre and Network hospitals

Services should monitor their responsiveness:	Achievable	Minimum
Review of inpatient referral ≤ 72 hours	>90%	>80%
Transfer to arterial centre vascular ward bed ≤ 48 hours	>90%	>80%

9.14 It is safe, provided that:

- More complex interventions are performed at the arterial centre
- Governance structures, including submission of data to the NVR, are in place

Management of major haemorrhage

- 9.15 Network hospital should maintain their capacity to manage major haemorrhage.
- 9.16 Interventional suites (including cath labs) should have adequately sized angioplasty balloons ('control') and stent grafts ('definitive repair') on the shelf; ideally as a 'rupture' box in case of major haemorrhage from vessel rupture.

Inpatient beds

- 9.17 There should be **no** inpatient vascular beds at network hospitals as having admitted patients outside of an arterial centre has serious implications, including, continuity of care and providing 24/7 emergency cover.
- 9.18 People with acute diabetic foot problems may be admitted under the care of an endocrinologist with support from the diabetic foot MDT (for antibiotics, pressure offloading and diabetes management).
- 9.19 Some people with acute type B aortic dissection may be admitted under the care of cardiology (cardiac surgery) with support from a supra-regional aortic MDT (for blood pressure management and serial cross-sectional imaging).

Vascular laboratory

- 9.20 Non-invasive vascular imaging should be available at networked hospitals to support vascular and other hospital services.
- 9.21 Network vascular laboratories give people the choice of having their vascular assessment and/or surveillance scans closer to where they live.

Diagnostic Radiology

- 9.22 This should be available with locally agreed time critical access for people who are inpatients or referred to vascular 'hot' clinics.
- 9.23 **Failing to achieve equity, specifically in the time to imaging, will drive pressure onto radiology and vascular laboratories at other sites.**

Office space

- 9.24 Vascular specialists, including vascular nurse specialists, attending network hospitals should have ready access to a desk and administrative support (support may be provided from the arterial centre).

Information Technology

- 9.25 Vascular staff will require access and training to use local Trust IT systems.

Administrative support

- 9.26 The level of management and administrative support needed at each network hospital will depend on the size of the hospital, the services it provides, and number of vascular surgeons involved.

Working with other specialities

- 9.27 This section highlights the integration needed between vascular services and a wide range of other medical specialities:

Diabetic foot multidisciplinary team

- 9.28 The vascular surgeon is a key member of the diabetic foot MDT:
- Diagnosis and treatment of chronic limb threatening ischaemia
 - Time-critical drainage and/or debridement for diabetic foot infection
- 9.29 Many vascular services are taking a lead role in the shared care of people with acute diabetic foot problems (see [section 19](#)).

Stroke Medicine

- 9.30 Hospitals with a hyper acute stroke unit (HASU) should have access to quality assured carotid duplex scans and a specialist vascular opinion 5 days a week (see [section 22](#)).

Renal Medicine

- 9.31 Vascular patients are susceptible to acute kidney injury (AKI) because of chronic kidney disease, contrast induced nephropathy, or following intervention.
- 9.32 Some patients are on haemodialysis and require this to continue whilst admitted under the vascular team.
- 9.33 The management of renal artery stenosis and haemodialysis access (see [section 25](#)) require close working between nephrologists, vascular and renal transplant surgeons, and interventional radiologists.

Rheumatology

- 9.34 Rheumatologists provide valuable input into the management of people with:
- Vasospasm (Raynaud's)
 - Connective Tissue Disease
 - Vasculitis

Dermatology

- 9.35 Dermatology inputs into leg ulcer care, (see [section 21](#)) and vascular anomaly management (see [section 27](#)).

Cardiac Surgery

- 9.36 Specialist aortic surgeons from both cardiac and vascular surgical backgrounds are best placed to manage pathology of the arch descending thoracic and thoraco-abdominal aorta (see [section 23](#)).

Cardiology

- 9.37 Pre-operative cardiac assessment includes echocardiography, non-invasive cardiac testing, and coronary angiography.
- 9.38 Transcatheter aortic valve implantation ('TAVI') should have the support of a vascular surgical service (see [section 28](#)).

Hypertension clinic

- 9.39 People with resistant hypertension should be referred to a specialist clinic.

Lipid clinic

- 9.40 People with resistant hyperlipidaemia, or familial hypercholesterolaemia, should be referred to a specialist clinic.

Clinical genetics

- 9.41 People with vascular disease, for which a genetic cause is suspected should be referred for assessment and genetic testing.

Haematology / Thrombosis clinic

- 9.42 People with venous thrombo-embolism (VTE) or chronic deep venous disease (reflux or occlusion) should have shared care with haematology to discuss medication choices, duration of anticoagulation, screening for malignancy and thrombophilia testing.

Pain clinic

- 9.43 Specialist pain clinics provide a multi-factorial approach to pain management to limit opioid usage.
- 9.44 People with chronic pain, including people with CLTI and post amputation neuropathic pain, should be referred.

Microbiology

- 9.45 There should be locally agreed policies on antibiotic use for treatment and prophylaxis (reviewed at least annually).
- 9.46 The management of both diabetic foot infections and prosthetic vascular graft infections requires close collaboration with microbiology consultants.

Trauma and Orthopaedic Surgery

- 9.47 Vascular surgeons contribute to the care of people with extremity trauma and vascular injuries (see [section 26](#)).
- 9.48 Diabetic foot MDTs should include input from a foot and ankle surgeon.
- 9.49 Hand surgeons can assist with management of upper limb digital ischaemia.

Spinal surgery

- 9.50 Vascular Surgeons are asked to assist spinal surgeons for cases with a higher risk of bleeding (see [section 28](#)).

Plastic surgery

- 9.51 Plastic surgeons have an important role in vascular anomaly management ([section 27](#)).
- 9.52 Plastic surgeons can provide skin cover for soft tissue defects arising either from ulcers, from removal of necrotic tissue or from fasciotomy incisions.
- 9.53 Hand surgery expertise may also be helpful in the management of upper limb digital ischaemia.

General surgery

- 9.54 Management of acute mesenteric ischaemia requires a joint approach with gastro-intestinal surgeons (see [section 24](#)).
- 9.55 Many of these patients have prolonged hospital admissions and require complex abdominal wound, stoma, and nutrition management.

Other surgical specialities

- 9.56 Vascular surgeons are asked to assist colleagues from other specialities performing procedures with a high risk of major haemorrhage.
- 9.57 This includes retroperitoneal tumour resection as part of a multi-disciplinary surgical team (see [section 28](#)).

Standards

NHS England. Specialised Vascular Services (Adults) 17004/S (2017).

Health and Social Care Board (HSCB) and Public Health Agency (PHA) Northern Ireland. Review of Vascular Services in Northern Ireland (2013).

Figure 4. Red marker, arterial centre co-located in hospital with a major trauma centre (MTC). Blue marker, other arterial centre. Yellow marker, network hospital performing angioplasty.



SECTION 10

10. SERVICE DELIVERY AND CLINICAL GOVERNANCE

NHS Landscape

- 10.1 As NHS England and Improvement move on from the era of competition between Trust ¹ to Integrated Case Systems (ICSSs), we should reflect on the impact of this on the delivery of care by vascular networks.
- 10.2 Lessons learned during the Covid-19 pandemic remain germane here; co-operation between units, more (virtual) team interaction, and better appreciation of staff are good pillars on which to build a successful network.
- 10.3 Over the last decade or so, the increased reliance on team-delivered care with cooperation between colleagues, 'unit' ward rounds, joint operating and MDM-based decision making have changed how we work.
- 10.4 **Patient care has become the responsibility of multiple members of the multi-professional team and not of a single named vascular surgeon.**
- 10.5 This model lends itself to be applied over the larger scale of a network and fits well with the introduction into the NHSEI of Integrated Care Systems (ICSSs). ²
- 10.6 The move away from individual surgeon outcome reporting for 2020 gives networks more corporate responsibility for outcomes. This also reflects the new team approach to working and chimes better with new funding models.
- 10.7 In line with the Care Quality Commission's focus on what matters most to people, in delivering networked vascular services, we should ask ourselves:
- **Are they safe?**
 - **Are they effective?**
 - **Are they caring?**
 - **Are they responsive?**
 - **Are they well led?**

Patient safety

- 10.8 Vascular surgery is inherently risky, with significant consequences for patients when something goes wrong.

- 10.9 Vascular services should be committed to a culture of openness, transparency and accountability that underpins patient safety:

- Data submission to the National Vascular Registry ³
- Incident reporting of significant adverse events and 'near-misses'
- Be open and honest with patients, and their families, when things go wrong
- Duty of Candour legislation (UK) ^{4,5} and Open Disclosure (Ireland) ⁶

- 10.10 The poor UK outcomes in aortic surgery in the 1990s highlights the importance of avoiding complacency with robust and transparent outcome reporting.

Historical perspective

Sixteen years ago, NCEPOD ⁷ and then VASCUNET ⁸ reported that UK outcomes for abdominal aortic aneurysm (AAA) repair in England were poor, and the UK had the highest mortality in Western Europe for elective AAA repair. The UK was also slow to uptake on endovascular aortic aneurysm repair (EVAR).

A VS Quality Improvement Programme for AAA Repairs was implemented to improve outcomes.⁹

This was successful in improving outcomes to equivalent to those in other European countries.

- 10.11 In addition to performing safe surgery, vascular services should monitor the following areas with a high risk of serious adverse events:

- Patient transfers between hospitals
- Falls, slips and trips
- Pressure injuries
- Medication errors (most frequently for anticoagulation)

National Vascular Registry (NVR)

- 10.12 The NVR measures the quality of care given to patients undergoing vascular intervention in the UK, but not Ireland (excluding private healthcare providers). ¹⁰
- 10.13 Full NVR data is available publicly for the following index procedures:
- Elective AAA repair
 - Carotid endarterectomy
 - Lower limb angioplasty/stent
 - Lower limb bypass
 - Lower limb major amputation

10.14 Consultants should annually benchmark their performance against peers as a mandatory requirement for General Medical Council appraisal and revalidation.¹¹

10.15 HQIP analyses performance against peers using risk adjusted data to identify outliers. HQIP informs the individual, and their employing trust, if this analysis raises concerns.¹²

10.16 The National Vascular Registry is described in greater detail in [section 11](#).

Mortality and Morbidity Meetings

10.17 Vascular networks should hold regular reviews to learn, and act where necessary, to improve patient safety.¹³

10.18 Attendance at these meetings should mirror that of the network MDT.

10.19 Events that warrant morbidity and mortality meeting review:

- Unexpected death
- Patient safety incident triggering statutory Duty of Candour (UK) or Open Disclosure (Ireland)
- Never event
- Delay in inter-hospital transfer
- Delay in AAA repair > 12 weeks (unless mitigating reason, [section 23](#))
- Unplanned re-intervention
- Hospital re-admission

10.20 Reviews at these meeting should focus on what can be learnt from adverse incidents to prevent them from happening again based on analysis of human, system, and patient factors ('root cause analysis').

10.21 Near misses, coroner inquests and medico-legal claims may also be valuable opportunities for learning.

10.22 Network governance leads, supported by the network management team, should keep a record of cases discussed and provide regular updates on agreed actions.

Effective care and Monitoring

10.23 POVS and the NHSEI vascular service specification describe how vascular services should be most effectively delivered.

10.24 Vascular care is monitored by multiple oversight organisations in England (see [section 16](#) for arrangements in the three devolved UK nations and in Ireland):

Quality Care Commission (CQC)

10.25 The Quality Care Commission has overarching responsibility for monitoring the quality of acute hospital services.

Specialised Commissioners (NHSEI)

10.26 The quality of vascular care delivery is monitored by healthcare commissioners (NHSEI Specialised Services) using Specialised Services Quality Dashboards (SSQDs) based on HES and NVR data.

10.27 Regional NHSEI Specialised Services commissioners assess the effectiveness of each network's services against the national service specification.¹⁴

10.28 Services unable to deliver the quality standards in this specification can be placed under 'derogation' and asked to produce an action plan on how they will provide a compliant service through reconfiguration.

Healthcare Quality Improvement Partnership (HQIP)

10.29 HQIP provides oversight for vascular surgery through the NVR (see [section 11](#)).

10.30 The NVR publishes annual reports, organisational-level data sheets and patient infographics summarising some of the KPIs.

Get it Right First Time (GIRFT)

10.31 The Get It Right First Time Programme (GIRFT) has a focus on both effectiveness and patient safety.

10.32 All arterial centres have been visited and KPIs are tracked 'live' on dash boards.

10.33 The 2018 Vascular GIRFT report:¹⁵

- Endorsed the network approach to delivering urgent vascular care
- Highlighted the need to improve data collection for complex endovascular aortic procedures and angioplasty

AAA Screening Programmes (NAAASP)

10.34 The four national AAA screening programmes monitor the treatment of screen detected aortic aneurysms.¹⁶

National Institute for Health and Care Excellence (NICE)

10.35 The National Institute of Clinical and Health Excellence (NICE) audits adherence to its Guidelines and Quality Standards.

Cost effective care

- 10.36 Within a taxpayer funded (i.e., cost constrained) system consideration must be given to the cost effectiveness of treatments.
- 10.37 NICE has highlighted concerns that a review of the published literature shows that EVAR is not cost effective for intact AAA and therefore its use should be restricted to selected patients.¹⁷
- 10.38 Some interventions are not routinely commissioned and/or funded in all areas by NHSEI, despite published evidence that they are cost effective:
- Supervised exercise therapy for people with intermittent claudication¹⁸
 - Intervention to varicose veins complicated by new leg ulceration¹⁹
- 10.39 **It is recommended that access to cost effective treatments is equivalent across networks to remove inequalities in care (the so called 'post code lottery').**

Time-frame standards

- 10.40 This an area that NHSEI monitoring focuses on to reduce unwarranted variation in patient care.
- 10.41 The five key performance indicators (KPIs) for a vascular service of timely care:

1	Inpatients at arterial centre and at network hospitals seen within 72 hours of referral.
2	Revascularisation for CLTI within 5 days for admitted patients and 14 days for non-admitted patients.
3	Carotid endarterectomy within 14 days of TIA or minor stroke.
4	People with a lower limb wound assessed within 2 weeks of primary care referral.
5	Intact AAA repair performed within 8 weeks of reaching threshold for intervention.

Quality Improvement

- 10.42 VS Quality Improvement Frameworks have been used to improve the effectiveness and safety of vascular services:
- **Quality Improvement Programme for Patients with Abdominal Aortic Aneurysms (2012)**
 - **Best Practice Clinical Care Pathway for Major Amputation (2016)**
 - **Peripheral Arterial Disease Quality Improvement Programme (2019)**

- 10.43 The 2018 GIRFT vascular report¹⁵ highlighted 3 areas for quality improvement:
- Reducing re-interventions
 - Reducing inpatient length of stay
 - Reducing hospital re-admissions
- 10.44 Clinical governance and network leads can promote quality improvement by:
- Disseminating standards documents
 - Regular performance updates
 - Highlighting areas for improvement
 - Enabling quality improvement activity
- 10.45 Best practice quality improvement resources are available on the VS Quality Improvement Programme website.²⁰

Compassionate care

- 10.46 A person's individual values and beliefs should be listened to and inform care.
- 10.47 Network leaders should model the behaviours that become the network norm; a comfortable, caring, and safe environment in which staff deliver care in a calm, reassuring, way to patients.²¹

Responsive to people's needs

- 10.48 Vascular services should listen to, and act on, the patient voice.
- 10.49 People want healthcare to be personalised, focused on their needs and values, with them involved in making decisions about their treatment.²²
- 10.50 Services should be organised to meet these needs and consider the distances people are willing to travel to access care²³
- 10.51 Patients want care to be joined up and focussed on their needs:
- Named hospital consultant
 - Medical records and imaging available when they are seen in a clinic
 - Time available for shared decision making around treatment options
 - Timely follow up after treatment
 - Physical and psychological support during recovery from surgery
- 10.52 A service that starts with the patient will provide a better patient experience and consequently better clinical outcomes:
- It gives people control, so they can make informed decisions
 - It listens to patient and family needs
 - It utilises the skills and expertise of both the clinician and the patient

- 10.53 **Patient engagement should be a partnership, with the network listening and patients actively participating.**

Protecting choice

- 10.54 People have the legal right to choose the hospital or service they wish to attend.²⁴
- 10.55 It is often people who are the most socially disadvantaged who are most affected by healthcare inequalities and who have the least choice around their healthcare.²⁵
- 10.56 **Networks should monitor use of their services by disadvantaged groups.**

NHS England and Improvement (NHSEI) would like every patient to be able to say:

I was offered appropriate choices of where to go for my care or tests.

I have discussed with my healthcare professional the different options available to me, including the risks and benefits and, where appropriate, the option to do nothing.

Information to help me make decisions was available and I knew where to find it in a format that was accessible to me.

I was given sufficient time to consider what was right for me.

Listening to feedback

- 10.57 Reported patient experience is a fundamental measure of the quality of care.
- 10.58 There are no routinely collected vascular surgery patient reported outcome measures (PROMs).
- 10.59 In the absence of other patient feedback, patient advice and liaison service (PALS) feedback and routinely collected 'Friends and Family test feedback' from the vascular ward both provide useful insight into the service from the patient's perspective. These should be acted upon.^{26, 27}
- 10.60 Special attention should be given to the experience of people who are older, vulnerable or experiencing poor mental health, including people with dementia.

- 10.61 Delivering a good patient experience is important for the reputation of an organisation and the wellbeing of its staff.

- 10.62 **Vascular networks should develop ways to encourage people to report their experience of both good and bad care.**

Well led

- 10.63 Vascular networks should have a strong leadership team to provide a shared purpose and to engage all network staff in decision making (see [section 12](#)).

When things do go wrong

- 10.64 The VS is sometimes asked for expert independent advice on matters relating to vascular service or individual performance:

- Service reviews
- Individual reviews
- Clinical record reviews

- 10.65 Invited reviews can be commissioned from any of the four surgical Royal Colleges in the UK and Ireland using the Invited Review Mechanism (IRM).
- 10.66 The terms of reference for the invited review should specify the scope of the review, the organisations involved, supporting data, guidance, and the service specification to be used for the review.²⁸
- 10.67 The process will produce a written report addressing the areas specified in the terms of reference with non-binding but advisory recommendations.
- 10.68 The review will include members, or past members, of the elected council of the VS on the review panel.

Standards

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11. NATIONAL VASCULAR REGISTRY (NVR)

Overview

- 11.1 Open reporting of surgical outcomes brings transparency, quality assurance of services, and drives quality improvement.
- 11.2 The routine entry of data on all vascular procedures, including major amputation and endovascular interventions, into a single national registry, the National Vascular Registry (NVR) should be considered best practice.
- 11.3 Reporting should ideally include procedures performed in the private sector.

Organisation

- 11.4 The Healthcare Quality Improvement Partnership (HQIP) commissions the NVR as part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP).¹
- 11.5 The Clinical Effectiveness Unit (CEU)² of the Royal College of Surgeons of England (RCS Eng.) manages the NVR in partnership with the VS, BSIR and VASGBI.
- 11.6 The NVR is overseen by the VS Quality and Safety Committee.
- 11.7 The chair of this committee is responsible for the annual report.
- 11.8 The NVR has data sharing agreements with:
 - NHS England & Improvement **NHSEI**
 - Getting it Right First Time **GIRFT**
 - NHS Abdominal Aortic Aneurysm Screening Programmes **NAAASP**
 - National Diabetic Foot Audit **NDFA**
 - National Confidential Enquiry into Patient Outcome and Death **NCEPOD**

Data submission

- 11.9 NVR data collection is different in the countries that make up the UK and in Ireland:

England and Wales

- 11.10 NHS trusts are contractually obliged to submit complete, accurate, index-procedure data to the NVR.
- 11.11 Vascular surgeons and interventional radiologists should have the necessary support put in place for this, including a network data manager (see [section 12.105](#)).

Scotland and Northern Ireland

- 11.12 The Scottish Government has agreed to fund data submission to the NVR for vascular procedures performed in Scotland.
- 11.13 Hospital trusts are not contractually obliged to contribute NVR data.
- 11.14 Participation in the NVR should be considered best practice, with vascular surgeons and interventional radiologists strongly encouraged to submit their cases.
- 11.15 To ensure adequate engagement the necessary support needs to be in place as for England and Wales.

Ireland

- 11.16 Vascular surgeons and interventional radiologists cannot submit data to the NVR.
- 11.17 They are strongly encouraged to establish an equivalent national registry to the NVR for vascular procedures performed in Ireland.
- 11.18 The Covid-19 pandemic has shown the benefit of contemporaneous procedural reporting over deferred ('batch') uploading.³
- 11.19 Consultants should adhere to reporting schedules provided by the NVR to review their data and ensure it is up to date.
- 11.20 **Vascular services should employ a data manager to improve the quality and completeness of both their NVR and HES data.**

Reports

- 11.21 HQIP publishes annual NVR reports containing data from the past three years.⁴
- 11.22 Special reports are published:
 - UK vascular activity during the early phase of the Covid-19 pandemic³
 - Aortic medical device specific data⁵
- 11.23 Contributors to the NVR can view their own data on-line and download for use in annual appraisal and revalidation.
- 11.24 User guides for on-line reports are available on the VSQIP website.⁶

Individual surgeon's outcomes

- 11.25 In cardiac surgery (NICOR registry ⁷), reporting individual surgeon outcomes has been established for more than two decades
- 11.26 During this time surgical autonomy in decision-making has diminished and been replaced by MDT-based judgements on the best treatment strategy for individual patients.
- 11.27 Furthermore, patient outcomes are significantly influenced by the expertise of intensive care specialists, anaesthetists, and other allied health professionals.
- 11.28 For these reasons the Society of Cardiothoracic Surgery (SCTS),⁸ whilst continuing to collect surgeon level data for internal audit and quality assurance, have recently reached agreement to only report unit level data publicly.⁹
- 11.29 Responsibility for standards and governance has shifted to the units.
- 11.30 Agreement has been reached with HQIP to only publish unit level outcomes from the NVR for 2020 in response to the impact of the Covid-19 pandemic.
- 11.31 Individual surgeon level outcomes will continue to be analysed for quality assurance and the NVR outlier policy will still apply.¹⁰
- 11.32 **The VS recommends that if this change is well received, only the publicly reporting of unit (not individual) outcomes is adopted for future NVR reports.**

Device specific data

- 11.33 In response to the 2018 GIRFT vascular surgery report¹⁰ and the 2020 report by Baroness Cumberlege 'First do no harm'¹¹ medical devices and reinterventions have been added to the NVR dataset.
- 11.34 **It is envisaged that device specific data reporting will become a mandatory NVR requirement.**

Other areas for improvement

- 11.35 Current improvement work by the NVR team at the RCS Eng. CEU is focused on:
- **Improving data collection for the VS peripheral arterial disease QIP**
 - **Improving the reporting of complex aortic endovascular procedures**
 - **Maximising collection of medical device specific data**
 - **Collecting reinterventions and late deaths for aortic device outcomes**

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12. WORKFORCE

Overview

- 12.1 The VS created a Workforce Committee in November 2019 to develop and support best workforce practices.
- 12.2 This builds on previous VS workforce surveys and the VS response to concerns raised in a trainee survey of bullying and harassment.¹
- 12.3 When considering a healthcare workforce, the emphasis is often, correctly, placed upon the numbers of staff needed to meet the needs of the population served:
- Training
 - Recruitment
 - Retention
- 12.4 Equally important for safe and effective patient care is how professionals (the ‘vascular MDT’) function as a team.

Looking after staff

- 12.5 Staff wellbeing is improved when staff feel part of ‘something important’; **a vascular network delivering the very best patient care.**
- 12.6 The NHSEI People Promise provides a framework for looking after people:²
- Listen to what they are saying
 - Review staff turnover
 - Obtain more formal feedback (e.g., annual appraisal, exit interviews)
- 12.7 **A motivated, cohesive, well organised, and well led, MDT is a vascular service’s greatest asset.**
- 12.8 Effective teams share several characteristics features:
- **Mutual respect with ‘zero tolerance’ of incivility, undermining or bullying**
 - **Staff able to act consistently with their work and life values**
 - **Staff deliver valued outcomes** (i.e., delivering high-quality care)
 - **Staff are not continuously overloaded**
- 12.9 Vascular networks should therefore do the following to look after their staff:
- Value and respect every person
 - Support and listen to staff
 - Provide mentorship, education, and training so people can learn and develop
 - Give people control over their work lives (i.e., less than full time working, job sharing and sabbaticals)
 - Acknowledge when something has gone well
 - Provide support and help for work-based stress
 - Plan to fill staff vacancies

- 12.10 Failing to look after staff will result in sickness, burnout, and poor staff retention.
- 12.11 Of concern, a 2021 Rouleaux survey of vascular trainees has again reported high levels of bullying, harassment, and undermining of trainees at work.
- 12.12 The workforce committee will be focussing on ways to change this behaviour.

Workforce planning

- 12.13 Workforce planning is a process to achieve the right number of people with the right knowledge, skills, and behaviours; in the right place; and at the right time.
- 12.14 Workforce planning needs to be compatible with less than full time working and not disadvantage any staff group.²
- 12.15 Workforce surveys were carried out of VS members in 2014,³ 2018⁴ and 2021.⁵
- 12.16 Regular surveys are important as the way in which NHS staff work changes.
- 12.17 Staff retention, including during vascular speciality training,⁶ is also important for future planning.

Specific staff groups

Vascular Surgeon

- 12.18 The current UK estimate is of 1 vascular surgeon per 129,000 population. ⁵
- 12.19 England has seen 63 additional consultants appointed since the first VS workforce survey in 2013.
- 12.20 Some of this increase is in response to working practices having changed.
- 12.21 This increase is not mirrored in the three devolved UK nations, with a decrease in consultant numbers in Scotland (-3) and Northern Ireland (-5).
- 12.22 Northern Ireland has 1 vascular surgeon per 237,000 population, as compared to 1 per 155,000 population in the Republic of Ireland.
- 12.23 Numbers of consultants across the UK and Ireland remains lower than in Europe, Austral-Asia and North America.
- 12.24 The VS recommends that there should be provision of 1 vascular surgeon per 100,000 of population.
- 12.25 The vascular SAC is working with Health Education England (HEE) 'Workforce Planning and Intelligence' to match the need for vascular surgeons with the correct number of trainees.
- 12.26 **The VS recommend that the number of vascular NTN's should be increased to maintain or expand vascular surgery to meet increasing demand.**

Interventional Radiologist

- 12.27 The current estimate is that there is 1 interventional radiologist per 100,800 population in the UK. ⁷
- 12.28 The BSIR recommends that there should be ≥ 1 interventional radiologist per 64,000 of UK population.

Vascular Nurse Specialist

- 12.29 To provide an adequate level of service, there should be a minimum of 2.0 whole time equivalent (WTE) vascular nurse specialists (VNSs) attached to the arterial centre, and 1.0 WTE VNS per network hospital.
- 12.30 Recruitment of specialist nursing staff is a specific concern as there are currently 100,000 nursing vacancies in England.
- 12.31 **The VS recommend that the number of vascular nurse specialists should be increased.**

Clinical Vascular Scientist

- 12.32 There are 263 clinical vascular scientists registered with the SVT in the UK (1 per 253,000 population).
- 12.33 To provide a sustainable service there should be 3.0 WTEs (or equivalent staff) at each arterial centre.
- 12.34 **The VS recommend that the number of clinical vascular scientists should be increased.**

Appointing to new posts

- 12.35 The published job description should include an overview of the local network:
- **Population served** (including for supra-regional services)
 - **Network hospitals**
 - **Arterial centre facilities**
 - **Procedure numbers**
 - **Vascular MDT staff**
 - **Management structure**
 - **Network lead roles**
- 12.36 State if specific skills or interests are preferred or required (i.e., research, trauma, complex endovascular or diabetic foot).
- 12.37 The clinical workload, and it's scheduling, should be in keeping with the best practice advice in [section 13](#).
- 12.38 The Royal College of Surgeons of England requires the following for consultant surgeon posts advertised in England (all are best practice): ⁸
- Option of less than full time working
 - Mentorship, in hours and out of hours, for newly appointed consultants
 - Job plan review within 12 months

On call rotas

- 12.39 Consultant on call rotas should have a frequency of 1 in 6 or greater. ⁹
- 12.40 Consultant numbers required for safe and sustainable on call rotas in each vascular network will depend upon the population size and skill mix
- 12.41 Additional commitments such as major trauma, renal transplant, specialist aortic, and for interventional radiologists' non-vascular commitments may require less frequent rotas due to higher volumes of work out of hours.
- 12.42 **For staff aged over 55 years old, a reduction in on call commitments during career later stages should be considered beneficial.**

Table 1. United Kingdom and Republic of Ireland (ROI) vascular surgery workforce (2021), change needed to achieve recommended target of 1 vascular surgeon per 100,000 population.

Region	Consultants (Actual, 2021)	Consultants (Target)	Change Needed	%
England	447	563	+116	+26
Scotland	36	55	+19	+53
Wales	27	32	+6	+19
Northern Ireland	8	19	+10	+138
Republic of Ireland	32	49	+17	+53
UK and ROI	550	718	+168	+31

Source: National Vascular Registry (2021, 2018, 2013) vascular surgeons who perform AAA repair and Mr McDonnell (ROI). VS POVS which recommends 1 vascular surgeon per 100,000 capita of population. Office of National Statistics (ONS) population mid-year estimate 2019 (release date: 24 June 2020): United Kingdom (66,796,800); England (56,287,000); Scotland (5,463,300); Wales (3,152,900); and Northern Ireland (1,893,700). Central Statistics Office population April 2019 (release date: 27 August 2019) Republic of Ireland (4,921,500).

Seven days working

- 12.43 Extending the vascular service from 5-days to 7-days routine working could create more capacity to treat patients but requires additional resources so that supporting services are also available on all 7-days.
- 12.44 For a move to 7-day working a minimum of a 1 in 10 on call rota would be required to deliver a safe working pattern.
- 12.45 To provide a 5-days a week service requires 1.2 WTE staff to be in post, for a 7-day service 1.7 WTEs.
- 12.46 **Any move to 7-day working will require careful planning and pilots to ensure it is both safe and cost effective.**

Clinical staff

- 12.47 This section contains specific workforce considerations for professional groups who are part of the vascular MDT:

Vascular surgeon

- 12.48 The specialist services provided by each vascular surgeon will be determined by local requirements as well as their own training and competencies.
- 12.49 Vascular surgeons should be employed by the NHS trust hosting the arterial centre with up to 40% of their time spent at network hospitals (see [section 9](#)).

Interventional Radiologist

- 12.50 Most interventional radiologists perform a range of image guided interventions in addition to aortic and peripheral vascular procedures.⁸
- 12.51 Interventional radiologists also have non-arterial commitments and may be employed either at the arterial centre or at network hospitals.
- 12.52 Some interventional radiologists will perform vascular procedures regularly and have a close working relationship with vascular surgeons, collaborate in endovascular procedures and attend vascular MDMs.
- 12.53 For other interventional radiologists' non-vascular procedures will form most of their clinical workload.

Vascular Anaesthetist

- 12.54 Vascular anaesthesia is recognised as a sub-specialty of anaesthesia and has its own specialist society, VASGBI.¹⁰
- 12.55 Vascular anaesthetists provide pre-operative assessment and deliver inpatient vascular surgery lists (including hybrid theatre).

Clinical Vascular Scientist

- 12.56 SVT accreditation demonstrates that an individual has reached and maintains specialist skills in non-invasive techniques to image and assess blood flow (duplex ultrasound).¹¹
- 12.57 There are sonographers and others (including radiologists) who are not accredited by SVT who also perform vascular scans.

Vascular Nursing

12.58 Vascular nursing combines aspects of general surgical nursing, critical care, limb and wound assessment, tissue viability, wound care, end of life care and rehabilitation.

Vascular Nurse Specialist (VNS)

12.59 The role of the VNS should be distinguished from that of an ANP whose focus is on ward based patient care.

12.60 A VNS can provide a specialist vascular opinion to establish a diagnosis (including investigations) and formulate a treatment plan:

- **Inpatient reviews** (assessment, advice, arranging non-invasive imaging and liaise with the wider vascular MDT)
- **Outpatient clinics** (seeing patients either in an independent clinic or as an autonomous practitioner attached to a consultant clinic)
- **Perform interventions** (wound and lower limb ulcer care, endovenous procedures and/or surgical assisting)

Advanced Nurse Practitioner (ANP)

12.61 This role is used in some trusts to support the safe care of ward patients as a supplement to the Foundation doctor role.

Theatre nurses

12.62 Vascular theatre nurses at the arterial centre will require the knowledge and skills for both vascular and endovascular procedures.

Interventional radiology nurses

12.63 Interventional radiology nurses at both the arterial centre and network hospitals require the knowledge and skills appropriate to the endovascular procedures being performed.

Ward nurses

12.64 The vascular ward should be staffed by nurses with the specific knowledge and skills to care for patients with complex vascular conditions.

12.65 There should be a core of nurses who have completed a designated vascular course.

Tissue Viability Nurse (TVN)

12.66 TVNs are in an ideal position to compliment the VNS service in providing complex wound advice and management.

Outpatient clinic nurses

12.67 When TVN's are not available to support an outpatient clinic, the outpatient nurses need to have the knowledge and skills in wound care, and specifically be competent in compression therapy and wound care.

Advanced Clinical Practitioner (ACP)

12.68 Advanced clinical practitioners come from nursing or allied healthcare professional (AHP) backgrounds and complete a master's level degree.

12.69 They may work at the equivalent of a middle grade doctors' role.

Physician Associate (PA)

12.70 Physician associates (PAs) have a life science or allied health degree and have completed a postgraduate diploma.

12.71 They are also trained to perform roles normally performed by doctors.¹²

Radiographer

12.72 Radiographers are needed for interventional radiology rooms and the hybrid operating theatre.

12.73 They may take on extended roles (i.e., ultrasound or line insertion).

12.74 A **lead radiographer**, supported by medical physics, should be responsible for radiation protection procedures.

Pharmacist

12.75 Vascular patients require high level pharmacist input as patients are on multiple medications are often elderly, frail and may have renal disease.

Podiatrist

12.76 Podiatrists are lead members of community diabetic foot protection teams.

12.77 Podiatrists work in hospitals alongside vascular teams delivering complex foot wound care, podiatric surgery, and amputation prevention.

12.78 Podiatrists can provide community-based PAD triage and diagnosis.¹³

Physiotherapist

12.79 Many vascular patients, not just people who have undergone a major amputation, require experienced vascular physiotherapy input to aid recovery after surgery.

12.80 Amputee care should be from a specialist physiotherapy team.¹⁴

Occupational Therapist

12.81 Occupational therapists provide home assessment visits and co-ordinate safe discharge back into the community.

Discharge Coordinator

12.82 People with complex discharge social or rehabilitation needs should be allocated to a named discharge coordinator.

Social Worker

12.83 Social workers input is frequently needed for the successful recovery of frail and disabled patients after treatment.

Network leadership and management

12.84 Every vascular network should appoint into each of the following network clinical leadership roles:

- **Network clinical lead**
- **Network governance lead**
- **Lead vascular nurse specialist**
- **Lead interventional radiologist**
- **Lead vascular anaesthetist**
- **Lead clinical vascular scientist**

12.85 To be effective in these roles leaders should have adequate dedicated time for these roles agreed within their job plan to:

- Work closely with hospital managers and administrators across the network
- Motivate and encourage their teams
- Support colleagues to reach their potential and gain new skills
- Be sensitive and supportive to colleagues who are struggling
- Invest time in relationships (i.e., to listen and develop the MDT)

12.86 **Staff in lead roles should hold a recognised management qualification or be supported to obtain one by their Trust.**



Bristol Bath Weston Vascular Network

The following indicative example of a network leadership and management team is for a vascular network created in 2014 to serve a population of 1.3 million people.

The network covers 4 acute hospitals in the Southwest of England.

There are 11 WTE vascular surgeons:

- **Network clinical lead**
(Consultant Vascular Surgeon) 0.1 WTE
- **Network governance lead**
(Band 7) Funded within improvement role
- **Lead vascular nurse specialist**
(Band 8) Funded within nursing role
- **Lead interventional radiologist**
(Consultant) Unfunded
- **Lead vascular anaesthetist**
(Consultant) Unfunded
- **Lead clinical vascular scientist**
(Band 8) Unfunded
- **Network manager**
(Band 5) 1.2 WTE (with a job share)
- **MDM coordinator**
(Band 4) 0.8 WTE
- **Data manager**
(Band 5) 0.4 WTE

In addition, this vascular network has a secretarial team, based at the network arterial centre and 1 of 3 network hospitals.

12.87 The following roles and responsibilities should sit with each of the network roles:

Network clinical lead

- 12.88 Overall responsibility for the performance of the vascular network.
- 12.89 Chairs regular network management meetings supported by the network manager.
- 12.90 Recruitment of network medical staff (including to middle grade doctor roles).

Network governance lead

- 12.91 Responsible for responding to serious adverse event (SAE) across the network.
- 12.92 Chairs the network morbidity and mortality meeting and acts on concerns raised.
- 12.93 Takes overall responsibility for responding to complaints.

Lead vascular nurse specialist

- 12.94 Responsible for the allocation of the vascular specialist nursing team (staff rotas).
- 12.95 Responsible for the line management of nursing staff and the supervision of nurses in development roles.

Lead interventional radiologist

- 12.96 Works with the network clinical lead to support the interventional radiologist's role within the vascular MDT.

Lead vascular anaesthetist

- 12.97 Helps to deliver and develop a specialist vascular anaesthetics service at the arterial centre.

Lead clinical vascular scientist

- 12.98 Represents vascular scientists from across network sites, including staff rotas.
- 12.99 Responsible for the governance of non-invasive imaging surveillance.

Network manager

- 12.100 The roles of the network manager will vary between vascular services.
- 12.101 The role should include as a minimum:
- Point of contact for the network
 - Manages network staff
 - Monitor the effectiveness, quality, safety, and accessibility of the service
 - Implement recommendations from NHSEI, NICE and VS QIPs through improvement programmes and monitor their delivery
 - Be responsible for ensuring network protocols are kept up to date

MDM coordinator

- 12.102 Is a single point of contact for referrals to the vascular MDM.
- 12.103 Supports smooth running of the MDT through preparation. At MDM, records discussions, and outcomes.
- 12.104 Distributes MDM outcomes and makes available in patient's medical records.

Data manager

- 12.105 Primary responsibilities are for the completeness of NVR and HES data.
- 12.106 Should work with and support NHS clinical coders to improve accuracy of both diagnosis and procedure codes.¹⁵
- 12.107 Supports both the network clinical lead and network governance lead by providing data for governance and quality improvement.
- 12.108 Provision of key performance indicator (KPI) data to inform service improvements.

Medical secretaries

- 12.109 Important point of contact for patients to ask for advice and raise queries.
- 12.110 Roles will vary across network dependent on local hospital administrative arrangements.

Standards

NHSEI. We are the NHS: People Plan 2020/21 - action for us all (2020).

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13. The College of Podiatry. Podiatry-led detection, diagnosis and management of peripheral arterial disease.
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13. INDICATIVE JOB PLANS

Overview

13.1 The following activities should be recognised in new vascular job plans:

- On call arrangements
- Regular out of hours duties
- Review of inpatients at the arterial centre and at network hospitals
- Support for dual consultant operating for complex open and endovascular cases (including mentorship)
- Multidisciplinary team meetings (including remote access)
- Morbidity and mortality meetings
- Patient administration
- Travel between network sites
- Continuing professional development
- Data entry into the NVR
- Opportunities to further develop career with education, management, or research roles

Vascular Surgeon

13.2 Flexible working patterns, including 'Consultant of the Week' models of care, mean that these job plans usually need to be described over a 'rota cycle' not a single working week.

Specimen job plan for vascular surgeon

- Two outpatient clinics per week
- Minimum one all day operating list per week
- Half-day day-case surgery or angioplasty list (if suitably trained)
- Multi-disciplinary team meeting(s)
- Morbidity and mortality meetings
- Patient administration (including triage of referrals)
- Ward rounds / inpatient reviews including at network hospitals
- Travel
- On call
- Supporting professional activity (SPA)*

* Minimum recommended allocation of 1.5 PAs ¹

13.3 POVS 2018 included more detail on vascular surgeon job planning. ²

Interventional Radiologist

13.4 Non-vascular interventional radiology includes hepatobiliary, genitourinary, and musculoskeletal procedures.

13.5 Most interventional radiologists will perform embolisation for control of haemorrhage and for oncologic control (tumour embolisation).

Specimen job plan for interventional radiologist, descriptive but not prescriptive, and focuses on consultants who regularly perform vascular procedures:

- Vascular and non-vascular procedure lists – ideally including one all day list (it is expected that most will undertake more procedural sessions on a regular basis)
- Reporting - diagnostic imaging (CTA/MRA/US), including vascular and non-vascular (variable for local needs)
- Interventional radiology clinics and/or ward rounds (must have regular clinic access and time for continuing inpatient care)
- Vascular MDM (including preparation)
- Patient administration
- On call (predictable and unpredictable emergency work – a diary exercise will be required to assess the commitment)
- Supporting professional activity (SPA) *

* Minimum recommended allocation of 1.5 PAs ¹

13.6 Further details on job plans for interventional radiologists can be found in the Provisional of Interventional Radiology Services document (2016). ³

Vascular Nurse Specialist

13.7 Nurses undertaking advanced nursing roles should practice autonomously, within their expanded scope of clinical practice: ^{4,5}

- Advanced clinical practice
- Leadership
- Facilitation of education and learning
- Research and innovation

13.8 Generic agenda for change job profiles should be used to structure and appropriately band vascular nursing roles.

Specimen job plan for a vascular nurse specialist is indicative of activity that is appropriate to this role

- Two or more outpatient clinics (e.g. a surveillance clinic, independent nurse-led peripheral arterial disease clinic and/or reviewing patients in a vascular 'hot' clinic)
- Supervised exercise class
- Telephone consultations and advice
- Reviewing inpatient referrals at both arterial centre and network hospitals
- Performing interventions - one or two sessions a week (see [section 12.60](#))
- Patient administration (including triage of referrals)
- Multi-disciplinary team meeting(s)
- Patient and nursing staff education
- Morbidity and mortality meetings
- Research
- Supporting professional activity

Clinical Vascular Scientist

- 13.9 Clinical vascular scientists may work under close supervision or have advanced roles with a greater scope of practice.
- 13.10 Practice should be performed according to AHCS Good Scientific Practice (GSP) ⁶ and the SVT code of practice ⁷.
- 13.11 Some roles require advanced skills for specialised imaging such as:
- Contrast enhanced duplex ultrasound
 - Functional assessments (i.e. for thoracic outlet syndromes or popliteal artery entrapment syndromes)

Specimen job plan for a clinical vascular scientist is indicative of activity that is appropriate to this role

- Six or more outpatient duplex scanning clinics (these may include DVT scans)
- Scanning inpatient referrals both at both arterial and network hospitals
- MDT attendance
- Patient administration (including vetting of referrals)
- Morbidity and mortality meetings
- Reviewing protocols and regulations
- Research
- Supporting professional activity

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6. Academy for Healthcare Science. Good Scientific Practice (2012).
7. SVT. Code of Professional Conduct (2016).

14. EDUCATION AND TRAINING

Overview

- 14.1 Sustainable healthcare delivery requires investment in training and education.
- 14.2 The GMC has approved curricula for vascular surgery, interventional radiology (as a sub-specialty of clinical radiology) and for a CCT (CCST) in anaesthetics.¹⁻³
- 14.3 Training should foster joint MDT working between future vascular specialists; this happens best when vascular surgery, interventional radiology, and anaesthetic trainees work and train together.
- 14.4 **Vascular leads and managers should be responsible for identifying the training needs of their teams.**

Vascular surgery

- 14.5 Vascular speciality training (ST3-8) is overseen by the vascular Specialist Advisory Committee (SAC).⁴
- 14.6 Entry into this specialist training follows 2 years of core surgical training⁵ or following a successful pilot (Improving Surgical Training programme⁶) can follow the Foundation Programme:
 - **Core surgical training** 2 years
 - **Vascular surgery training** 6 years
- 14.7 Other than one year spent training in gastro-intestinal surgery training is delivered at specialist vascular training units.

Specialist Vascular Training Units⁷

Vascular training units should meet the JCST quality indicators, including performing a sufficient volume of major elective and emergency vascular cases to provide sufficient supervised operative experience for each trainee to achieve the expected competencies for their level of training.

Units should be recognised by AAA screening Programme as a treatment centre.

Units should deliver outcomes in line with national standards.

- 14.8 Prior to the award of Certificate of Completion of Training (CCT) in the UK or Certificate of Completion of Specialist Training (CCST) in Ireland trainees must pass the Joint Committee on Intercollegiate Examinations (JCIE) Vascular Fellowship Exam.⁸

Operative and endovascular experience

- 14.9 It is important that trainees rotate appropriately within and between units.
- 14.10 Trainees should work within a team with one assigned educational supervisor and at least 2-3 clinical supervisors during each year of their specialist training.
- 14.11 Close cooperation between vascular surgeons and interventional radiologists should deliver both vascular surgery and interventional radiology trainees the experience they need in endovascular techniques.



Freeman Hospital, Newcastle

Obtaining high quality training in endovascular techniques can be challenging for trainees.

Vascular surgeons and interventional radiologists have been working together in Newcastle to promote a successful collaborative training initiative, aiming to improve endovascular training opportunities for both vascular surgery and interventional radiology trainees:

- Joint outpatient clinics
- Educational briefs before cases, to define roles and goals for trainees to meet their training needs
- Joint regional training days
- Endovascular 'mini' fellowships with protected training sessions delivered by both interventional radiology and vascular surgery consultants

Trainees from both specialities have welcomed our initiatives with extremely positive feedback.

We are aiming to achieve fair, consistent, and high-quality training, building a foundation of trust, teamwork and collaboration.

14.12 To maximise training opportunities, if a trainee at the appropriate level is available, a procedure (part or whole) should be performed by that trainee under consultant supervision.

Complex procedures

14.13 Some complex procedures are performed in only a few specialised centres and so do not require every trainee to reach competence by the final year of training:

- Trainees are expected to have knowledge of such procedures so that they can initiate appropriate referral to a regional specialist centre
- It is expected that trainees wishing to work in such centres will seek further experience and mentorship after CCT

'On call'

14.14 Trainees should undertake 'on call' commitments in every year of their training.

14.15 Vascular trainees are expected to provide at least 1 year of general surgery on call during their ST3 or ST4 years.

14.16 Trainees from ST5 upwards should maximise their supervised experience and are therefore not expected to participate in general surgery on call rotas.¹

14.17 Vascular surgery on-call from home, or long-day rather than night working, are more desirable options for training.

Interventional radiology

14.18 The Royal College of Radiology oversees training. Interventional radiologists obtain their CCT in clinical radiology with interventional radiology sub-specialisation.²

14.19 Training includes clinical radiology, vascular interventional radiology, and non-vascular interventional radiology:

- **Clinical radiology** 3 years
- **Interventional radiology** 3 years

14.20 The European Board of Interventional Radiology is taken by many interventional radiology trainees, although not mandatory.

Vascular anaesthesia

14.21 The Royal College of Anaesthetists oversees specialty training. It takes 7 years to complete specialist training, with vascular anaesthesia training at stage 3 (ST6-7).³

14.22 Vascular anaesthetists have regular sessional commitments to major arterial surgery and have developed expertise in preoperative CVD risk assessment.

14.23 They have specific knowledge of the principles underlying the index vascular procedures and keep up to date in the field of vascular anaesthesia.⁹

14.24 They can lead the delivery of care in this area of practice to the benefit of both patients and the organisation.

ASPIRE Programme

14.25 The VS Education Committee working with the vascular SAC established **ASPIRE** as an annual training programme for all vascular speciality trainees.

14.26 The **ASPIRE** programme has been designed to incorporate professional competencies and training in both operative and endovascular techniques:

- Simulation¹⁰
- Cadaveric dissection
- Non-technical skills
- Radiation protection
- Preparation for the examination
- Consultant practice

14.27 Attendance to **ASPIRE** courses should be supported by training programme directors (TPDs). Trainees, including those returning to training or out of programme, are expected to attend.

14.28 In 2020, **ASPIRE Digital** was launched, a series of Webinars open to trainees which were curriculum linked and supplementary to the ASPIRE programme.



ASPIRE 3: National Vascular Induction.
Delegates and faculty
(Bristol, September 2021)

Nurse training

- 14.29 NHSEI sets out a clear standard of education for advanced clinical practice.¹¹
- 14.30 Vascular nurses of all grades should be encouraged to undertake a vascular specific educational course.
- 14.31 Both the vascular nurse practitioner and vascular nurse specialist roles should be working towards master's degree level education, including clinical assessment and non-medical prescribing.
- 14.32 The SVN has produced guidance on advanced vascular nurse competencies.¹²
- 14.33 Each network should consider the employment of a 'junior' vascular nurse specialist as a professional development role to allow for career succession and facilitate the progression of more junior nursing staff.

Clinical vascular scientist training

- 14.34 Most trainee clinical vascular scientists are on the Scientific Training Programme (STP) for Vascular Science.¹³

Standards

- GMC. Generic Professional Capabilities Framework (2017).
- GMC. Excellence by Design: standards for post-graduate curricula (2017).
- GMC. Vascular surgery curriculum (2021).
- The Royal College of Radiologists. Interventional Radiology Specialty Training Curriculum (2021).
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15. RESEARCH AND INNOVATION

Overview

- 15.1 The NHS Constitution includes a commitment to innovation and to the promotion, conduct and use of research to improve the current and future health and care of the population. ¹
- 15.2 As today's research is tomorrow's evidence, it is essential that we promote a research-positive culture to ensure the provision of safe, clinical effective and cost-effective care for our patients.
- 15.3 Additionally, it is well established that hospitals with active clinical research programmes deliver better outcomes. ²⁻⁴
- 15.4 It is important for the specialty to continue to make the case for research funding, given the ongoing evidence of increasing demand, the morbidity and mortality of vascular patients and the high cost of delivering specialist vascular care.

Research priorities

- 15.5 Nine vascular special interest groups (SIGs) with representation from both patients and clinicians have been established:

- Amputation
- Aorta
- Carotid
- Diabetic foot
- Peripheral arterial disease
- Service
- Vascular access
- Venous disease
- Wounds

- 15.6 In collaboration with the James Lind Alliance, the SIGs have identified research priorities which they will develop into research questions to take forward for funding applications. ⁵

Enabling research

- 15.7 The VS actively encourages vascular research and supports a fundraising and grant giving charity for vascular research, the **Circulation Foundation** (CF). ⁶
- 15.8 Whilst some clinicians may choose to take a formal university academic pathway, the opportunity to participate in research is open to every consultant.

- 15.9 For new consultants, trusts should identify the funds and a transparent method to allocate research PAs.
- 15.10 The VS recommends that vascular networks should aim to recruit a minimum of 50 patients per year into clinical trials.



Hull University Teaching Hospitals Trust

In April 2021, the Academic Vascular Surgical Unit introduced a new academic vascular nurse-led specialist service (AVNS). Existing vascular nurse roles were combined to create a 50/50 split of clinical and academic duties.

The AVNSs not only focus on enhancing the experience and outcomes of patients with vascular disease, but the role also provides further opportunities to develop the nurse's specialist skills under the guidance of the Senior AVNS

The AVNS's are helping to lead and deliver high quality vascular research studies, raising the profile of research which is now embedded within these services.

Journal of the UK Vascular Societies

- 15.11 A survey of the membership of the VS and affiliated societies (Rouleaux, SVN, SVT, BACPAR and BSIR) was overwhelmingly supportive of establishing a UK vascular journal.
- 15.12 The first edition of the Journal of Vascular Societies (Great Britain and Ireland) - JVSGBI, will be published online in Autumn 2021. ⁷

Trainee research network

- 15.13 The Vascular and Endovascular Research Network (VERN) was formed in 2014 by UK vascular surgery trainees.⁸
- 15.14 VERN is a multidisciplinary collaborative, facilitating multi-centre, cross-specialty, research and audit, in vascular patients.⁹
- 15.15 During the COVID-19 pandemic, VERN led an international prospective cohort study assessing outcomes of patients presenting with vascular pathology and documenting the impact on vascular services.¹⁰⁻¹¹

Innovation, and its risks

- 15.16 Innovation is a broad term that encompasses new ideas, devices, methods, or ways of working.
- 15.17 Service leaders should be forward looking to foresee how new treatments, new technology and changes to healthcare funding will impact on the way in which they will work in the future.
- 15.18 We recommend that network teams plan for continual improvement in their service based on the core principles of:
- **Equitable access**
(i.e. at all networked hospitals)
 - **Clinical effectiveness**
(i.e., evidence-based practice)
 - **Patient safety**
(i.e., mortality reviews and learning)
 - **Patient experience**
(i.e., by listening to their patients)

- 15.19 To monitor if changes are effective requires real-time, data collection, ideally overseen by a network data manager to ensure accuracy and completeness.
- 15.20 Innovation has an integral role in vascular surgical practice, improving patient outcomes, reducing complication rates & length of stay, and decreasing morbidity and mortality.
- 15.21 However, without proper evaluation, governance and training, such innovations can carry significant risks, as evidenced by recent experience with failures during follow of with the Nellix™¹² and Navion™ aortic devices.
- 15.22 It is essential that new procedures, techniques, and technologies are introduced into service in a way that provides robust oversight and protects patient safety whilst supporting surgical innovators:¹³

Standards

Royal College of Surgeons of England. Surgical innovation, new techniques and technologies (2019).

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16. UK NATIONS AND IRELAND

Overview

- 16.1 Health and social care delivery are devolved from Westminster for the countries of Scotland, Wales, and Northern Ireland.
- 16.2 Respective UK population sizes in mid-2020 were estimated at: ¹
- **England** 56.6 million
 - **Scotland** 5.5 million
 - **Wales** 3.2 million
 - **Northern Ireland** 1.9 million
- 16.3 The population of **Ireland** was estimated at 4.9 million in mid-2020, 40% of whom live in Dublin.

England

- 16.4 Specialised vascular services for adults are commissioned nationally by NHS England and Improvement (NHSEI) Specialised Services.
- 16.5 There is a NHSE commissioning policy for complex endovascular aortic aneurysm repair. ²
- 16.6 Not all arterial centres meet the requirements of the NHS service specification, and some vascular services are in discussions with commissioners regarding reconfiguration.
- 16.7 Superficial venous disease, leg ulcer management, and management of diabetic foot disease are commissioned regionally by CCGs (or ICSs).
- 16.8 AAA screening is delivered by NHS England and Improvement (NHSEI).
- 16.9 National selection for vascular training has been run by the vascular SAC alongside general surgery, however, this will change to a separate, jointly run, selection process.

Scotland

- 16.10 The Scottish Government sets out the principles and standards for Health and Social care delivery.
- 16.11 Vascular services across Scotland are being reorganised with higher volume arterial centres forming networks with smaller units.
- 16.12 Whilst the system differs from that in England, in that there is no commissioning, POVS 2021 should be used by clinicians, senior management and service providers to ensure that vascular services across Scotland are fit for purpose.

16.13 Scotland functions as a single deanery with higher surgical trainees being appointed at UK national selection.

16.14 National Education for Scotland (NES) has recently increased the number of vascular NTN's in Scotland, recognising that there is capacity to train more trainees and that currently insufficient numbers are being trained to maintain the workforce.

Modernising Patient Pathways ³

16.15 This programme is an initiative set up to standardise and streamline patient care.

16.16 For vascular patients, this includes:

- **Venous leg ulcer pathway**, where assessment and intervention are addressed by MDT involving specialist nurses, vascular technologists, vascular surgeons, and dermatologists
- **Chronic limb threatening ischaemia**
- **Intermittent claudication**
- **Abdominal aortic aneurysm**

16.17 The Scottish AAA screening programme is very similar to the NAAASP in England. It has its own set of Standards and Key Performance Indicators (KPIs) but the important standards of time to treatment and 30-day mortality are identical.

16.18 Units must ensure that they meet these standards and have the necessary resource in place to achieve this.

16.19 The national thoracoabdominal aortic aneurysm service is based in the Royal Infirmary of Edinburgh and is funded to perform open surgical intervention.

16.20 Larger units with sufficient experience continue to perform complex endovascular aortic repair. A national MDT meeting with representation from all units in Scotland, where all complex aortic interventions are discussed, is in the process of being set up.

Wales

16.21 In 2009, the NHS in Wales reconfigured as seven Local Health Boards (LHB) to commission and deliver health care for their respective populations.

16.22 Commissioning for people with vascular disease involves collaboration between two or three adjacent LHB's.

16.23 There are three national NHS trusts:

- Welsh Ambulance Services Trust
- Velindre NHS Trust (cancer care and support services)
- Public Health Wales NHS Trust

16.24 Service reconfiguration into three vascular networks is nearing completion. This has been supported by the Wales Abdominal Aortic Aneurysm Screening Programme (WAAASP).

16.25 Establishment of hybrid theatres lags the rest of the UK and Ireland:

- Hybrid theatres have opened in Glan Clwyd Hospital, Rhyl, in 2019 and in The Grange University Hospital, Cwmbran, in 2020
- Plans are at an advanced state for a hybrid theatre in Cardiff, and less advanced in Swansea

16.26 Lack of hybrid theatre facilities has impacted negatively on recruitment of interventional radiologists, and recruitment and retention of vascular surgeons.

16.27 The geographic distribution of the Welsh population does not support the development of a national aortic centre. However, there are good relationships with Bristol, Birmingham and London who provide complex aneurysm repair on an individual patient funding request basis.

16.28 Recruitment for trainees is via National Selection. Vascular training currently occurs in South Wales, however there is reliance on adjacent training centres to deliver interventional radiology training.

Northern Ireland

16.29 Northern Ireland (NI) has a devolved and integrated Health and Social Care (HSC) system as part of the NHS, alongside some cross-border care arrangements with the Republic of Ireland.

16.30 Vascular Services are delivered through a regional vascular network, with the arterial centre located in Belfast, the largest conurbation in the East, where it is co-located with regional specialist services such as cardio-thoracic surgery, neurosurgery, neuroradiology, interventional radiology, and the regional major trauma centre.

16.31 **The number of vascular surgeons per capita of population (1 per 237,000) is lower than in Scotland, Wales, England (1 per 127,000) or Ireland (1 per 144,000).**

16.32 NI has regional protocols and care pathways for the management of all the common time critical vascular conditions, with local imaging and managed central transfer.

16.33 NI benefits from an integrated Electronic Care Record (ECR) which allows the central Belfast Hub to view patient information remotely, including images, to facilitate urgent and emergency vascular consultation.

16.34 The AAA screening programme (NIAAASP) has a network of local ambulatory ultrasound screening clinics and referral protocols to the designated treatment centre in Belfast.

16.35 Varicose veins are managed by vascular surgery through 2 Designated Elective Care Centres (DECC), at Lisburn and Omagh (see [section 20](#)).

16.36 Diabetic foot disease is managed in conjunction with endocrinology and podiatry through a regional managed clinical network in conjunction with three Enhanced Foot Protection Services (EFPS) and one Multi-disciplinary Diabetic Foot Team (MDFT) in Belfast.

16.37 Renal access surgery is managed by renal medicine and transplant surgery. A few vascular surgeons contribute to the service, and vascular speciality trainees have access to training.

16.38 The National Training Program for Higher Specialty Trainees (HSTs) in vascular surgery benefits from UK national selection, the ASPIRE training program and vascular SAC guidance.

Ireland

16.39 There are currently 32 vascular surgeons employed within the public health service in Ireland. In addition, there are 2 vascular surgeons engaged in full time private practice.

16.40 Several centres employ vascular nurse specialists. This role is less well defined than in the UK and offers potential for further development to enhance patient care.

16.41 Vascular services are delivered by 10 units for the population:

- 5 in Dublin
- 2 in Cork
- 1 each in Waterford, Limerick, and Galway respectively

16.42 Based on the 'POVS' vascular network models the number of arterial centres could reduce to 5 or 6.

- 16.43 There is no national AAA screening programme for men.
- 16.44 There is no national vascular registry.
- 16.45 Vascular surgical training is like that in the UK, with trainees appointed to numbered training posts by a competitive process.
- 16.46 Training posts are inspected regularly by the vascular SAC and accreditation of trainees is achieved via the Intercollegiate Specialty Examination in Vascular Surgery.

Standards

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SECTION 17

17. CARDIOVASCULAR DISEASE

Assessment of risk

- 17.1 NICE CG181 gives recommendations for the assessment and treatment of adults who are at risk of, or who have, CVD.¹
- 17.2 NICE recommends using QRISK-3 to calculate predicted CVD risk in people aged <85 years of age.²

Self-management

- 17.3 NICE (PH25) recommends that anyone with a predicted 10-year risk of CVD $\geq 20\%$ should be encouraged to adopt a healthier lifestyle to reduce this risk.³

Smoking cessation

- 17.4 Behavioural counselling (stop smoking service support) with medication (nicotine patch or varenicline) are the most effective smoking cessation strategies.^{4,5}
- 17.5 In 2020, nearly 1/3 of people quitting smoking in England used a vaping product.⁶

Lipid modification

- 17.6 Lipid lowering should be considered for people with CVD and/or hyperlipidaemia.
- 17.7 Investigate for causes of secondary hyperlipidaemia and then:
- Baseline lipid profile, CK, LFTs, renal function, and HbA1c⁷
 - Commence statin therapy (unless drug interactions, person is elderly, high risk of adverse effects, or patient preference)
 - Repeat lipids and LFTs at 3 months
 - Annual lipids and review for side effects
- 17.8 **Primary prevention**, aim is for total cholesterol <5, non-HDL-cholesterol <3, and fasting triglycerides <1.7 (all mmol/L).⁷
- 17.9 **Secondary prevention**, aim is to reduce non-HDL-cholesterol by 40%-50%.
- 17.10 Patients should be counselled about statin side effects, including muscle pains.
- 17.11 The following should prompt referral to a specialist lipid clinic:
- Resistant hyperlipidaemia
 - Primary familial hyper-lipidaemia

Anti-thrombotic therapy

- 17.12 Unless contra-indicated, intolerant, or already on anti-thrombotic medication:⁸
- **Small AAA** low dose Aspirin
 - **Symptomatic PAD** or **Multi-territory CVD** Clopidogrel
 - **Recurrent CVD events** low dose Rivaroxaban plus Aspirin⁹
- 17.13 ISDNs should provide advice on anti-platelet therapy following TIA or stroke.

Obesity

- 17.14 NICE has issued advice on prevention (CG43) and management (CG189):¹⁰⁻¹²
- **BMI >25kg/m²** provide a healthy weight goal and advice on diet and exercise
 - **BMI >40kg/m²** or **BMI 35-40 kg/m²** with type II diabetes or hypertension, and patient has tried to lose weight for > 2 years, consider bariatric surgery
 - **BMI ≥ 50 kg/m²** refer for bariatric surgery

Atrial fibrillation

- 17.15 Anticoagulation, or low dose Aspirin, should be considered to reduce their risk of cardio-embolic stroke.¹³
- 17.16 Use CHA₂DS₂-VASc score for stroke risk predictions and ORBIT score for bleeding risk prediction.¹³

Diabetes mellitus

- 17.17 Screening should be by measuring fasting plasma glucose (FPG) or HbA1c.
- 17.18 People should be supported to achieve HbA1c <53 mmol/L (or higher target if older).
- 17.19 First line treatment in person with type 2 diabetes is metformin.
- 17.20 Additional medications should be added if HbA1c target not reached in 3-6 months.¹⁴

Hypertension

17.21 Recommended thresholds for assessment and treatment of hypertension:

	< 80 years	≥ 80 years
Outpatient	>140/90	>150/90
Clinic	mmHg	mmHg
Ambulatory (Home)	>135/85	>145/85
	mmHg	mmHg

17.22 In younger patients, or when blood pressure is very high, consider secondary causes of hypertension.

17.23 In all people with hypertension, advise smoking cessation; reducing caffeine, alcohol and salt intake; increase physical exercise; and relaxation (stress reduction).

17.24 First choice medication in most people ≥55 years is a dihydropyridine calcium channel blocker (CCB).

17.25 First choice for people aged < 55 years is an angiotensin receptor inhibitor (ACE I) or blocker (ARB), unless of Afro-Caribbean ancestry (then use CCB).

17.26 If a patient needs 2nd or 3rd line hypertension therapy, combining CCB and ACE I and add thiazide diuretic, or if renal function impaired, a loop diuretic. ¹⁵

17.27 Resistant hypertension should prompt referral to a specialist hypertension service.

Dietary advice

17.28 Dietary advice should be broadly in line with healthy eating recommendations:

- Low in fat, sugar, and sodium ¹¹
- Fruit and/or vegetables five times a day
- Calorie intake from starchy foods such as pasta, bread, rice, or potatoes
- Moderate amounts of dairy products and protein-rich foods

Alcohol consumption

17.29 The maximum recommended weekly limit for alcohol consumption is 14 units. ¹⁶

Physical activity

17.30 Advise at least 150 minutes of moderate aerobic activity (vigorous enough to get out of breath) every week.

17.31 Advise strength exercises on 2 or more days a week (i.e., brisk walking, swimming, cycling, gardening or playing with children). ¹⁷

Standards

NICE-CG181 Cardiovascular disease: risk assessment and reduction, including lipid modification (2014).

NICE-NG92. Stop smoking interventions and services (2018).

NICE-CG127. Hypertension in adults: diagnosis and management (2011).

NICE-CG43. Obesity prevention (2006).

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16. <https://www.nhs.uk/live-well/alcohol-support/calculating-alcohol-units/> (Accessed 04.10.21)
17. <https://www.nhs.uk/live-well/exercise/> (Accessed 04.10.21)

18. PERIPHERAL ARTERIAL DISEASE

Overview

- 18.1 Peripheral arterial disease (PAD) is common, and increasing, affecting 1 in 5 people over the age of 60 in the UK. ^{1,2}
- 18.2 PAD carries both the risk of lower limb amputation and an increased risk of dying from a complication of CVD. ¹
- 18.3 Walking for people with intermittent claudication improves their quality of life and reduces their future risk of CVD. ^{2,3}
- 18.4 Timely revascularisation in people with chronic limb threatening ischaemia (CLTI) reduces the significant personal and socio-economic costs associated with lower limb amputation.

Vascular assessment

- 18.5 Clinical staff, specifically those who care for people who are elderly, people with diabetes and people with ischaemic heart disease should be aware of the signs and symptoms of PAD.
- 18.6 Peripheral pulse examination should be accompanied by an objective assessment of limb perfusion:
- **Ankle brachial index (ABI)**
 - **Toe brachial index (TBI)**
 - **Transcutaneous tissue oxygen perfusion measurement (TcPO₂)**
- 18.7 Handheld Doppler, suitably sized cuffs and equipment to undertake ABPI and TBI should be provided in arterial centres and at network hospitals seeing significant numbers of patients with PAD.
- 18.8 This equipment should also be available to community care practitioners, including podiatrists and nurses, who are well placed to detect PAD early.
- 18.9 Limb perfusion measurement requires specific competencies; vascular networks have a responsibility to deliver this training.



Manchester Amputation Reduction Strategy (MARS), Greater Manchester

We are the community-based arm of MARS. Led by vascular trained specialist podiatrists & nurses with experience in high risk & complex lower limb management. Supporting GPs and linked directly to our hospital vascular & other lower limb teams via clinical governance meetings and agreed clinical pathways.

The focus is to provide GPs and other community clinicians with timely, accessible clinical diagnosis, triage, and treatment planning for people in Manchester with PAD, looking at both cardiovascular and limb protection.

We have reduced unnecessary hospital vascular referrals of suspected PAD by >80% and developed innovative access to supervised exercise therapy in community settings and Cardiac Rehabilitation services.

Intermittent Claudication

- 18.10 People with PAD should have their CVD risk factors addressed (see [section 17](#)).
- 18.11 Initial management should be within a primary care setting (see [section 18.6-18.9](#)), with referral to a supervised exercise programme (SEP). ^{5,6}
- 18.12 SEP is usually delivered for 2 hours per week over 12 weeks, and should include self-help advice, both for maintaining walking and for wider 'healthy' lifestyle changes.
- 18.13 **Only people whose symptoms of intermittent claudication remain lifestyle limiting after attending a supervision exercise programme should be referred to the vascular service for assessment (unless foot or leg wound, or progression to CLTI with ischaemic rest pain).**

SEP provision for people with IC

- 18.14 Supervised exercise for people with intermittent claudication is a clinically and cost-effective intervention. ^{2,3}
- 18.15 NICE (CG147) has identified this as a high priority area for quality improvement.
- 18.16 SEP provision to a vascular network population should be a key performance indicator and used to reduce inequalities in SEP access across the UK and Ireland.
- 18.17 SEPs can be delivered appropriately trained physiotherapist or an exercise therapist, both with vascular nurse specialist support.
- 18.18 Vascular nurse specialists and other providers of exercise programmes are well placed to deliver SEPs to patients through:
 - Flexible and imaginative use of SEPs that already exist
 - Developing existing CVD or community-based exercise programmes to meet the needs of people with IC ^{7,8}

Chronic Limb Threatening Ischaemia

- 18.19 People presenting with CLTI are at an advanced stage of PAD, and usually have significant other CVD and comorbidities. ⁹
- 18.20 Their risk of amputation at one year relates to WIFI clinical disease stage; stage 1, 0%; stages 2/3, 9%; and stage 4, 29%. ¹⁰
- 18.21 Mortality at 1 year is around 22% ¹¹ with 5-year mortality of up to 50%. ¹²
- 18.22 Whilst the incidence of CLTI is around 1% that of PAD, treating people with CLTI constitutes the largest proportion of the urgent workload of vascular networks: ¹³

- Vascular network serving 800,000 population might expect to see 350-400 people each year with CLTI
- This number is likely to increase with population ageing and rising prevalence of diabetes

18.23 Time-critical CLTI pathways should be a key focus for vascular networks:

- General practitioners, podiatrists, community nurses and ED doctors should have the necessary clinical skills to diagnose and assess a person presenting with CLTI
- People with suspected CLTI should be referred the same day for assessment
- Patients with severe ischaemia and/or with foot infection (including sepsis) should be discussed immediately with the on call vascular team for same day admission to the arterial centre

18.24 Use of the Society for Vascular Surgery’s (SVS) Wound, Ischaemia and foot infection (WIFI) classification is recommended for people with CLTI. ⁴

SVS’s WIFI Classification

The WIFI score can help objectively assess the risk to the limb and benefit of treatment.

Wound score (0-3)

Ischaemia score (0-3)

Foot infection score (0-3)

18.25 If the decision is made to admit a patient with CLTI, the following are recommended timelines for management:

TIME STANDARDS FOR ADMITTED CLTI PATHWAY

Uncontrolled rest pain and/or significant tissue loss and/or infection

	Achievable	Minimum
Admission to arterial centre ≤48 hours from decision to admit	>90%	>80%
Review by consultant vascular surgeon within 14 hours of admission	>90%	>80%
Vascular assessment including imaging ≤48 hours of admission	>90%	>80%
Revascularisation within 5 days	>90%	>80%

18.26 People with more stable manifestation of CLTI, such as minor tissue loss or manageable rest pain can be assessed and worked up for intervention through an outpatient pathway. This pathway is still ‘time-critical’ as the foot can rapidly decline:

TIME STANDARDS FOR NON-ADMITTED CLTI PATHWAY

Manageable rest pain and/or minor tissue loss

	Achievable	Minimum
Vascular assessment including imaging within 7 days	>90%	>80%
Revascularisation within 14 days	>90%	>80%

Revascularisation

18.27 All people presenting with CLTI should be assessed as to their benefit from revascularisation, and the risks:

- Decision making should be supported using the SVS's WIFI classification ⁴
- There should be access to both non-invasive and cross-sectional vascular imaging (CTA and MRA)
- Patients (and family / carers) should be actively involved in the decision-making process
- The vascular MDT (see [section 12](#)) are important in supporting patients in making their treatment choices
- Revascularisation should not be delayed by waiting for a formal MDT meeting ('*time is tissue*')

18.28 Structured review by a consultant with a specialist interest in the management of frail and elderly patients, known as Comprehensive Geriatric Assessment (CGA), is important for decision making and optimisation in people with CLTI as many are elderly and/or frail.

18.29 Routine formal pre-operative MDT discussion of straightforward patients should not introduce delay in revascularisation. How this is achieved will vary, one option is a daily "mini-MDT" at which time-critical patients are discussed.

18.30 Revascularisation procedures (endovascular, surgical and 'hybrid') should be performed by an appropriate vascular surgery and/or interventional radiology team.

Primary amputation

18.31 In some people it may be appropriate to perform a primary amputation (i.e., without a prior attempt at revascularisation):

- Systemic sepsis requiring life-saving amputation of an infected foot
- Non-salvageable limb
- Higher risk for surgical bypass and no endovascular option
- Non-ambulatory (patient choice)

18.32 In elderly, frail, or comorbid patients a conservative approach may be appropriate management for CLTI due to high risk of intervention and limited life expectancy. ¹⁴

Amputation surgery

18.33 The VS major lower limb amputation quality improvement framework (2010) significantly improved lower limb amputee care:

- **All major lower limb amputations should be performed by surgeons with expertise** (this may include orthopaedic or plastic surgeons in certain circumstances)
- **All above the ankle amputations performed by vascular surgeons should take place in an arterial rehabilitation MDT** (see [section 6](#))

18.34 Since a 2014 NCEPOD report on patients undergoing major amputations in the UK amputee care has improved: ¹⁵

- Better rehabilitation planning
- Greater consultant input to care
- Fewer operations performed out of normal working hours
- Reduction in early mortality

18.35 Vascular networks should have written amputation pathways compliant with the 2010 VS lower limb amputation QIF and incorporating time-frame standards:

STANDARDS FOR ADMITTED MAJOR AMPUTATION PATHWAY

	Achievable	Minimum
Medical review for poor glycaemic control ≤12 hours after admission	>90%	>80%
Pain team review for ischaemic rest pain ≤12 hours after admission	>90%	>80%
Vascular assessment unless unsalvageable limb	100%	>95%
Major amputation within 48 hours of decision to amputate	>90%	>80%

Recovery and Rehabilitation

18.36 A dedicated physiotherapy or occupational therapy led amputee rehabilitation team, provides the best patient outcomes: ¹⁶⁻¹⁸

- Daily inpatient gym session (i.e., of ≥1 hour, provision of early walking aids)
- Early provision of a wheelchair
- Stump oedema control ¹⁹
- Psychological support
- Protecting the contra-lateral limb ²⁰
- Early referral to a Prosthetic and Amputee Rehabilitation Centre (PARC)

Figure 5. Infographic for intermittent claudication
© Circulation Foundation 2019.



Standards

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SECTION 19

19. DIABETIC FOOT DISEASE

Overview

- 19.1 Complications of diabetes, along with peripheral arterial disease, are the two most common cause of non-traumatic lower limb amputation.
- 19.2 Ulceration precedes more than 80% of major amputations in people with diabetes.
- 19.3 The predicted increase over the next decade in the number of people with diabetes will have a significant impact on vascular services and healthcare expenditure.^{1,2}

NICE Framework

- 19.4 The NICE best practice pathway for diabetic foot disease (NG19) has highlighted three key areas of practice:
- **Foot screening**
(diagnosis of peripheral neuropathy, peripheral arterial disease and musculo-skeletal problems)
 - **Foot protection**
(people identified as moderate to high risk of acute foot problems)
 - **Multidisciplinary foot care service**
(for treatment of people with active diabetic foot disease).

Foot screening

- 19.5 Screening is usually performed in primary care by a nurse, community podiatrist or another appropriately trained health care professional (trained in pulse palpation, use of handheld Doppler, and assessment of peripheral neuropathy).
- 19.6 If the person is assessed as moderate or high risk for foot ulceration (as per NICE-NG19), then they should be referred to the foot protection team.

Community foot protection

- 19.7 Foot protection services are led by podiatrist with special training in dealing with diabetic foot problems in primary care.
- 19.8 Podiatrists work collaboratively with other services such as orthotics and dieticians and refer onto the multidisciplinary footcare service or vascular surgery.

Multidisciplinary footcare service

- 19.9 People with active diabetic foot disease (see table) should be referred to the diabetic foot multidisciplinary foot care service within one working day.

- 19.10 Care should then be co-ordinated by the diabetic foot MDT; diabetologist (including diabetes nurse specialists), podiatrist, vascular surgery (including vascular nurse specialists), interventional radiology, musculoskeletal radiology, infectious diseases (microbiology), pharmacists, and physiotherapists.⁵
- 19.11 A vascular specialist should be present at multi-disciplinary foot care clinics across the vascular network.

ACTIVE DIABETIC FOOT DISEASE

- Ulceration
- Spreading Infection
- Chronic limb threatening ischaemia
- Tissue necrosis
- Acute Charcot arthropathy
- Unexplained hot, red, swollen foot - with or without pain

Sepsis drainage and/or debridement

- 19.12 People with suspected infection should be started on antibiotic treatment as soon as possible and referred immediately to the diabetic foot MDT.³
- 19.13 Patients with life or limb threatening foot sepsis require emergency hospital admission to the network arterial centre under the vascular service, unless alternative local arrangements are in place for immediate drainage of foot sepsis at the network hospital (e.g., by an orthopaedic or podiatric surgical team).³
- 19.14 Minor amputation, when required, should be performed by a vascular, orthopaedic, or podiatric surgeon with the necessary expertise and training.

Revascularisation

- 19.15 People with diabetes who require revascularisation should be treated within the same timeframes and pathways as people with chronic limb threatening ischaemia (CLTI) without diabetes:
- **Admitted patients should have** specialist review, WIFI score⁴ and vascular imaging performed within 48 hours of referral irrespective of whether admitted to the arterial centre or a network hospital

- **Non-admitted patients** should have specialist review, WIFI score, and vascular imaging performed within 7 days of referral, ideally at a network hospital close to where they live

Clinical governance

- 19.16 The National Diabetes Foot Care Audit (NDFA) was launched in July 2014 in England and has a record of > 300,000 foot ulcers in people with diabetes. ⁶
- 19.17 The Scottish Care Information – Diabetic Collaboration (SCI-DC) provides a single shared electronic record for data entry in Scotland. ⁷

Standards

NICE-NG19. Diabetic foot problems: prevention and management (2015).

Vascular Society. A Best Practice Clinical pathway for Peripheral Arterial Disease (2019).

NICE-NG28. Type 2 diabetes in adults: management (2020).

National Wound Care Strategy Programme. Lower Limb: Recommendations Clinical Care (2020).

Figure 6. Posterior tibial artery recanalisation for CLTI in person with diabetes and foot ulcer.



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7. <https://www.sci-diabetes.scot.nhs.uk> (Accessed 04.10.21)

20. VENOUS DISEASE

Overview

- 20.1 The expert assessment and treatment of patients with acute and chronic venous conditions is a core vascular service.
- 20.2 Acute venous disease is a potential threat to both life (from pulmonary embolus) and limb (from 'phlegmasia').
- 20.3 Chronic venous disease is associated with significant impairment in health-related quality of life.

Superficial venous reflux Varicose veins

- 20.4 The adult community prevalence of superficial venous reflux is between 35-50% and chronic venous disorders represent a large workload for a vascular network.¹⁻³
- 20.5 The treatment of superficial vein reflux is highly effective. Treating symptomatic varicose veins is cost-effective.^{4,5}

COMPLICATIONS OF UNTREATED SUPERFICIAL VENOUS REFLUX

Acute

Superficial venous thrombosis (SVT)
Venous bleed

Chronic (damage to skin and soft tissues)

Malleolar flare
Venous eczema
Swelling
Pigmentation
Sclerosis
Ulceration

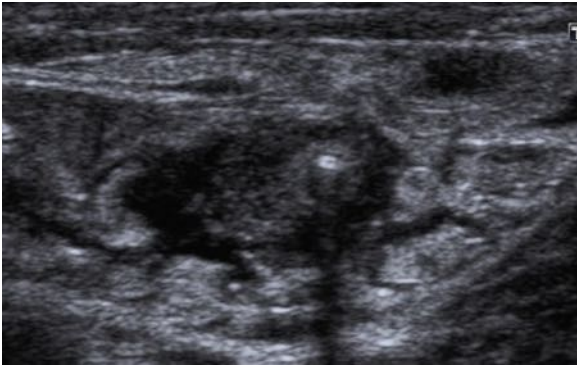
- 20.6 NICE CG168 and the NWCSP recommend that people with a bleeding varicose vein should be immediately referred to the vascular service.
- 20.7 All leg wounds should be offered an assessment within 14 days (NWCSP).
- 20.8 NICE venous guidelines and the accompanying quality standards (QS67) have not been uniformly implemented by healthcare commissioners, resulting in geographical variation in access to assessment and treatment for superficial venous reflux.⁶
- 20.9 **The VS recommends that vascular networks use the development of ICSs in their areas to offer people with superficial venous disease better care.**

Assessment

- 20.10 NICE (CG168) recommends that people with symptomatic varicose veins should have duplex ultrasound assessment.
- 20.11 Assessment (clinical and ultrasound) should be performed by a specialist with appropriate specific training and experience.
- 20.12 Ideally this individual should also be trained and experienced in the planning of endovenous procedures in addition to diagnostic imaging.
- 20.13 A small proportion of patients require further imaging to assess pelvic or iliac vein function. This may be possible in network hospitals but may require the facilities of an arterial centre.

Superficial venous interventions

- 20.14 The vascular service should be able to offer a range of interventions, including:
- Endovenous thermal ablation
 - Ultrasound guided foam sclerotherapy
 - Open ligation and/or phlebectomy
- 20.15 NICE recommends endothermal ablation for truncal reflux (CG168). Very few patients require open varicose vein surgery.
- 20.16 Endovenous treatments should be delivered as ambulatory, local anaesthetic, procedures in network hospitals based on resources, patient choice of location and geography.
- 20.17 NICE recommends that compression therapy is not used alone as a treatment unless a patient is not suitable or declines interventional treatment (this is rare).
- 20.18 Recurrence rates are similar following all these venous procedures.⁷



Dedicated Elective Care Centre (DECC), Northern Ireland

In NI, people were waiting over 4 years on average for varicose vein treatment.

In 2018, vascular surgeons made a successful bid to the Health and Social Care (HSC) board to pilot a DECC for varicose veins. With expert agreement and after public consultation two DECCs were established utilising day-case facilities in accessible locations to service the entire NI population.

These were supported by vascular surgeon, uniform care pathways for treatment, and pooled regional waiting lists to improve quality and equity of care.

Waiting times for varicose vein Treatment in Northern Ireland

	> 1 year	> 2 years	> 3 years	> 4 years	Waiting List
2018	586	373	257	131	1,347
2019	330	124	69	37	560
2020	211	67	37	6	321

Waiting times for VV treatment have reduced progressively and regional waiting list variability has been removed.

Lower limb venous ulceration

- 20.19 Compression therapy applied by a practitioner with specialist training and expertise is the mainstay of treatment for venous leg ulceration. ^{8,9}
- 20.20 Superficial venous interventions of all types are highly effective in promoting healing of venous leg ulcers and reducing subsequent ulcer recurrence. ^{10,11}
- 20.21 **Compression should be used alongside endothermal ablation of truncal reflux or occasionally alone in a person not wanting intervention (provided no contraindication i.e., arterial disease).**

Superficial venous thrombosis

20.22 Superficial venous thrombosis (SVT) management takes place in primary care:

- Compression and/or limb elevation
- Anti-inflammatory medication
- Anticoagulation with Fondaparinux when SVT is extensive or extends close to saphenofemoral and/or saphenopopliteal junctions ¹²

20.23 Best practice is for a venous duplex scan to be performed in people with SVT.

20.24 The incidence of concomitant deep vein thrombosis (DVT) is 6-40% and pulmonary embolus (PE) 2-13%. ¹³

20.25 If varicose veins are present (up to 62% of people with SVT) these should be treated to reduce the risk of recurrence.

20.26 Treatment should be delayed for 3 months until after the pro-thrombotic phase.

Deep vein thrombosis

20.27 The annual incidence of first episode symptomatic DVT is 50-100 per 100,000 adults in the UK. ^{14,15}

20.28 Lower limb DVT is managed via community or outpatient pathways without the direct involvement of vascular services.

20.29 Diagnosis is with risk scoring, D-dimer and, in most people, a venous duplex scan.

20.30 Immediate management is with anticoagulation (NICE NG158).

20.31 Patients with swelling should be offered immediate below knee compression treatment for 6-12 months (unless contra-indication) to reduce pain, swelling and the risk of post thrombotic syndrome (PTS). ¹³

20.32 DVT is associated with a risk of fatal pulmonary embolus (PE), symptomatic recurrence and post-thrombotic syndrome (PTS), with the latter being a common complication (20-50% by 2 years). ^{16,17}

20.33 Immediate or early interventional radiology intervention may be (rarely) required to save life or limb due to:

- **Massive pulmonary embolus with circulatory compromise**
- **Threatened venous infarction of the leg (phlegmasia cerulea dolens)**

20.34 Selected people with ilio-femoral DVT (i.e., young women with left sided symptoms) should be considered for an early thrombus removal aiming to reduce the risk of PTS (see [section 20.44-20.48](#)).

Preventing recurrence

20.35 The duration of anticoagulation is a balance between individual risks of thrombosis recurrence, the bleeding risk from anticoagulation, and patient preference.

20.36 Extended anticoagulation should be considered for people with:

- ‘Unprovoked DVT’
- ‘Provoked DVT’ with minor risk factors
- Thrombophilia
- Thrombosis at an unusual site

20.37 **This decision making can be complex and is best supported by a haematology service (thrombosis clinic).**

Cancer associated thrombosis

20.38 Between 4% and 12% of patients with ‘unprovoked DVT’ with no history of malignancy at presentation are subsequently diagnosed with a cancer: ¹⁸

20.39 Initial investigation should be driven by history and examination findings rather than ‘blanket investigation’ (i.e., whole body CT).

20.40 The duration of anticoagulation should be extended in people with malignancy.

Deep venous interventions

20.41 Chronic deep venous disease is most commonly as consequence of past venous thrombotic episodes.

20.42 Deep vein occlusion and/or reflux can result in swelling, venous claudication, chronic pain, and/or leg ulceration (post thrombotic syndrome, ‘PTS’).

20.43 Compression therapy is again the mainstay of treatment

20.44 Vascular services should be involved in the invasive management of:

- Acute ilio-femoral DVT
- Chronic post thrombotic syndrome
- Non-thrombotic deep venous lesions
- Upper limb DVT (see [section 27](#))

20.45 Treatment options include early thrombus removal, usually by a combination of pharmacological and mechanical means, or later intervention with venous stenting.

20.46 The use of intravascular ultrasound (IVUS) is considered best practice when performing venous stents.

20.47 Deep venous interventions should only be offered in vascular centres with the necessary multidisciplinary skill mix, appropriate resources, and facilities.

20.48 Given the lack of clinical trial data of benefit patients should be entered into new clinical trials and national registries.

Upper Extremity DVT

20.49 Upper extremity DVT (UEDVT) should primarily be treated with 3 months of anticoagulation. ¹³

20.50 Thrombus removal strategies may be considered in selected cases and following this, decompression of any demonstrable thoracic outlet compression (see [section 27](#)).

20.51 When UEDVT is in association with a central venous catheter, its removal should be considered. ¹³

Clinical governance

20.52 Hospital thrombosis committees benefit from the input of a vascular specialist with an interest in venous thrombosis.

20.53 National registries are needed to record procedures and outcomes for acute venous thrombolysis, pharmaco-mechanical thrombectomy and venous stenting (BSIR have developed a venous stent registry ¹⁹).

20.54 The venous datasets should include details of medical devices and patient reported outcomes measures (PROMs).

20.55 The governance recommendations in [section 27](#) equally apply to the treatment of deep venous disease.

Standards

NICE-CG92. Venous thromboembolism – reducing the risk (2010).

NICE-CG168. Varicose veins: diagnosis and management (2013 updated 2016).

NICE-QS67. Varicose veins in the legs Quality standard (2014).

NICE-NG158. Venous thromboembolic diseases: diagnosis, management, and thrombophilia testing (2020).

National Wound Care Strategy Programme. Lower limb - recommendations for clinical care (2020).

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18. Delluc A, et, al. Real-world incidence of cancer following a first unprovoked venous thrombosis: results from the EPIGETBO study. *Thromb. Res.* 2018; 164: 79-84.
19. <https://www.bsir.org/registries/active-registries/bsir-venous-registry/> (Accessed 04.10.21)

21. LEG AND FOOT ULCERATION

Overview

- 21.1 It is estimated that at any time in the UK approximately 730,000 people (1.5% of the adult population), are affected by active leg or foot ulceration. ¹
- 21.2 These chronic wounds have an enormous impact upon health-related quality of life and generate significant healthcare costs. ¹
- 21.3 There is considerable variation in assessment, treatment, and outcomes. ²
- 21.4 This variation extends to healing times (with associated cost). ³

Leg ulcer

- 21.5 A leg wound is a wound on or above the malleoli (ankle bones) but below the knee.
- 21.6 A wound persisting for 2-4 weeks is termed an ulcer.
- 21.7 Venous insufficiency is the most common cause, and accounts for >70% of leg ulcers (see [section 20](#)).

Foot ulcer

- 21.8 A foot wound is a wound sited distal to the malleoli, including on the heel.
- 21.9 Foot ulcers occurs most frequently in people with diabetes (see [section 19](#)) and/or peripheral arterial disease (see [section 18](#)).
- 21.10 Wounds due to pressure damage associated with immobility or a medical device should be reported (reporting is mandatory for trusts in some cases ⁴).

Multi-disciplinary team approach

- 21.11 Initial ulcer management should be by a health care professional with advanced capabilities in lower limb assessment. ⁵
- 21.12 This can be any member of the lower limb ulcer MDT, provided they have the necessary training, equipment, and dressings.
- 21.13 This lower limb ulcer MDT comprises:
- **Vascular services**
 - **Podiatrists**
 - **Tissue viability nurses**
 - **Lymphoedema practitioners**
 - **Medicine**
(Diabetologists and Dermatologists)

- 21.14 How these team members will interact will vary across networks. What is important is that a complete MDT is in place with agreed prevention strategies, clinical referral pathways for assessment, and timescales for escalation if an ulcer is non-healing.



MARS, Greater Manchester

Vascular reconfiguration has created a single service for 3 million people across 10 CCGs, 12 acute hospitals, and 48 community services.

MARS is the community reconfiguration that compliments hospital change. It is bringing together public health, community, and hospital services to ensure a seamless journey for lower limb patients. This change is creating 'fuss-free' pathways, an educated work force and a focus on reducing the inequality of provision, access, and outcome in lower limb services. In short, a 'whole systems' approach to reducing amputations.

Early results demonstrate fewer inappropriate vascular service referrals (25% vs 5%) and lower average amputation costs (£7,578 vs £8,621).

MARS has brought together commissioners, clinicians, strategists, finance, and academia to co-create and measure change using the 'Manchester Vascular Tube Map' and facilitated Manchester becoming an implementation site for the National Wound Care Strategy Programme (NWCSP).

Prevention

- 21.15 People with diabetes or peripheral arterial disease should be educated on:
- Foot self-care (including foot ware)
 - Healthy living (see [section 17](#)) ⁶
- 21.16 People with diabetes or peripheral arterial disease who are at high risk for foot ulceration should have regular foot checks (3 or 6 monthly). ⁷

21.17 People with healed venous leg ulcers, should be reviewed at a minimum 6-monthly for replacement of compression garments and ongoing advice about prevention of recurrence.

Assessment

21.18 The National Wound Care Strategy Programme (NWCSP) recommendations set out:

- 'Red flags' prior to initial assessment,
- Immediate and necessary care
- Evidence-based recommendations for lower limb ulcer assessment:

INITIAL ASSESSMENT

This should identify the contributing causes for ulcer non-healing and give a diagnosis:

Wound

Collect data required to meet the CQUIN minimum data 3 (ideally including imaging)

Screening for diabetes (see [section 17](#))

Arterial supply (see [section 18](#))

Neuropathy (see [section 19](#))

Venous insufficiency (see [section 20](#))

Lymphoedema (see [section 27](#))

21.19 The NWCSP is supported by NHS England and Improvement (NHSEI), and the Queen's Nursing Institute (QNI).

Treatment

21.20 Treatment of leg and foot ulceration should be guided by a local policy, which reflects evidence base and national recommendations.

21.21 For leg wounds, in the absence of the NWCSP red flag symptoms, first line mild graduated compression therapy (20mmHg or less at the ankle) is recommended.

21.22 Patients should be given an individualised wound care plan and advice on self-management influenced by their needs and wishes.

21.23 The effectiveness of the wound care plan should be regularly reviewed.

21.24 If a wound deteriorates, then this should be escalated to a relevant clinical specialist service.

21.25 If after 12 weeks, if a wound remains unhealed a comprehensive reassessment should be undertaken (see [sections 18-20](#)) and the need for referral to a specialist service considered.

Core Capabilities Framework

21.26 The NWCSP Core Capabilities Framework for England describes the skills, knowledge and behaviours required to deliver high quality, person-centred, wound care.⁵

Clinical governance

21.27 Recommended NWCSP timescales:

NWCSP RECOMMENDATIONS FOR WOUND ASSESSMENT TIMES

New foot wound in person with diabetes	For person in hospital (or being admitted), referral to diabetic foot MDT ≤ 24 hours of initial examination of the feet For all other acute diabetic foot problems, referral ≤ 1 working day to the foot protection service or multi-disciplinary footcare service.
Any other non-diabetic foot wound	Referral ≤ 1 working day to the foot protection service (FPS) or multidisciplinary footcare service.
Non-healing leg wounds (including venous ulceration)	Should be assessed (including vascular assessment of arterial supply) ≤ 14 days of presentation.

21.28 Services managing foot and leg ulcers should have systems in place for daily triage of referrals (Monday to Friday).

21.29 People with foot ulceration should ideally be seen and assessed once referred ≤ 48 hours.

21.30 People with non-healing leg wounds should be managed along time-critical pathways and not left for 'treatment in turn'.

Standards

National Wound Care Strategy Programme. Lower Limb – Recommendations for Clinical Care (2020).
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NICE-KTT9. Antimicrobial stewardship: Prescribing antibiotics (2015 updated 2019).
Health Education England. Multi-Professional Advanced Capabilities Framework for Lower Limb Viability (2021).
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22. CAROTID DISEASE

Overview

- 22.1 Stroke services in England are being organised into Integrated Stroke Delivery Networks (ISDN) to meet the ambitions set out in the NHS Long Term Plan.¹
- 22.2 In the ISDN model, stroke patients will be admitted to Hyperacute Stroke Units (HASUs) with subsequent rehabilitation delivered at other network locations.
- 22.3 Vascular services play a small, but important, part in in this stroke pathway in treating people with extra-cranial internal carotid artery stenosis.

Stroke service model

- 22.4 The National Stroke Service Model describes the staff and facilities needed to deliver high quality stroke care:²

Transient ischaemic attack (TIA) clinic

- 22.5 People with acute neurological symptoms that resolve completely within 24 hours should be referred to be assessed ≤ 24 hours by a specialist physician in a TIA clinic.

Hyper Acute Stroke Unit (HASU)

- 22.6 HASUs offer people suffering a stroke rapid assessment and treatment:
- Acute stroke thrombolysis and/or mechanical thrombectomy
 - 24/7 monitoring and physiological intervention in a high-dependency bed
 - 24/7 neurologist, neurosurgeon, interventional radiologist, specialist nurse and therapist on call
- 22.7 This phase of care is envisioned to be for ≤ 72 hours of hospital admission.

Acute Care

- 22.8 An acute stroke bed with access to therapists and discharge planning.

Community Rehabilitation

- 22.9 Specialist rehabilitation tailored to the needs of the individual person.

Symptomatic carotid stenosis

Recognition

- 22.10 Stroke, TIA and transient loss of vision (amaurosis fugax or transient monocular vision loss, TVML) are medical emergencies.
- 22.11 ISDNs should work with partner organisations to support public awareness of the signs and symptoms of stroke, and the need to take immediate action.³

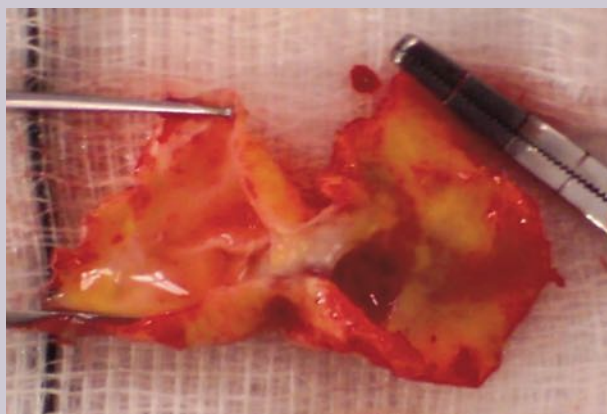
Imaging

- 22.12 Carotid imaging is recommended for people presenting with symptoms suggesting anterior circulation cerebral ischaemia who might be suitable for carotid intervention:
- Carotid imaging, when indicated, should be performed within 24 hours
 - Increasingly, cross-sectional imaging (CTA or MRA) is obtained in addition to aid decision making (i.e. to identify tandem carotid lesions)

Carotid endarterectomy

- 22.13 The benefit of carotid endarterectomy (CEA) in patients with symptomatic internal carotid stenosis graded 50-99% (NASCET criteria) was demonstrated in the NASCET and ECST trials 30 years ago.^{4,5}
- 22.14 These trials included patients who underwent CEA up to 6 months after their index event. The greatest benefit for the patient is derived when CEA is performed < 14 days and ideally < 7 days, and in patients with stenosis graded 70-99%.

Figure 7. Carotid plaque following endarterectomy showing tight stenosis and area of ulceration with adherent thrombus.



- 22.15 **Achieving timely intervention is the greatest challenge of this pathway for vascular services, with significant variance observed between networks.** ⁶
- 22.16 Difficult or complex cases (e.g., large infarct where a delay is inevitable) should be discussed in a formal MDT meeting with other vascular surgeons, a radiologist and ideally at least one stroke physician.
- 22.17 Routine formal pre-operative MDT discussion of straightforward patients is not essential and may introduce delay.
- 22.18 In response to declining CEA numbers the VS has amended its recommendation to a minimum of 35 procedures per year.

Carotid artery stent

- 22.19 Current evidence does not support the routine use of carotid artery stenting (CAS) for symptomatic carotid stenosis:
- Whilst CAS reduces the risk of cranial nerve injury and haematoma formation as compared with CEA, the risk of procedural stroke is higher ⁷
 - There may be patients with a hostile neck or otherwise high risk for surgery in whom CAS is appropriate treatment
- 22.20 Based on this evidence base patients for CAS should undergo intervention by a specialist MDT, with adequate annual case volumes, and with outcomes that are transparently reported and rigorously audited.
- 22.21 This requires referral of patients for carotid artery stenting to a small number of supra-regional teams across the UK.
- 22.22 Interventional neuroradiologists are often the specialists best equipped to perform these procedures. When they do, they are encouraged to register with the NVR and submit their carotid artery stent cases.

Recovery after intervention

- 22.23 Most patients do not require a critical care unit bed after carotid intervention. They can be safely monitored in the PACU and then nursed on a vascular ward.
- 22.24 There should be protocols in place for close monitoring of blood pressure for 24 hours (or longer until stable), and if elevated instigating immediate blood pressure control.

KEY PERFORMANCE INDICATORS

Risk adjusted and allows for volume of procedures on which estimate was based

	Achievable	Minimum
Percentage of people receiving intervention ≤ 14 days of symptoms	$\geq 70\%$	$\geq 50\%$
Number of CEAs performed annually ¹	–	≥ 35
Risk adjusted procedural stroke and/or mortality ≤ 30 days of intervention ²	$\leq 2\%$	$\leq 3\%$

1. Averaged over the last 3 years

2. 2.3% in NVR for 2018-20 (assessment by a consultant neurologist is associated with higher reported minor stroke rates in clinical trials ⁶)

Asymptomatic carotid stenosis

- 22.25 It is estimated that around 8-15% of acute strokes occur in people with a previously asymptomatic 50-99% internal carotid artery stenosis. ⁸
- 22.26 There is less benefit in performing CEA in every person with an asymptomatic stenosis as the number needed to treat (NNT) to prevent 1 stroke is approximately 20 procedures. ^{9,10}
- 22.27 There is probably a subset of people in whom CEA is beneficial. This may include:
- High grade stenosis (>90%)
 - Progressive stenosis
 - Silent ipsilateral infarct on CT or MRI
 - High-risk plaque characteristics
- 22.28 Importantly, patients should have more than 5 years of reasonable life expectancy to gain benefit (over the first 2 years the procedural stroke risk outweighs the benefit in reduced later events).
- 22.29 Data from on-going trials of asymptomatic patients are awaited to guide treatment decisions.
- 22.30 **Asymptomatic stroke patients should be discussed at a formal MDM.**

Ocular ischaemic syndrome

- 22.31 Robust clinical pathway involving ophthalmologists, opticians and stroke physicians should be agreed for assessment and treatment of these rare patients. ¹¹

Carotid restenosis

- 22.32 Rates of restenosis (defined as >70% stenosis or occlusion) are reported as 4.1-5.8% post CEA and 10% following CAS. ¹²

22.33 The late ipsilateral stroke rate after CEA is higher if restenosis is present:¹²

- 5.2% per year for >70% stenosis
- 1.2% per year for <70% stenosis

22.34 Symptomatic restenosis should be considered for intervention, with the patient consented as to a higher procedural risk of cranial nerve injury (for CEA) and stroke.

22.35 Conservative treatment with optimal medical therapy should be considered the preferred choice in asymptomatic re-stenosis.

22.36 All people with restenosis should be discussed at a vascular MDM, ideally with a stroke consultant present.

Carotid and vertebral artery dissection

22.37 Most carotid and vertebral artery dissections are treated conservatively with formal anti-coagulation (e.g., direct acting oral anti-coagulant) or an antiplatelet treatment.

22.38 Local protocols should be in place for follow up and imaging.

Clinical governance

22.39 Overall governance of the stroke services is from ISDNs.

22.40 The NVR reports on the timeliness, safety, and effectiveness of carotid endarterectomy.

Standards

Royal College of Physicians (Intercollegiate Stroke Working Party): National clinical guideline for stroke (5th edition) (2016).

NICE-NG128. Stroke: The diagnosis and acute management of stroke and transient ischaemic attacks (2019).

National Stroke Programme: National Stroke Service Model: Integrated Stroke Delivery Networks (May 2021).

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23. AORTIC DISEASE

Overview

- 23.1 The prevalence of aortic disease is changing, with fewer people presenting with abdominal aortic aneurysm (AAA) and more presenting with acute aortic dissection (AD).¹
- 23.2 This fall in AAA repairs reflects a reducing prevalence of AAA in the UK.¹
- 23.3 In addition, NICE has questioned the effectiveness of repairing intact AAA with aortic stent grafts (EVAR).²

Regional coordination

- 23.4 Aortic procedures should only be performed in arterial centres that treat a sufficient volume of patients:³

- Too many arterial centres perform low numbers of open infra-renal AAA repairs and fenestrated / branched aortic stent grafts⁴
- One consequence of this is that significant regional variation is observed in the treatment offered to people with aortic disease

- 23.5 Regional coordination means that aortic services are delivered either by, or with input from, regional or supra-regional specialist aortic MDTs.
- 23.6 This specialist approach is designed to improve patient outcomes and reduce inequalities in access to care.

Aortic multi-disciplinary teams

- 23.7 Aortic MDTs involve vascular surgeons, cardiac surgeons, interventional radiologists, vascular anaesthetists, and specialist vascular and cardiac nurses.
- 23.8 Not all aortic MDT members need to be employed by one trust; in some UK cities vascular surgery and cardiac surgery are in separate hospitals.

Specialist aortic centres

- 23.9 People with thoraco-abdominal aneurysm and/or AD and/or aortopathy (connective tissue disease) and/or disease of the aortic root and/or aortic arch should be managed by a specialist aortic MDT.
- 23.10 Endovascular aortic procedures involving stent grafts with fenestrations and/or branches, and/or chimney grafts should be performed in aortic centres.

- 23.11 Standard open or endovascular AAA repair or thoracic aortic stent grafts can be performed at all arterial centres provided there are sufficient case volumes.
- 23.12 **A specialist aortic centre should cover a population of > 2 million people, with population of > 2.4 million people recommended.**

Specialist aortic centre responsibilities

- Clinician appointed to lead the aortic service and to chair the MDM
- Aortic MDT coordinator appointed (or role delivered by the MDT coordinator of the host vascular or cardiac service)
- Be experienced in performing full range of aortic procedures, including open supra-renal aortic aneurysm repair
- Have named vascular surgeons, cardiac surgeons and interventional radiologists identified as the team who specialise in this type of work
- Develop sufficient capacity, including for adult critical care, to deliver a supra-regional aortic service
- Develop adult critical care transfer for people presenting with acute aortic syndromes (including acute AD)
- Publish on call rotas with a single point of contact for referral of patients
- Publish regionally agreed care pathways include initial management in the emergency department and timely critical care transfer
- Have a spinal cord protection protocol
- Work with other aortic centres nationally to manage rare conditions (i.e., Marfan and Loeys-Dietz syndromes) and deliver less frequently performed procedures
- Participate in research and audit

- 23.13 Implementation of this model of care requires support from aortic patients, commissioners, vascular networks, cardiac units, and hospital trusts.

Abdominal aortic aneurysm

- 23.14 Abdominal aortic aneurysms (AAA) are usually asymptomatic until they rupture.

Screening for AAA

- 23.15 AAA screening programmes are operating in England and the three devolved UK nations, but not in Ireland:⁵
- 23.16 Population screening for AAA in men using ultrasound has been shown to reduce disease-specific mortality by about 50%.^{6,7}
- 23.17 AAA screening remains cost effective at current prevalence rates (NAAASP England 2019/20 figure is 0.92%).
- 23.18 Men are referred for treatment to a vascular service that meets the VS Quality Improvement Framework standards and has been through a NAAASP pre-implementation quality assurance process.

NHS AAA Screening Programme

Men aged 65 receive a written invitation to attend for an ultrasound scan to measure their infrarenal aortic diameter:

- Men with aortic diameter < 3.0cm are discharged
- Men with a small or medium AAA (3-5.4cm diameter) are offered health and lifestyle advice by a programme nurse and offered surveillance
- Men with a large AAA (≥ 5.5 cm), or with expansion >1 cm in 1 year, are referred to an accredited vascular service

NAAASP accredited units are expected to deliver fifteen specific performance standards.

The two most important are a 30-day mortality for intact AAA repair in line with national patient outcomes and treating patients in a time-critical way (treatment within 12, and ideally 8 weeks).

Repair intact AAA

- 23.19 Planned ('prophylactic') repair of incidentally found large AAA and screening detected AAA which have reached threshold to prevent future rupture is an important function of a vascular service.
- 23.20 Treatment is time-critical to reduce the aneurysm rupture risk prior to repair.
- 23.21 Although some people (i.e., people who are older, are frail, and/or have comorbidities) will not be suitable for operative AAA repair, many people choose intervention, particularly if suitable for endovascular aneurysm repair (EVAR).
- 23.22 There is no significant survival advantage to be gained from surgery to most AAA < 5.5 cm, as the risk of rupture is less than the risk of repair (even using EVAR).⁸

- 23.23 People with limited life expectancy and significant co-morbidities may similarly not benefit from prophylactic aortic intervention.

Open surgical repair

- 23.24 Open surgery to repair an AAA is a major operation, with a significant associated morbidity and mortality.
- 23.25 **The VS recommends that based on recently published data from international registries a minimum volume of 13 open intact AAA repairs per year should be performed at arterial centres in the UK.**⁹

Endovascular aneurysm repair (EVAR)

- 23.26 The National Vascular Registry (NVR) shows that 61% of UK AAA repairs performed in 2019 were done using EVAR.⁴
- 23.27 EVAR has not been shown to reduce overall mortality after four years compared to open repair in RCTs.¹⁰ Nevertheless, there are short term advantages in terms of:
- Reduced early (in hospital) mortality
 - Reduced length of hospital stays
 - Improved early quality of life
- 23.28 Issues of long-term durability and cost remain significant challenges for EVAR, such that published NICE guidance (2020) recommends open AAA repair unless patients have a 'hostile' abdomen or have comorbidities/risk factors that make them unfit for open repair.²

Patients deemed 'unfit'

- 23.29 For patients deemed unfit for open AAA repair, the decision to offer EVAR or no intervention requires careful consideration:
- MDM discussion should be part of the decision-making process
 - Patients should have their treatment options explained to them, including 'doing nothing' and the risks and benefits of each option, so that they can make an informed choice
 - Implications regarding DVLA eligibility to drive when AAA ≥ 6.5 cm explained
 - If a patient consents to this, then best practice is to include at least one family member in discussions
 - Advance care planning introduced for rupture if aortic aneurysm untreated

Repair of symptomatic or ruptured AAA

- 23.30 Overall mortality for ruptured AAA (rAAA), including pre-hospital deaths and 'turn-down' for rAAA surgery is about 85%.

- 23.31 In people who are frail, have multiple co-morbidities, or present in extremis (i.e., in cardiac arrest) than appropriate management is usually palliative with symptom relief.
- 23.32 For people who can gain benefit, emergency open surgical repair or endovascular repair (EVAR) are potential treatments based on the patient's anatomy.
- 23.33 The in-hospital mortality for rAAA treatment options remains high at 30-40%.
- 23.34 The IMPROVE trial has shown a quality-of-life benefit following endovascular repair of rAAA in women and in men ≥ 70 years who are anatomically suitable: ¹¹

- NICE recommends EVAR for men ≥ 70 years and in women with rAAA ²
- NICE recommends open repair in men < 70 years of age with rAAA ²

RUPTURED AORTIC ANEURYSM Immediately life threatening

	Achievable	Minimum
Emergency repair using EVAR (in men ≥ 70 years and in women)	–	$\geq 25\%$

INTACT AORTIC ANEURYSM SURGERY Time critical care delivery

	Achievable	Minimum
AAA diameter ≥ 5.5 cm		
Referral to vascular service within 1 day	$\geq 85\%$	$\geq 75\%$
Percentage of people with AAA ≥ 5.5 cm assessed ≤ 2 weeks	$\geq 90\%$	$\geq 80\%$
Time from AAA reaching threshold (or referral) to treatment ≤ 8 weeks ^{1,2}	$\geq 80\%$	$\geq 60\%$
1. Unless treatment deferred for medical optimisation or manufacture of a custom aortic stent graft.		
2. People waiting ≥ 12 weeks with screen-detected aneurysm repair to be reported as a long waiter.		

INTACT AORTIC ANEURYSM SURGERY Procedure numbers

Cases per annum (averaged over 3 years)	Achievable	Minimum
All AAA repairs (open, EVAR, intact or rupture) ¹	–	≥ 60 ²
Open AAA repair	–	≥ 13
Open supra-renal cases	–	≥ 5
Complex endovascular FEVAR, BEVAR, chimney	–	≥ 35
TEVAR	–	≥ 10
1. Includes EVAR with iliac branch device (IBD/IBE) as infrarenal (AAA) procedure		
2. ≥ 100 aortic procedures for specialised aortic centre		

INTACT AORTIC ANEURYSM SURGERY Risk adjusted and allowing for volume of procedures on which estimate was based

Open, standard EVAR or Complex EVAR	Achievable	Minimum
Median length of stay for standard EVAR ¹	≤ 1 day	≤ 2 days
Median length of stay for open AAA repair	≤ 7 days	≤ 10 days
In-hospital mortality	$\leq 3.5\%$	$\leq 6\%$
Readmission ≤ 30 days	$\leq 10\%$	$\leq 15\%$
TEVAR	Achievable	Minimum
In-hospital mortality	–	$\leq 8\%$
FEVAR and/or BEVAR	Achievable	Minimum
In-hospital mortality	–	$\leq 5\%$

1. Includes EVAR with iliac branch device (IBD/IBE) as infrarenal (AAA) procedure

Thoracic aortic aneurysm

23.35 Thoracic aortic disease should be treated by specialist teams treating adequate volumes of cases and working in:

- **Specialist aortic centres**
- **Cardiac surgery units**
- **Major trauma centres (MTCs)** (repair of traumatic aortic injuries)

23.36 A spinal cord protection protocol should be in place, including for the use of cerebrospinal fluid (CSF) drainage.

23.37 **All thoracic aortic cases should be discussed in a specialist regional aortic MDM; or in the emergency setting with the specialist aortic on call consultant.**

Aortic dissection

23.38 Specialist aortic services should engage with emergency departments and diagnostic radiology across their network to educate them (if needed) as to the need for a CT scan for a definitive diagnosis in aortic dissection (AD).¹²

23.39 If AD is confirmed, then immediate referral should be made to a single point of contact at the regional aortic centre.

23.40 If the patient is accepted for transfer, this should be time-critical ('blue light' or adult critical care transfer service) for medical management in a critical care setting (most people with type B AD) or immediate aortic root surgery (most type A AD).

23.41 In selected people with acute type B AD the aortic service will provide support for a patient to admitted to local high dependency unit bed (i.e., coronary care unit) for blood pressure control and serial imaging.

23.42 NHSEI is preparing an aortic dissection 'toolkit' which will aid vascular networks to work with cardiac units to develop their acute AD pathways.

Mycotic aneurysm or Graft infection

23.43 Both open aortic grafts and aortic stent grafts may become infected, sometimes with an associated aorto-enteric fistula.

23.44 Medical and surgical management of aortic graft infection is complex, with a high associated morbidity and mortality.

23.45 Surgical management should be limited to a few supra-regional centres that have MDTs with experience of:

- Graft explantation
- Reconstruction using a variety of open surgical techniques
- Complex endovascular repair
- Antimicrobial suppression of infection

Aortic surveillance

23.46 Robust imaging surveillance is important for the safe management of people with aortic disease.

23.47 This including people who have had an endovascular aortic stent graft implanted.

AORTIC SURVEILLANCE IMAGING

	Achievable	Minimum
Small AAA ¹ (screening detected)	≥95%	≥85%
Small AAA ¹ (non-screen detected)	≥95%	≥85%
Post standard EVAR ¹	} 1. Written network pathways for aortic surveillance 2. List of patients updated annually	
Post complex EVAR ²		
Aortic dissection ²		
1. Abdominal aortic ultrasound by clinical vascular scientists or sonographers		
2. Cross-sectional imaging (usually annually) with either CTA or MRA		

Clinical governance

23.48 The 2018 vascular GIRFT report looked at hospital length of stay and readmissions for surgery for intact AAA.¹³

23.49 Device specific data and reintervention data for all aortic procedures has recently been added to the NVR.¹⁴

23.50 NICE has recommended that people undergoing complex EVAR are consented for submission of outcomes data to registries or research studies.²

Figure 8: Olivia McBride and Rachel Forsythe performing open AAA repair (courtesy of Andrew Tambyraja, Royal Infirmary of Edinburgh).



Standards

The Vascular Society. Quality Improvement Framework for AAA (2012).

Joint working party BSIR VS VASGBI. Delivering an endovascular aneurysm service (2012).

NAAASP. Standards and outcome measures for the NHS AAA Screening Programme (2020).

NICE-NG156. Abdominal aortic aneurysm: diagnosis and management (2020).

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24. ACUTE ISCHAEMIA

Overview

24.1 Acute ischaemia of an organ or limb is a time-critical vascular emergency associated with significant morbidity and mortality.

24.2 In a UK population-based study conducted over 10 years: ¹

- **Acute limb ischaemia (ALI)**
The incidence was 10 per 100,000 people per year (as compared to 22 per 100,000 per year CLTI events)
74% of people were alive at 30 days.
- **Acute mesenteric ischaemia (AMI)**
The incidence was 8 per 100,000 people per year
28% of people were alive at 30 days

24.3 **Severity of the ischaemia and time to revascularisation are the two main factors determining patient outcomes.**

Acute lower limb ischaemia

24.4 Acute limb ischaemia (ALI) is differentiated from chronic limb threatening ischaemia (CLTI) by the duration of symptoms being ≤ 2 weeks: ²

- Approximately 70% of people present within those two weeks
- Many present immediately (≤ 24 hours) with an acutely threatened limb

24.5 Over the last century, the aetiology of ALI has shifted from embolic due to valvular heart disease to embolic in people with atrial fibrillation (unless anticoagulated).

Acute management

24.6 10-15% of people will require a major amputation as the limb cannot be salvaged. ³

24.7 Vascular networks should have a written clinical pathway for the management of ALI.

24.8 This should include bypass of local emergency departments by the ambulance service, to avoid treatment delays.

24.9 **Ischaemia severity should be graded using Rutherford classification.** ⁴

RUTHERFORD CLASSIFICATION OF ACUTE LIMB ISCHAEMIA ⁴

I	Limb viable, not immediately threatened
IIa	Limb threatened – marginal, salvageable if promptly treated
IIb	Limb threatened – immediate, salvageable with immediate revascularisation (< 6 hours)
III	Limb irreversibly damaged, major tissue loss or permanent nerve damage

24.10 Revascularisation is time critical and may require more than one treatment modality (i.e., embolectomy, thrombolysis, and/or surgical bypass).

24.11 Revascularisation is therefore best performed in a hybrid operating theatre by a multi-disciplinary team of a vascular surgeon, interventional radiologist, and vascular anaesthetist.

24.12 The anaesthetist's role is important as people can become unwell when the ischaemic limb is reperfused.

Prevention of recurrence

24.13 In cases of ALI due to an embolus the source should be sought (i.e., ECG, 24-hour Holter monitoring, ECHO and CTA of the whole aorta).

24.14 With primary arterial thrombosis, without venous thrombosis, thrombophilia testing is not recommended,⁵ though it may be prudent to consider the possibility of an underlying malignancy as a cause. ⁶

Acute upper limb ischaemia

24.15 Acute upper limb ischaemia is less common, perhaps by one fifth ⁷, than lower limb ischaemia and the risk of a patient requiring arm amputation is also lower.

24.16 Digital ischaemia related to a dialysis arteriovenous fistula is typically managed by members of the haemodialysis access team (see [section 25](#)).

24.17 In younger patient's thoracic outlet syndromes and vasculitis should be considered as causes (see [section 27](#)).

Management

- 24.18 The main difference from the lower limb is that an Iloprost™ infusion may be of greater benefit, more so in people with vasculitis.⁸
- 24.19 Subsequent management will be determined by the severity of limb/digital ischaemia and the underlying cause, with treatment individualised to the patient based on their potential risks and benefits.
- 24.20 Input from a hand surgeon or plastic surgeon may be of benefit when amputation of a digit or forearm or hand fasciotomies are required.

Acute mesenteric ischaemia

- 24.21 Cause of acute mesenteric ischaemia (AMI) include arterial embolus (often from the left atrium in a patient with atrial fibrillation), acute thrombosis (usually on a pre-existing stenosis) and malperfusion associated with aortic dissection.
- 24.22 Occlusion of the superior mesenteric artery is the commonest finding.⁹
- 24.23 The first-line diagnostic investigation is a triphasic, fine slice (≤ 1 mm) CT angiogram.

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Management

- 24.24 Management of the ischaemic or infarcted bowel ('damage control surgery') and consideration of revascularisation requires a multi-speciality approach from vascular specialists and interventional radiologists working with gastro-intestinal surgeons.
- 24.25 Vascular networks should have a written clinical pathway for the management of AMI, jointly agreed with the gastro-intestinal surgeons across all network hospitals to avoid delays to revascularisation.
- 24.26 Patients who survive often have long hospital admissions with need for parenteral nutrition, management of complex abdominal wounds and further laparotomies.

Clinical governance

- 24.27 The NVR does not capture sufficient data to evaluate outcomes in people presenting with acute ischaemia.

Standards

- European Society for Vascular Surgery (ESVS). Clinical Practice Guidelines on the Management of the Diseases of Mesenteric Arteries and Veins (2017).
- European Society for Vascular Surgery (ESVS). Clinical Practice Guidelines on the Management of Acute Limb Ischaemia (2020).

25. HAEMODIALYSIS ACCESS

Overview

- 25.1 There are almost 30,000 people receiving haemodialysis in the UK and this number is increasing year on year.¹
- 25.2 In these patients, mortality rates are lower when starting dialysis with a functioning arteriovenous fistula (AVF) rather than via a central vein catheter (CVC).
- 25.3 Under-provision of primary AVF surgery in the UK manifests as long waiting times for primary AVF and too many people starting, and continuing, dialysis via a CVC which can make future access creation more challenging if they develop subsequent thoracic central vein stenosis or occlusion.

Renal access service

- 25.4 New AVF formation, plus revisions, generate an annual workload of 100–150 operations per million population.
- 25.5 The core MDT to run such a service is shown in the box below:

RENAL ACCESS SERVICE

Nephrologist

Transplant and/or Vascular surgeon *
(trained in vascular access)

Interventional radiologist *

Renal access coordinator

MDM coordinator

Renal access nurses

Clinical vascular scientist (or sonographer)

*Few surgeons and interventional radiologists deal exclusively with renal access and so this is likely to form part of several individuals' job plans.

- 25.6 Regular dedicated outpatient assessment slots with access to duplex imaging ('one-stop' service) should be available for access assessment.
- 25.7 All patients should have arterial and venous ultrasound mapping prior to fistula creation.
- 25.8 The VASBI publication 'Vascular Access – An Introduction Workbook' provides a self-directed learning guide for health care staff delivering renal access services.²

Renal access MDM

- 25.9 This MDM is to assess and decide on 'right access for the right patient at the right time' as part of an end stage kidney disease "Life-Plan".³

Theatre sessions

- 25.10 Most AVF are performed as day case surgery under local or regional anaesthesia.
- 25.11 Brachial plexus block may be associated with improved primary radio- or brachio- cephalic fistula patency than local infiltration, and shorter operation times.^{4,5}
- 25.12 Creation of three primary AVFs should be achievable in a theatre session (4 hours). Sessions should be designated for vascular access surgery.
- 25.13 If percutaneous minimally invasive access procedures are widely adopted this will move demand from surgical to interventional radiology lists.

Fistula maintenance

- 25.14 Dialysis access grafts should be kept under surveillance by non-invasive measurement of fistula flow rates.
- 25.15 The most common complications in the arteriovenous access circuit include stenosis, acute thrombosis and dilatation.
- 25.16 In around 5-10% of people, AVF can induce steal syndrome which manifests with digital ischaemia and reduced hand function. A small number of patients will need revision procedures (i.e., banding, RUDI, PAI, DRIL or ligation).
- 25.17 Renal services should have a network wide agreement, signed off by all stakeholders, stating who is responsible for managing acute AVF complications:
- Single point of contact for referral and advice
 - Regular ward rounds on larger dialysis units and renal wards
 - Network agreed centre for emergency hospital admission
- 25.18 Most reinterventions are performed by interventional radiologists, with up to 2 interventional radiology sessions per week required for this per 100 patients with AVF.

Clinical governance

- 25.19 Renal units routinely report dialysis access related infection rates, including MRSA and MSSA bacteraemia.
- 25.20 Surgeons performing AVF surgery are encouraged to join VASBI.⁶
- 25.21 We recommend that national registries are utilised to detect inequalities in provision between regions, and between transplant and other renal units, so that these can be addressed.

RENAL ACCESS STANDARDS

	Achievable	Minimum
Attend patient education sessions prior to AVF ¹	100%	>90%
Primary AVF under local or regional anaesthesia	>85%	>75%
Known to nephrology > 4 months and start dialysis with AVF ²	> 75%	> 65%
Proportion of all dialysis patients with functioning fistula	>95%	>85%

1 Trigger might be eGFR < 20 ml/min/1.73m²
2 UK Renal Association⁷

Standards

- UK Renal Association. Clinical practice guideline: Vascular access for haemodialysis (6th edition) (2015).
- NICE NG-107. Renal replacement therapy and conservative management (2018).
- National Kidney Foundation: NKDOQI Vascular Access Guidelines (2019).
- European Society for Vascular Surgery (ESVS). Vascular Access: Clinical Practice Guidelines (2018).

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26. VASCULAR TRAUMA

Overview

- 26.1 In the United Kingdom and Ireland major trauma services are delivered by major trauma networks (MTNs) with designated major trauma centres (MTCs).
- 26.2 At each MTC the 'trauma team' are the first responders who act as trauma surgeons, most commonly general, trauma and orthopaedic or vascular surgeons.¹
- 26.3 Vascular surgeons are called to MTCs to assist as secondary responders or are called to assist colleagues from other specialties in the advent of a vascular injury.

Mechanism of injury

- 26.4 The most common injuries are to the arteries and veins of the extremities.
- 26.5 Vascular trauma in civilian practice most commonly arises from:²
- Blunt injury from falls (often <2 meters in height)
 - Road traffic collisions
 - Inter-personal violence (i.e., stabbing)
 - Industrial accidents
 - Medical procedures

Prevention and Preparedness

- 26.6 Whilst many of these injuries cannot be easily prevented, it is prudent for the vascular team to be available to assist other specialties when high bleeding risk procedures are performed (see [section 28](#)).
- 26.7 Use of major incident simulation exercises should be encouraged to build capacity and preparedness for current and future threats which may result in major casualty events in the civilian setting.

Management

- 26.8 Up to half of all trauma deaths within the first 48 hours after injury are attributable to major haemorrhage.
- 26.9 The priority in vascular trauma is therefore to resuscitate the patient and control active sites of major haemorrhage:
- For internal bleeding, except in the most haemodynamically unstable patients, a CT angiogram should be performed to identify all injuries
 - Consider use of a hybrid theatre to facilitate rapid interventional radiology ('embolisation') and/or surgical ('ligation') haemorrhage control

- 26.10 The second priority is then relief of limb or organ ischaemia, or primary amputation of a non-salvageable limb.
- 26.11 Major trauma networks (MTNs) should have written policies in place, agreed with their vascular networks, setting out their approach to vascular trauma:
- How, and from whom, to seek advice and assistance
 - Blood and blood product transfusion³
 - Tranexamic acid administration
 - How to stabilise the patient and transfer (when appropriate) for definitive treatment
- 26.12 Vascular surgeons and interventional radiologists should be updated whenever MTC haemorrhage policies change.
- 26.13 At network hospitals, including those with a major trauma centre but no arterial centre, there is likely to be delay until a vascular surgeon can attend.
- 26.14 **It should be explicit in major haemorrhage protocols that until the vascular surgeon (and/or interventional radiologist) arrives the local surgical team are responsible for haemorrhage control.**

Thoracic injuries

- 26.15 Blunt deceleration injuries causing an acute traumatic rupture or dissection to the thoracic aorta can be treated using TEVAR to prevent delayed rupture (see [section 23](#)).

Abdominal injuries

- 26.16 Immediate open surgery remains the mainstay of treatment due to high rates of associated visceral injuries.⁴
- 26.17 Damage control surgery principles should be followed in haemodynamically unstable patients.
- 26.18 This approach may also help when treating people with significant co-morbidity, or at either end of the age spectrum, where physiological reserve may be limited.

Figure 9. Traumatic aortic injury of the proximal descending thoracic aorta treated with a thoracic aortic stent graft (TEVAR)



Extremity injuries

- 26.19 Immediate open surgical exploration remains the first-line treatment in the presence of hard signs of vessel injury, such as haemorrhage or ischaemia.^{5,6}
- 26.20 The availability of hybrid theatres has increased the use of minimally invasive treatments for extremity vascular injuries.
- 26.21 Useful adjuncts include the use of embolectomy balloon catheters, intra-vascular shunts, and four-compartment fasciotomy for to prevent or relieve compartment syndrome.

Clinical governance

- 26.22 The governance of major trauma sits with Major Trauma Networks (MTNs) with outcomes reported to the Trauma Audit and Research Network (TARN) database.⁷

Standards

NICE-NG39. Major trauma: assessment and initial management (2016).

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7. <https://www.tarn.ac.uk>

27. SPECIALIST PRACTICE

Overview

- 27.1 These are areas of vascular surgery in which only a small number of UK and Irish surgeons have a regular practice.
- 27.2 Training in these areas is usually gained at post-CCT level, for instance by undertaking a one-year clinical fellowship.
- 27.3 Whilst none of these areas are recognised as sub-specialist fields in the vascular surgery curriculum, all vascular surgeons should therefore have sufficient knowledge to investigate and diagnose these conditions.
- 27.4 When the non-specialist is seeing such patients support and advice should be sought early, or patient referred on to the appropriate service.
- 27.5 All these patients require thorough assessment and explanation; sufficient time must be scheduled into clinics for this.
- 27.6 Most benefit from high-quality diagnostic imaging; including static and dynamic and/or functional imaging (contrast enhanced MRA or PET-CT).

Vascular anomalies

- 27.7 Vascular anomalies, comprising both vascular tumours and vascular malformations are principally managed by a small number of interventional radiologists, vascular surgeons, and plastic surgeons.
- 27.8 These lesions can be complex and additional input from other surgical specialities, dermatologists and geneticists may be required.
- 27.9 Specialist undertaking treatment for vascular malformations are encouraged to join the vascular anomalies special interest group, VASIG. ¹



Royal Free Hospital, London

Over the past 10 years, we have built a unique, for the UK, vascular anomaly MDT that has brought together specialists from vascular surgery and interventional radiology together with clinical nurse specialists, psycho-therapists, and other medical and surgical specialties (haematology, plastic surgery, maxillofacial surgery, and orthopaedics) to offer patient-specific management for vascular malformations and associates syndromes (Klippel-Trenauney, Proteus, CLOVES, etc.).

We have an active academic programme publishing peer-reviewed papers.

Over the last 3 years we have established the international VASIG meeting.

Thoracic outlet syndromes

- 27.10 Thoracic outlet syndromes describe a group of disorders due to compression of the neuro-vascular structures at the thoracic outlet. ²
- 27.11 Abnormal pectoralis minor impingement compressing these structures more laterally is also included as a thoracic outlet syndrome.
- 27.12 Arterial and venous compression often present acutely as upper limb or digital ischaemia (see [section 24](#)) or upper limb deep vein thrombosis (see [section 20](#)).

Thoracic outlet service

- 27.13 Treatment is best performed in supra-regional specialist centres managing an adequate volume of patients depending on local expertise, service maturity and development.
- 27.14 The core thoracic outlet syndrome MDT team should be vascular surgeon, physiotherapist, interventional radiologist, and diagnostic (musculoskeletal) radiologist.
- 27.15 Additional input may be requested from one of more of the following specialists: Chronic pain, orthopaedic surgeon, neurologist, or neurosurgeon.
- 27.16 Many patients undergo initial, up to 6 months, active conservative management with physiotherapy.
- 27.17 In some people, diagnostic and therapeutic muscle blocks can be of benefit.
- 27.18 Where active conservative management is considered to have failed surgical decompression should be considered.

Lymphoedema (and Lipoedema)

- 27.19 Lymphoedema affects 5.5 people per 1,000 of the population, this is around 430,000 people in the UK. ³
- 27.20 The structure of a lymphoedema service is available from the British Lymphology Society. ⁴
- 27.21 The role of the vascular specialist is in diagnosis, and the exclusion of other reversible cause of limb swelling, specifically excluding **venous hypertension** (see [section 20](#)).
- 27.22 Most treatment is non-surgical and led by lymphoedema practitioners.
- 27.23 Compression therapy should be trialled as it may reduce swelling, ease discomfort, and provide support.
- 27.24 There is a need for better supra-regional tertiary services to offer more complex interventions including liposuction, lympho-venous anastomosis, lymph node transfer, and (less commonly) debulking. ⁵

Paediatric vascular surgery

- 27.25 Paediatric vascular care is infrequent. When needed, it is provided by adult vascular surgeons with support from paediatricians and relevant sub-specialists.
- 27.26 Paediatric trauma surgery, a small number of children per year in the UK, should be delivered by supra-regional MDTs including experienced vascular surgeons.
- 27.27 The same approach is recommended for all major vascular reconstruction in children (i.e., for mid aortic syndrome).

Carotid body tumour

- 27.28 People with both hereditary and non-hereditary carotid body tumours (paragangliomas) are referred to both vascular and head and neck (ear, nose, and throat or maxillo-facial) surgeons.
- 27.29 Management of carotid body tumours requires a combined approach between surgeon, geneticist, endocrinologist, diagnostic radiologist, clinical oncologist (radiotherapist), and patient.
- 27.30 Vascular surgeons may occasionally lead this practice; however, most services are now led by head and neck services.
- 27.31 In 2020, the British Skull Base Society published a consensus guideline for management of head and neck paragangliomas. ⁶

Vasospasm (Raynaud's)

- 27.32 People with suspected or diagnosed Raynaud's syndrome are occasionally referred to vascular services for diagnosis and/or treatment.
- 27.33 Treatment may include hospital admission for daily prostacyclin analogue infusion (Iloprost™).
- 27.34 Thoroscopic sympathectomy is now infrequently performed.

Connective tissue disease, Vasculitis and Fibromuscular dysplasia (FMD)

- 27.35 These are auto-immune conditions (other than FMD, the cause is unknown) managed by rheumatology services.
- 27.36 Vascular service involvement is for digital ischaemia or the large artery or aortic complications of vessel occlusion or aneurysm/pseudo-aneurysm formation.
- 27.37 Whenever possible surgical intervention should be delayed until disease remission has been achieved with immune suppression.
- 27.38 In the context of impending vessel rupture or organ threatening malperfusion treatment with a stent graft (or embolisation) may be safer than open surgery.

CONNECTIVE TISSUE DISEASES

Managed by rheumatology services

Rheumatoid arthritis
(also cause of difficult to heal leg ulceration)

Scleroderma

Systemic lupus erythematosus (SLE)

Mixed connective tissue diseases (MCTD)

Undifferentiated connective tissue disease

Polymyositis/Dermatomyositis

Ehlers-Danlos syndrome *

Behçet's Disease *

* NHSEI commissions specialised rheumatology services for people with these two conditions.

VASCULITIS

Giant cell arteritis (temporal arteritis)
 Takayasu's arteritis
 Polyarteritis Nodosa
 Kawasaki disease
 Granulomatous with polyangiitis
 (previously Wegener's Granulomatosis)
 Microscopic polyangiitis
 Henoch-Schönlein Purpura
 (Non-ANCA)
 Buerger's disease (thromboangiitis
 obliterans)
 Immune complex-mediated vasculitis

27.39 The Vasculitis UK website is a useful source of information for both patients and healthcare professionals.⁷

Exercise-induced limb discomfort

27.40 In people without CVD risk factors, many of whom are also younger, causes other than PAD (see [section 18](#)) should be considered for symptoms of exercise induced limb discomfort:

- Aortic coarctation
- Middle aortic syndrome
- Iliac artery endofibrosis
- Cystic adventitial disease
- Popliteal artery entrapment
- Exertional compartment syndromes

27.41 Patient assessment often requires cross-sectional imaging (CTA and/or MRA) and provocation testing with imaging by a suitable trained clinical vascular scientist.

27.42 Treatment should be by, or in discussion with, a specialist MDT familiar with treating these conditions.

Governance

27.43 The consequence of the 'ad-hoc' commissioning of all the 'specialist' services described earlier in this section are:

- Service under provision
- Inequalities in access
- Low volume practice
- Poor (or absent) outcome reporting

27.44 **The VS recommends that best care in each of these areas is provided when vascular surgeons working within MDTs to treating an adequate volume of patients.**

27.45 Specialist MDTs, should develop referral guidance, provide education, and give access for clinicians to have patients discussed at their multidisciplinary team meetings (MDMs).

27.46 These areas of activity are not reported on the NVR. The VS recommends that there should be disease specific registries and patient reported outcome measures (PROMs).

27.47 Specialists' services should consider peer review of their service to compare outcomes with those from other units.

27.48 All cases should be discussed in an MDM prior to surgical intervention.

27.49 Standards for patient care in each of these areas should be developed through their special interest groups with patient involvement to define which outcomes are most important to them.

27.50 Where service gaps exist, vascular specialists should support colleagues to develop the service, supported by regional specialist commissioners.

Standards

NHS England. Specialised rheumatology service (adults) A13/S/a (2013).

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28. ASSISTING OTHER SPECIALITIES

Overview

- 28.1 Vascular surgeons are in a unique position to assist other specialities in vascular control.
- 28.2 The necessity for emergency control of major haemorrhage most commonly occurs in major trauma and obstetric peri-partum bleeding, but the vascular surgeon can be called to help most other surgical specialities with vessel control and repair.

Cancer resection

- 28.3 Cancer resections can necessitate mobilisation, control and en bloc resection of blood vessels that may be involved in planned resection margins.
- 28.4 Review of imaging and planning of cases should be undertaken in the MDM of the host speciality with a vascular surgery consultant in attendance.
- 28.5 In particularly challenging cases, the vascular surgeon should further discuss within the vascular MDM, particularly if they would like interventional radiology involved.
- 28.6 Resection of the tumour may necessitate arterial and venous in situ or extra-anatomic revascularisation:
- Iliac artery and vein in pelvic exenteration for locally advanced or recurrent cancer involving the lateral pelvic compartment ¹
 - Inferior vena cava involvement in renal carcinoma resection
 - Femoral, pelvic, and abdominal lymphadenectomy
 - Primary vascular tumours
- 28.7 In complex major cancer resections consideration must be given to the sequencing of different surgical teams (for example in pelvic exenterations this may variously involve colorectal, urology, vascular, orthopaedic, and plastic surgeons).
- 28.8 The extent of the resection and the degree of intra and postoperative anticoagulation must be considered and agreed between the members of the MDT operators beforehand.

Transcatheter aortic valve implantation

- 28.9 Vascular complications, including iliac artery rupture or femoral artery occlusion have been reported in up to 15% of transcatheter aortic valve implantations (TAVI) cases. ²

- 28.10 Vascular surgeons can facilitate femoral or axillary arterial access to reduce the risk of arterial perforation, dissection, or thrombosis.
- 28.11 Written arrangement should be in place for vascular surgery and interventional radiology cover when TAVI procedures are being performed.

Spinal surgery

- 28.12 Spinal surgery is coordinated through fourteen Regional Spinal Networks (RSNs).
- 28.13 Published series of anterior lumbar surgery report significant incidences of vascular injury requiring repair (6-11%): ^{3,4}
- Most were minor venous injuries repaired by the spinal surgeon
 - Vascular surgery or interventional radiology input was needed for arterial injuries and more severe venous injury requiring multi-suture repair
- 28.14 Vascular injury following posterior discectomy is rare (0.03% to 4% of cases). ⁵

Recommendations

- 28.15 The death of a patient after L4/5 discectomy in 2017 prompted the British Association of Spinal Surgeons (BASS) to advise that providers of spinal surgery have: ⁶
- Protocols agreed for vascular imaging and vascular surgeon assistance
 - Cell salvage and blood products
 - Vascular instruments
- 28.16 The complex spinal surgical services specification template recommends that there is a vascular service on site for revision anterior lumbar spinal surgery. ⁷

Governance

- 28.17 Consideration must be given to the instruments and equipment available in the operating theatre as different teams will use a variety of different instruments, electro-surgical devices, sutures, and adjuncts.
- 28.18 Arrangements for post-operative review by different teams must be agreed, together with surgical cover for post procedural complications.
- 28.19 These recommendations are even more important for surgery performed in the private sector.

Standards

NHS England. Clinical Commissioning Policy: Transcatheter Aortic Valve Implantation (TAVI) for Aortic Stenosis (2013).

NHS England. URN 1738. Complex Spinal Surgery Services (All ages).

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7. <https://www.england.nhs.uk/wp-content/uploads/2021/03/1738-Service-specification-FINAL.pdf> (Accessed 04.10.21)

29. KEY PERFORMANCE INDICATORS (KPIs)

Vascular services should **reduce preventable deaths and improve quality of life** for people with vascular disease.

Timeliness standards refer to the time from receipt of the referral by the vascular service to treatment except when stated as otherwise, and apply regardless of where the patient presents (arterial centre, network hospital or to primary care, including podiatry).

Reducing **variation in practice** is important, as is improving completeness of outcome reporting to the **National Vascular Registry (NVR)**.

NHSE Outcomes Framework Domain (OFD)		Quality Care Commission (CQC)
Domain 1	Preventing people from dying prematurely	Are services safe ?
Domain 2	Enhancing quality of life for people with long term conditions	Are services effective ?
Domain 3	Helping people to recover from episode of ill-health or following injury	Are services caring ?
Domain 4	Ensuring people have a positive experience of care	Are services responsive to people's needs?
Domain 5	Treating people in a safe environment and protecting them from avoidable harm	Are services well led ?

NHSE VS QIF	CQC	Area of Practice	Achievable standard	Minimum standard	Data source
6. Integrated care					
OFD 1-5	Safe Effective Caring Well led	6.1. Network wide, and agreed, written pathways of care for Acute limb ischaemia (ALI); Intact, symptomatic, and ruptured AAA; Major vascular injury; Acute diabetic foot problem; Carotid artery stenosis; Peripheral arterial disease; Acute mesenteric ischaemia; Acute aortic syndrome (including aortic dissection, AD) and/or thoracic aneurysm ¹ ; and Haemodialysis access (if performed).	-	All	Self-declaration
OFD 1-5	Safe Effective Caring Well led	6.2. Network wide, and agreed, written surveillance protocols for Small AAA ² ; Thoracic aortic dissection and/or aneurysm ¹ ; Endovascular aortic stent graft ¹ ; Lower limb arterial bypass; and Deep venous stent (if performed).	-	All	Self-declaration
OFD 1-5	Safe Effective Caring Well led	6.3. Network agreements in place between provider organisations Ambulance bypass to arterial centre (rAAA, AD and ALI); Review of inpatients at network hospitals; Inter-hospital transfers (including adult critical care transfers); and repatriation of patients no longer requiring specialist vascular inpatient care.	-	All	Self-declaration
OFD 1-3 PAD QIF	Safe Effective	6.4. Patients having planned major vascular surgery are reviewed pre-operatively in a pre-operative assessment clinic (POAC)	100%	≥90%	Provider
OFD 1-3 PAD QIF	Safe Effective	6.5. Medical specialists trained in comprehensive geriatric assessment (CGA) are available to review patients both pre- and post-operatively	-	-	Self-declaration
OFD 2,4	Caring Responsive	6.6. Network supports, or has a relationship with, one or more national patient associations and supports its own local patient groups	-	-	Self-declaration
OFD 2,4	Effective Caring	6.7. Advance care planning (ACP) commenced for people approaching end of life	-	-	Self-declaration

1. Pathway of care agreed across supra-regional specialist aortic MDT to reduce inequality in service provision.

2. Consistent with surveillance of men in the NHS AAA screening programmes.

NHSEI	CQC	Area of Practice	Achievable standard	Minimum standard	Data source
7. Network organisation					
OFD 1-5	Safe Effective Responsive Well led	7.1. Network leadership and management roles filled Clinical lead; Governance lead; Vascular specialist nurse; Interventional radiologist; Vascular anaesthetist; Network manager; MDM coordinator; and Data manager.	All network lead roles filled	Clinical lead, Manager, and MDM coordinator	Self-declaration
OFD 5	Safe Effective	7.2. Network population of sufficient size	-	> 800,000 population ¹	Provider
OFD 1,2,4	Safe Effective Caring Well led	7.3. Staff regularly attend the vascular network's MDM Quorate with ≥50% vascular surgeons, ≥2 interventional radiologists, 1 vascular anaesthetist, 1 vascular nurse specialist, 1 clinical vascular scientist, and MDT coordinator in attendance or accessing MDM remotely	Quorate 100% Of weeks	Quorate ≥ 95% Of weeks	MDT Register
OFD 2	Safe Effective	7.4 Same day emergency care (SDEC) arrangements for review of time critical vascular patients ≤ 3 working days who do not otherwise require hospital admission (i.e., 'hot' clinic, surgical assessment unit or 'urgent' clinic slots)	5 days/week	3 days/week	Provider
OFD 5	Safe Effective	7.5 Staff can access essential IT systems from hospitals across the network	-	-	Self-declaration
8. Arterial centres					
OFD 1	Safe Effective	8.1. Single point of emergency contact provided for GPs and clinicians	-	24/7	Self-declared
OFD 5	Safe Effective	8.2. Inpatient beds on a vascular ward	3:1 beds /100,000 pop.	2.5 beds /100,000 pop.	Self-declared
OFD 5	Safe Effective	8.3. Dedicated day care beds for vascular interventional radiology	5 days/week	2 days/week	Self-declared
OFD 5	Safe Effective Caring	8.4. Access to the following facilities, with capacity matched to demand, to allow time-critical vascular care to be delivered - Operating theatre, 'hybrid' theatre and interventional radiology room - Critical care	- -	24/7 24/7	Self-declared
OFD 5	Safe Effective Well led	8.5. Perform safe annual procedure volumes (averaged over 3 years) - Aortic (total of open and endovascular including symptomatic/ruptured) of which open AAA repair for intact aneurysm - Carotid endarterectomy (this number has reduced from ≥40 in POVS 2018) - Angioplasty (including at network hospitals)	- - - -	≥60 ² ≥13 ≥35 ≥40	NVR
ODF 5	Safe Caring	8.6. Timely review of admitted patients by consultant vascular surgeon < 14 hours for an unplanned admission and < 24 hours for planned admission	>90%	>80%	Provider
ODF 5	Safe Caring	8.7 For unplanned admitted patients, median time from admission to surgery	<12 hours	<24 hours	Provider

1. In geographically remote areas a smaller network population may be appropriate (based in part on travel times). In most areas of UK and Ireland a network population of >1.2 million is appropriate to generate an adequate volume of aortic cases to deliver better patient outcomes.

2. Supra-regional specialist aortic centres should perform a minimum of 100 aortic procedures annually.

NHSEI	CQC	Area of Practice	Achievable standard	Minimum standard	Data source
9. Network hospitals					
OFD 5	Safe Effective	9.1. No inpatient beds under the responsibility of the vascular service	-	-	Self-declared
OFD 4	Effective Responsive	9.2. Vascular outpatient clinics delivered at network hospitals	-	1 per week	Self-declared
OFD 1-4	Safe Effective	9.3. Inpatients referred for an urgent vascular review seen ≤ 72 hours	>90%	>80%	Provider
OFD 3-5	Safe Effective	9.4. Accepted patient transferred to the network arterial centre ≤ 48 hours	>90%	>80%	Provider
OFD 5	Safe Effective	9.5. Equitable access to time-critical vascular imaging at network hospitals as for people presenting at the network arterial centre	-	-	Self-declared
10. Service delivery and Clinical governance					
OFD 5	Safe Effective Caring	10.1. Evidence of monitoring and reporting of adverse events Inter-hospital transport adverse events; Falls, slips and trips; Pressure injuries; Medication errors; Surgical site infection; and Venous thromboembolism (VTE)	Continuous monitoring	Audit within last 12 months	Provider
OFD 5	Safe Caring	10.2. MDT members attend regular morbidity and mortality meetings to review Unexpected deaths; Unplanned reinterventions and/or hospital readmissions; Major complications; Serious adverse incidents (duty of candour or open disclosure); Never events; and Delayed referral, inter-hospital transfer or treatment.	Quorate ≥95% Of the time	Quorate ≥90% Of the time	Provider
OFD 1-5	Safe Responsive	10.3. Evidence of quality improvement activity being undertaken	-	-	Provider
OFD 5	Safe Effective Well led	10.4. Good NVR case ascertainment (as compared to trust HES data) Intact AAA repair; Ruptured AAA repair; Carotid endarterectomy; Lower limb arterial bypass; Lower limb angioplasty; and Major lower limb amputation.	>95%	>85%	NVR
OFD 4	Caring Well led	10.5. Demonstrate patient centred care with shared decision making	-	-	Provider
OFD 4	Caring	10.6. Written patient information widely available	Easy to understand	Information booklets	Self-declared
OFD 4	Caring Responsive	10.7. Patient satisfaction feedback has been collected by the vascular service	Within last 2 years	Within last 5 years	Self-declared
OFD 4	Caring Responsive Well led	10.8. Demonstrate efforts to tackle health inequalities for people who are: Socially disadvantaged; have poor Mental health (including people with dementia); Older people; and people living in Vulnerable circumstances.	Within last 2 years	Within last 5 years	Self-declared
OFD 4	Caring Responsive	10.9. Demonstrate that patients and/or the local population have been listened to and engaged when changes have been made to the vascular service	-	-	Self-declared

NHSEI	CQC	Area of Practice	Achievable standard	Minimum standard	Data source
12. Workforce					
OFD 5		12.1. Sustainable consultant workforce - Vascular surgeons (aspire to 1 per 100,000 population) - Interventional radiologists (aspire to 1 per 64,000 population)	≥ 1 in 8 on call for networks covering ≥ 1 million people	≥ 1 in 6 on call	Provider
OFD 5	Safe Effective Well led	12.2. Sustainable vascular nurse specialist workforce - 2.0 WTE at arterial centre and 1.0 WTE per network hospital	-	3.0 WTE	Provider
OFD 5		12.3. Sustainable clinical vascular scientist workforce - 3.0 WTE at arterial centre (or equivalent staff)	-	3.0 WTE	Provider
ODF 5		12.4. Evidence of positive staff well-being and provision of welfare support	-	-	Self-declared
ODF 5		12.5 Evidence of a safe, positive, working environment free from bullying, harassment, and/or conflict between staff	-	-	Self-declared Surveys
14. Education and Training					
-	-	14.1. Arterial centres meet the JCST quality indicators as training centre - Sufficient volumes of vascular cases for each trainee - Recognised by AAA screening programme as a treatment centre	-	-	Self-declared
-	-	14.2. Network provides staff development posts - Vascular specialist nurse and/or clinical vascular scientist - Post CCT (CCST in Ireland) clinical fellowships	-	-	Self-declared
15. Research and Innovation					
-	-	15.1. Vascular network recruits patients into clinical trials (per year, averaged over 3 years, including recruitment of patients to VERN studies)	-	≥ 50 p.a.	Self-declared
-	-	15.2. Vascular MDT members encouraged to publish research	-	-	Self-declared
ODF 5	Safe	15.3. New medical devices and techniques introduced according to a guiding framework to protect patient safety¹	-	-	Self-declared
17. Cardiovascular disease management					
OD 1,2	Effective	17.1. People who smoke can access to a smoking cessation service close to where they live (based in part on travel times)	>95%	>85%	Public health
OD 1,2	Effective	17.2. Statin therapy considered for people with CVD	CCG/ICS standard	CCG/ICS standard	NVR
OD 1,2	Effective	17.3. Screening for diabetes in patients with CLTI or leg or foot ulceration	CCG/ICS standard	CCG/ICS standard	Primary care

WTE, whole time equivalents

1. Royal College of Surgeons of England. Surgical innovation, new techniques and technologies (2019).

NHSEI VS QIF	CQC	Area of Practice	Achievable standard	Minimum standard	Data source
18. Peripheral arterial disease					
Intermittent claudication (IC)					
OFD 2 PAD QIF	Effective	18.1. People with intermittent claudication can access a supervised exercise programme close to where they live (dependent on transport access)	>90%	>75%	Public health Primary care
Chronic limb threatening ischaemia (CLTI)					
OFD 3 NWSCP	Safe Effective	18.2. Person with suspected CLTI referred to vascular service ≤ 1 working day	>90%	>80%	Primary care
NWSCP	Safe Effective	18.3. People with suspected CLTI are reviewed on the ward or in an outpatient clinic ≤2 working days (48 hours) from referral receipt	>90%	>80%	Provider
OFD 4	Safe Effective	18.4. Severity of limb threat in CLTI staged using the SVS WIFI score	-	-	Self-declaration
AMP QIF	Safe Effective	18.5. Medium time to inpatient review by diabetes consultant or nurse	5 days	7 days	Self-declaration
AMP QIF	Caring	18.6. Medium time to inpatient acute pain review by pain consultant or nurse	5 days	7 days	Self-declaration
PAD QIF	Safe Effective	18.7. Revascularisation procedure for patient with CLTI performed ≤5 days of hospital admission (bypass and/or angioplasty)	>90%	>80%	NVR
PAD QIF	Safe Effective	18.8. Revascularisation procedure for patient with CLTI performed ≤ 14 days for non-admitted patients (bypass and/or angioplasty)	>90%	>80%	NVR
OFD 3	Safe	18.9. Risk-adjusted in hospital mortality following lower limb bypass	-	≤ 7% ^{1,2}	NVR
OFD 3	Safe	18.10. Risk-adjusted in hospital mortality following lower limb angioplasty	-	≤ 4% ^{1,2}	NVR
OFD 3	Effective	18.11. Unplanned readmission to hospital ≤ 30 days after lower limb bypass	≤10% ¹	≤15% ¹	NVR
Lower limb amputation					
ODF 3,4 AMP QIF	Effective Caring	18.12. Arterial centre has a specialist amputee rehabilitation team (includes psychological support and rehabilitation medical or AHP consultant)	Rehabilitation consultant	AHP led team	Self-declaration
ODF 3,4 AMP QIF		18.13. Medium time from decision to perform amputation to surgery	2 days	5 days	Provider
OFD 5 AMP QIF	Safe Well led	18.14. Percentage of major amputation surgery performed 08:00 to 20:00	>85%	>75%	NVR
OFD 5 AMP QIF	Safe	18.15. Consultant vascular surgeon present in theatre for operation	-	>80%	NVR
OFD 2,3 AMP QIF	Effective	18.16. Ratio of below to above knee amputations	>1	1	NVR
OFD 3	Safe	18.17. Risk adjusted in hospital mortality following major amputation	-	<10% ^{1,3}	NVR
OFD 2	Safe Effective	18.18. Patients reviewed by the amputation rehabilitation MDT, and most referred to a Prosthetic and Amputee Rehabilitation Centre (PARC)	-	-	Self-declaration

1. Outcomes for a unit should be consistent with these standards, allowing for the volume of procedures on which the estimate was based.

2. The risk adjustment model accounted for age, sex, procedure type, ASA grade, Fontaine score, mode of admission, COVID, renal disease and chronic lung disease.

3. For elective cases, the rates were adjusted for age, ASA grade (1-3 vs 4-5), comorbid chronic renal disease, and COVID. For non-elective cases, the rates were further adjusted for level of amputation (below or above the knee).

NHSEI NWCSP NICE	CQC	Area of Practice	Achievable standard	Minimum standard	Data source
19. Diabetic foot disease					
ODF 2,3,4 NWCSP	Safe Effective	19.1 Vascular network population covered by diabetic foot protection teams	–	–	Primary care
ODF 2,3,4 NWCSP	Safe Effective	19.2 Vascular network population has access to a diabetic foot multi-disciplinary foot care service in all network hospitals	–	–	Provider
ODF 2,3,4 NWCSP	Safe Effective	19.3. People with active diabetic foot disease referred to the diabetic foot multidisciplinary foot care service ≤ 1 working day	>95%	>75%	Primary care
ODF 2,3,4 NWCSP	Safe Effective	19.4. Inpatients referred with active diabetic foot disease reviewed either on the ward on in a dedicated foot clinic ≤ 2 working days (48 hours)	>95%	>75%	Provider
ODF 2,4 NICE	Safe Effective	19.5. Vascular specialist attends diabetic foot MDT clinics (as proportion of diabetic foot MDT clinics across network sites)	>75%	>65%	Provider
20. Venous disease					
ODF 2,3,4 NWCSP	Safe Effective	20.1 Non-healing leg wounds, including venous ulceration, assessed ≤ 14 days of presentation (including assessment of arterial supply)	CCG/ICS standard	CCG/ICS standard	Primary care
ODF 2,4 NWCSP	Effective Caring	20.2. If a leg ulcer remains unhealed ≥ 12 weeks, a reassessment is undertaken and the need for referral to specialist service considered	CCG/ICS standard	CCG/ICS standard	Primary care
ODF 2 CG168	Effective Caring	20.3. Superficial venous reflux assessment and treatment commissioned for symptomatic varicose veins (ulcer, bleed and/or episode of SVT)	–	–	Primary care
ODF 3,4 CG168	Effective Caring	20.4. People with a leg ulcer, varicose vein bleed and/or SVT assessed clinically and with non-invasive imaging ≤ 2 weeks following referral receipt	>85%	>75%	Provider
22. Carotid disease					
ODF 3	Safe Effective	22.1. People presenting with suspected stroke or TIA referred to the multi-disciplinary stroke service ≤ 1 working day	>95%	>75%	Primary care
ODF 1 NSS	Safe Effective	22.2 Percentage of people receiving carotid endarterectomy (CEA) ≤ 2 weeks of symptoms (NB: standard is from symptom onset not referral receipt)	≥70%	≥50%	NVR
ODF 4	Effective	22.3. Median length of stay for CEA	≤2 days	≤3 days	NVR
ODF 3	Effective	22.4. Unplanned readmission to hospital ≤ 30 days after CEA	≤10% ¹	≤15% ¹	NVR
ODF 3	Safe	22.5. Risk-adjusted stroke and/or death rate at ≤30 days following CEA	≤2% ^{1,2}	≤3% ^{1,2}	NVR

1. Outcomes for a unit should be consistent with these standards, allowing for the volume of procedures on which the estimate was based.
2. The risk adjustment model accounted for age, gender, ASA grade, pre-op Rankin score, NHS England Covid-19 admission rates, diabetes, and creatinine.

NHSEI NAAASP	CQC	Area of Practice	Achievable standard	Minimum standard	Data source
23. Aortic disease					
OFD 1,5 NAAASP	Safe Effective	23.1. Service meets the standards of the NHS AAA screening programmes for assessment and treatment of people with screening detected AAA	-	-	Self-declaration
ODF 1	Safe Well led	23.2 Education programme regarding CT angiogram to confirm or exclude the diagnosis of acute aortic syndrome in network emergency departments	-	-	Self-declaration
ODF 1	Safe Well led	23.3. List of patients under aortic surveillance, kept and updated annually: Small AAA, post endovascular intervention and aortic dissection	-	-	Self-declaration
ODF 1,4	Safe	23.4. People identified as having an AAA measuring ≥ 5.5cm have been referred to the vascular service ≤ 1 working day	$>85\%$	$>75\%$	Provider
ODF 1,4	Safe Effective	23.5. Percentage of people with AAA of maximum diameter ≥ 5.5cm assessment by the vascular service ≤ 2 weeks	$\geq 90\%$	$\geq 80\%$	NVR
ODF 1	Safe	23.6. Percentage of men aged ≥ 70 years and women with ruptured AAA operated using EVAR as proportion of all rAAA repairs	-	$\geq 25\%$	NVR
OFD 1,3,5	Safe	23.7. Regional aortic centre performs adequate volumes of complex surgery - Population size (total population across vascular networks covered) - Open thoracic and thoraco-abdominal aortic repairs (TAA/TAAA) - Complex endovascular aortic repairs (FEVAR/BEVAR/Chimney) - Thoracic aortic stent graft (TEVAR)	- - - -	> 2 million > 5 p.a. >35 p.a. >10 p.a.	NVR
NAAASP OFD 1	Safe	23.8. Percentage of people (screened and unscreened) with AAA deemed fit for intervention operated on ≤ 8 weeks of referral receipt ¹	$\geq 80\%$	$\geq 60\%$	NVR
NAAASP ODF 1	Safe	23.9. People with AAA deemed fit for intervention operated on ≥ 12 weeks of reaching threshold (≥ 5.5 cm) discussed at morbidity and mortality meeting ¹	-	-	Self-declaration
OFD 4	Effective	23.10. Median length of stay for planned EVAR	≤ 1 days	≤ 2 days	NVR
OFD 4	Effective	23.11. Median length of stay for planned open AAA repair	≤ 7 days	≤ 10 days	NVR
ODF 1	Safe	23.12. Risk adjusted in hospital mortality rate following intact AAA repair	$\leq 3.5\%$ ^{2,3}	$\leq 6\%$ ^{2,3}	NVR
ODF 3	Effective	23.13. Unplanned readmission to hospital ≤ 30 days after intact AAA repair	$\leq 10\%$ ²	$\leq 15\%$ ²	NVR
ODF 1	Safe	23.14. Risk adjusted in hospital mortality rate following TEVAR	-	$\leq 8\%$ ²	NVR
ODF 1	Safe	23.15 Risk adjusted in hospital mortality rate following complex endovascular aortic stent graft (FEVAR, BEVAR or 'Chimney' but excluding IBD/IBE)	-	$\leq 5\%$ ²	NVR

1. Unless treatment deferred for medical optimisation, prehabilitation, or manufacture of a custom aortic stent graft.

2. Outcomes for a unit should be consistent with these standards, allowing for the volume of procedures on which the estimate was based.

3. The risk adjustment model accounted for gender, cardiac disease, aortic diameter, stroke as a comorbidity, and NHS England COVID-19 admission rates.

NHSEI	CQC	Area of Practice	Achievable standard	Minimum standard	Data source
24. Acute ischaemia					
ODF 1	Safe Well led	24.1. CT angiogram performed to help confirm or exclude the diagnosis of acute mesenteric ischaemia in network emergency departments	-	-	Provider
ODF 5	Safe Effective	24.2. Acute limb ischaemia severity staged using Rutherford classification	-	-	Self-declared
25. Haemodialysis access					
ODF 4	Caring	25.1. People who attend a patient education session prior to AVF	100%	>90%	Renal
-	Effective	25.2. Primary AVF performed under local or regional anaesthesia	>85%	>75%	Provider
-	Safe	25.3. AVF checked prior to first use	100%	>95%	Provider
ODF 2	Effective	25.4. Known to nephrology for > 4 months and start dialysis with AVF	>75%	>65%	Renal
ODF 2	Effective	25.5. Proportion of all dialysis patients with functioning AVF	>95%	>85%	Renal
26. Vascular trauma					
ODF 1	Safe	26.1. MTN policy for major haemorrhage disseminated to on call vascular surgeons and interventional radiologists regularly treating trauma patients	Within 2 years	Within 5 years	Self-declared
27. Specialist vascular practice					
ODF 5	Safe Effective	27.1. Care provision by a specialist MDT with all cases discussed at MDM (this may mean referral to another vascular network)	-	-	Self-declared
28. Assisting other specialities					
ODF 5	Safe	28.1. Network cover arrangement in place for vascular surgery to support transcatheter aortic valve implantation service (if performed within the network)	-	-	Self-declared
ODF 5	Safe	28.1. Vascular surgeon present for revision anterior spinal surgery cases (if performed within the network)	-	-	Self-declared

Recommendations for development of future vascular KPIs

The VS recognises that early mortality can be a poor discriminator of safety, quality, and effectiveness once mortality rates for vascular procedures are consistently low. We recommend that people undergoing revascularisation for CLTI (angioplasty or bypass), a major lower limb amputation, or intact AAA repair have their outcomes monitored to **one year**, and their outcomes reported at that time point:

NHSEI VS QIF	CQC	Area of Practice
Important outcomes not currently collected, and needing standards defining		
OFD 3	Effective	Amputation free survival at 1 year following revascularisation for CLTI
OFD 1	Effective	Survival at 1 year following major lower limb amputation (when amputation for ALI, CLTI, or a complication of diabetes)
OFD 3	Effective	Survival with aneurysm exclusion at 1 year after intact AAA repair (open or endovascular, including complex endovascular repair of juxta-renal AAA)
OFD 3	Effective	Unplanned reinterventions at 1 year in people treated for aortic disease with medical devices

The VS supports improved monitoring of variation in vascular health care provision. This data often only becomes meaningful once it includes the collection of data on **people who do not have surgery** (data not currently included in the National Vascular Registry):

NHSEI VS QIF	CQC	Area of Practice
Important outcomes not currently collected, and needing standards defining		
OFD 3	Effective	Ratio of angioplasty, lower limb bypass, major amputation, and conservative management (palliation), for CLTI
OFD 3	Effective	Ratio of carotid endarterectomy (with medial therapy) and medical therapy alone, for symptomatic carotid artery stenosis
OFD 1	Effective	Ratio of open, endovascular, complex endovascular, and no repair, for intact AAA
OFD 1	Effective	Ratio of repair and palliation, for ruptured AAA

The VS recognises that work is needed to monitor patient experience of vascular care. This should include development of vascular procedure specific **patient outcome reported measures (PROMs)** for those procedures not currently quality assessed (see [section 20](#) Venous disease and [section 27](#) Specialist vascular practice).

Vascular services need to develop the frameworks needed to obtain the 'patient voice':

NHSEI VS QIF	CQC	Area of Practice
Important outcomes not currently collected, and needing standards defining		
	Caring Effective	Percentage of patients who say they were involved in choosing their treatment
	Caring Effective	Percentage of patients say they have been asked about improving local vascular services

The VS finally recognises that the outcomes for people presenting with **acute ischaemia** are incompletely captured within the current NVR dataset. This is an important area of 'time critical' vascular practice with significant impact on patients (see [section 24](#) Acute ischaemia). Studies are needed to determine **time to revascularisation** in acute lower limb ischaemia (open, endovascular, or combined 'hybrid' procedures) and the in-hospital amputation free survival for people revascularized for Rutherford grade II acute lower limb ischaemia to inform the development of future KPIs.

The Vascular Societies of Great Britain and Ireland

British Association of Chartered Physiotherapists in Amputee Rehabilitation

British Society of Endovascular Therapy

British Society of Interventional Radiology

The Society for Vascular Nurses

The Society for Vascular Technology

Vascular Anaesthesia Society of Great Britain and Ireland

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