The Provision of Services For Patients with **Vascular Disease 2015**

VASCULAR SOCIETY
OF GREAT BRITAIN AND IRELAND

"High quality vascular care is best delivered in the UK by integrated vascular networks."

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1. Executive statement

1.1. The Vascular Society of Great Britain and Ireland is actively engaged in providing patients with vascular disease the best possible world-class care. The clinical vascular service should be patient focussed and configured to deliver the best possible outcomes. For elective and emergency vascular interventions it is important that the lowest possible morbidity and mortality rates are achieved. Patients should not be denied timely access to effective interventions due to poorly organised networks and referral pathways. The recommendations in this document give detailed guidance relating to all aspects of service organization and structure. The aim is to assist commissioners, clinicians and service providers to deliver the best possible care for their vascular patients.

1.2. The current Vascular Society advice, based on sound clinical evidence, is that high quality vascular care in the UK is best delivered with the establishment of integrated vascular networks. Such networks should decide upon a single hospital which will provide arterial surgery and complex endovascular interventions. The other hospitals in the network need to continue to provide the following clinical support:- vascular clinics; diagnostics; interventions such as renal access and varicose vein procedures; review of in-patient vascular referrals; and rehabilitation. Day-case (23-hour stay) peripheral angioplasty and stenting can also be performed at these local sites. This provides the patient with direct local access to the vascular service. The network will function best for the patient when travel to the arterial centre is only for specific arterial and complex endovascular interventions. The pre- and post- procedure care related to these interventions should be delivered whenever possible at the local non-arterial centre.

1.3. Concentrating arterial surgery and more complex endovascular interventions in one arterial centre has a number of benefits. Evidence shows that clinical outcomes are improved with increasing volumes of procedures. Sustainable on-call rotas can be achieved and effective multi-professional training is facilitated. Lack of exposure to sufficient numbers of training opportunities is the biggest problem facing current trainees. This problem is perpetuated when the training opportunities are distributed around a number of providers performing small numbers of cases in a regional network. Finally there are significant economic benefits to be gained by avoiding the replication of expensive technology and staff in hospitals throughout the network.

1.4. The high volume arterial hospital for the network should provide the following facilities:

a) A 24/7 consultant on-call rota for vascular emergencies of 1:6 or greater, covered by a combination of vascular surgeons and interventional radiologists to ensure adequate care.
b) A 24/7 critical care facility with ability to undertake mechanical ventilation and renal support and with 24/7 on-site anaesthetic cover.
c) Wards for dedicated vascular patients should be available.
d) At least one endovascular theatre or theatre specification endovascular suite is required, preferably with high quality imaging, advanced applications, and a dedicated X-ray table. (MHRA guidance)
e) A minimum number of 60 AAA and 40 carotid procedures (elective and emergency) are undertaken per annum. It is recommended that hospitals performing less cases than this, averaged over a 3 year period, should not continue to offer these procedures. Commissioners should monitor these numbers in the round.
f) The population covered by the network should be sufficient to generate the required volume of procedures at the arterial centre. A minimum of 800,000 is usually required for this.
g) An on-site vascular laboratory should be available.
h) Hospitals, vascular surgeons and interventional radiologists should submit cases to the National Vascular Registry (NVR) and publish their outcomes in line with the National HQIP programme. Actions should be taken to ensure all outcomes are satisfactory.
i) Vascular surgeons should undertake regular review of their practice and outcomes (morbidity and mortality / governance meetings).

1.5. Network care requires well organised, co-ordinated working between all units. When planning and organising a new vascular network, the full patient pathway from primary care through to central intervention and return for rehabilitation needs to be clear. Practical and functional emergency and elective pathways should be developed. Emergency transfer arrangements need to be robust. These can follow trauma network principles and national published guidance for ruptured aneurysms.

1.6. The surgical clinical commitments across the network should be shared between the vascular consultants as much as possible, with most having sessions at both the arterial and non-arterial centres. Consideration should be given to other health care professionals involved in vascular care (interventional radiologists, specialist nurses, podiatrists, scientists) working in a similar cross-site manner. As networks develop, manpower planning and training will be increasingly important to deliver the correct numbers of these skilled professionals to maintain the service.

1.7. Many patients with vascular disease are elderly with a number of associated co-morbidities. A multi-disciplinary multi-professional approach to their care is required. Increasingly, input from other specialists such as diabetes, stroke and elderly care will be central to providing the best care in all units of the network.

1.8. Less invasive treatment options can be advantageous and endovascular technology is constantly evolving to provide new treatment options. For a high quality service vascular surgeons and interventional vascular radiologists need to collaborate and lead effective teams in order to provide the necessary range of interventions on a 24/7 basis.

1.9. In some units complex endovascular procedures are performed by appropriately trained endovascular surgeons while in other centres surgeons and interventional radiologists work together for certain procedures such as EVAR. Providing the arterial centre has appropriately trained clinicians and has satisfactory audited outcomes that meet national guidelines, endovascular interventions may be performed by vascular surgeons or interventional radiologists.

1.10. There is currently a particular shortage of practitioners trained to deliver endovascular therapies out of normal working hours. Collaborative, network wide, on call rotas combining interventional vascular radiologists and endovascular trained surgeons are potential solutions to this problem that need to be developed further.

1.11. The service described above requires good leadership, governance, management and administrative support. Clinical and governance lead roles should exist with responsibility across the network. The clinical pathways in place should be documented and audited. Facilities and time in job plans for regular MDT meetings and, if required, travel across the network are required. Submission of data to national registries and network co-ordination needs administrative support.

1.12. In summary, the Vascular Society believes that every patient has the right to consult with a vascular surgeon close to their local hospital, but they may have to travel to obtain access to more complex diagnostic and interventional facilities. Only in this way can equality of access and the patients' desire for a local service be delivered alongside the best possible elective and emergency outcomes for individual patients.

2. Introduction

The Current Service and Future Issues

2.1. This document sets out the principles by which a 24/7 high quality, consultant led vascular service might best deliver optimal patient care. The document is intended to assist those responsible for the provision and resourcing of health care, as well as for commissioners of the service. The background highlights the main conditions presenting to the vascular service and the issues involved in their management. Further sections outline the personnel involved in the vascular service, the facilities required, organisation of networks, training and governance.

2.2. The current Vascular Society recommendation is that high quality vascular care in the UK is best delivered with vascular networks. The details of how vascular networks should operate to optimise local assessment, diagnosis and rehabilitation of patients in non-arterial centres - whilst also delivering high volume interventions at arterial centres - is described. The goal is a service which balances the needs of patient access with the provision of comprehensive, safe vascular care and intervention.

2.3. Both arterial and venous diseases are common in the community and their incidence and severity increase with age. The core activities of the vascular surgeon include:

a) Preventing death from aortic aneurysmal disease and dissections
b) Preventing stroke due to carotid artery disease
c) Preventing leg amputation due to peripheral arterial disease
d) Symptom relief from peripheral arterial and venous disease
e) Healing venous leg ulceration
f) Promoting cardiovascular health
g) Improving quality of life in patients with vascular disease
h) Assisting colleagues from other specialties with the avoidance and control of vascular bleeding
i) Assisting colleagues in the management of the vascular complications of diabetes and renal disease
j) Providing a renal access service for patients requiring haemodialysis.

2.4. A number of less common conditions that adversely affect quality of life also fall within the remit of the vascular surgeon. These include thoracic outlet syndrome, vascular malformations, hyperhidrosis and lymphatic disorders. The vascular specialist team has access to both interventional and medical therapies that may alleviate the symptoms and complications of these disorders.

2.5. The age of the average vascular patient is increasing with more associated co-morbidities. There is now more emphasis on the rigorous control of vascular risk factors to improve prognosis and outcomes. For our patients this is led by the vascular surgeon but with the support of an increasing number of related medical, nursing and rehabilitation specialists. There are close links with cardiac surgery, cardiology, diabetology, care of the elderly, stroke services, nephrology and transplantation. The Vascular Nurse Specialist role is increasingly important when co-ordinating care across networks. Efficient one-stop clinic diagnostics and vital post- procedure surveillance rely on input from Vascular Scientists.

2.6. Many vascular problems can now be treated by endovascular methods in both the elective and emergency settings. These vascular interventions are often performed in teams with close working relationships between surgeons, anaesthetists and interventional vascular radiologists delivering world-class results. In such units, surgical and IR trainees can gain vital experience of advanced vascular interventional techniques. The vascular patient will increasingly benefit from expert care delivered by broadly trained vascular surgeons with clinical, endovascular and surgical skills.

2.7. As many as 50% of patients with vascular disease present urgently or as an emergency. The delivery of the vascular service on a 24/7 basis is therefore a central challenge. Sustainable on-call rotas are required. A minimum of six specialists on a 1 in 6 rota is now the accepted basis for such sustainable on call rotas. If there is a move to 7-day working, a minimum of ten consultants may be required.

2.8. Outcomes following high-risk vascular interventions are better when they are performed by teams with high volumes. The Vascular Society reported outcomes after elective infra-renal AAA repair in 2012 as part of its quality improvement programme.[1] Analysis of unit volume in quartiles from the low volume units (mean of ten cases per year) through to the high volume units (150 repairs per year) showed a consistent reduction in mortality across the quartiles from 4.4% to 1.9%. Previous analysis of HES data reported similar findings.[2] There is a clear need to move towards higher volume units.

2.9. In the AAA screening programme, aneurysms requiring treatment are referred to arterial centres in a vascular network serving a minimum population of 800,000. This has therefore become the recommended minimum size for all arterial centres. Units of this size should perform a minimum of 60 AAA procedures and 40 carotid endarterectomies, elective and emergency, per year on average. The Vascular Society recognises that the centralisation of services required to meet this level of population can be difficult. Population density, geography and patient access all need consideration. In most regions however, the benefits of centralisation to large units will outweigh the difficulties related to local access and travel.

2.10. Regular team exposure to vascular procedures develops expertise in managing the condition and the patient. Minimising adverse outcomes is the most cost- effective way to deliver the service. Sometimes, withholding intervention (best medical therapy/palliative care) is the most appropriate management option. The support provided in large units with multi-disciplinary working assists with some of these difficult management decisions.

2.11. The provision of an effective vascular service is relatively expensive. Vascular units have high bed occupancies, particularly when repatriation in the network is delayed. The surgery is technically challenging with significant demands on both theatre time and critical care. Readmission rates due to disease progression are significant. Advances in endovascular treatment may offset some of this expense, but many of these procedures are also technically demanding, and time-consuming and require sophisticated and often expensive facilities and disposables. Replicating these services in every hospital is not cost effective.

2.12. The non-arterial centres in the vascular network provide local assessment, diagnosis and less complex interventions. This local vascular service is crucial to the success of the network. The non-arterial centres require support and investment to maintain a vascular presence and service via a well organised and co-ordinated visiting service. Repatriation to the non-arterial centre for recovery and rehabilitation locally is a key part of the care pathway.

2.13. This update highlights the requirements of the non-arterial centre in the network. Lack of well supported non-arterial centres leads to depleted local care, patients travelling long distances, and arterial centres becoming overwhelmed and unable to deliver safe, high quality care.

2.14. Each vascular surgeon should have knowledge of their own outcomes; this is an important component of clinical governance and is mandatory for individual revalidation and commissioning of vascular services. The National Vascular Registry (NVR) is the focus of data collection with respect to index vascular and endovascular procedures. Administrative support with data clerks for data entry and reports is essential. Results should be available in a way that is transparent and accountable and the specialist societies should provide back-up and support for any service with evidence of a problem.

2.15. High quality research into methods of preventing and treating vascular disease is needed. The benefits of this are improved outcomes, identifying optimum treatments and evaluating new therapies. It is important for the specialty to continue to make the case for future research funding, given the ongoing evidence of high morbidity and mortality in vascular patients. Vascular surgeons should be encouraged to contribute to collaborative research that may help define future management strategies for vascular diseases. The Society actively encourages surgical research and supports a fundraising charity - the Circulation Foundation - and a grant giving body, administered by its Research Committee.

3. Background

The Vascular Patient and Vascular Conditions

3.1. Vascular services deal with disorders of the arteries, veins and lymphatics.

3.2. The Vascular patient will suffer from at least one of these conditions. The vascular service deals with all atherosclerotic arterial disease outside of the heart and brain. The national service specification for vascular services includes the treatment of the following arterial conditions: lower limb ischaemia; abdominal aortic aneurysm; stroke prevention (carotid artery intervention); venous access for haemodialysis; suprarenal and thoraco-abdominal aneurysms; thoracic aortic aneurysms; aortic dissections; mesenteric artery disease; renovascular disease; arterial/graft infections; vascular trauma; upper limb vascular occlusions; vascular malformations and carotid body tumours. In addition some less common arterial conditions not related to atherosclerosis, including arteritis and compression syndromes, may require input from the vascular service.

3.3. Venous disease due to valvular insufficiency and thrombosis is an expanding part of the vascular workload with the development of more effective treatments for both superficial and deep venous insufficiency. Venous disease commonly causes lower limb swelling and ulceration. Lymphoedema leads to chronic limb swelling, pain and reduced mobility.

Cardiovascular Risk

3.4. Specific regional arterial problems present to the vascular service. When assessing and treating the vascular patient however, they should be considered within the broad spectrum of cardiovascular disease (CVD). The underlying pathology is atherosclerosis (thickening, narrowing and occlusion of arteries) which can affect many parts of the arterial tree. Although a patient may present with a particular set of symptoms, it is important their treatment considers their CVD in general. This will include coronary artery disease, stroke, hypertension, hypercholesterolaemia, diabetes, chronic kidney disease, peripheral arterial disease, and vascular dementia. Lifestyle advice (stop smoking, lose weight, and take regular exercise), anti-platelet and lipid-lowering therapy, diabetes screening and blood pressure control are all required. There is clear evidence that this secondary prevention plays a major role in reducing the morbidity and mortality of atherosclerosis. This is consistent with the National Cardiovascular Disease Outcomes Strategy published in 2013.[3]

3.5. The prevalence of CVD is set to rise, related to an increasingly elderly population with increasing levels of obesity and diabetes. By 2022 the number or people at more than a 20% risk of CVD could rise from 3.5 million in 2010 to 4.2 million.[3] Vascular disease is the major cause of morbidity in diabetes and the risks of disease progression are higher. Over 40% of patients admitted under the care of the vascular team have diabetes.

3.6. Smoking is a major cause of vascular disease and over 80% of vascular patients are current or ex- smokers. Although there was a rapid decline in the proportion of smokers during the 1980s, when 39% of adults smoked, this decline then levelled off in both men and women aged less than 65 years. Despite DoH initiatives such as smoking cessation clinics in primary and secondary care, plus the ban on smoking in public areas, the further fall in smoking rates has been small, from 26% in 2003 to 19% in 2013.[4] Smokers are at greater risk of complications from vascular interventions because of cardiac and respiratory co-morbidity; in addition, the longer-term success of vascular intervention is reduced in patients who continue to smoke.

Peripheral Arterial Disease

3.7. Peripheral arterial disease (PAD) commonly affects the leg arteries with 20% of people over 60 years of age estimated to suffer with PAD. The symptoms are of cramping in the legs on walking, intermittent claudication (4% of patients > 60 yrs. of age) and 20% of these will deteriorate and develop critical limb ischaemia (CLI). NICE published their clinical guideline for PAD in 2012.[5]

3.8. This NICE guidance made a number of recommendations. Information should be made available to patients explaining the condition, the risk factors, importance of life style changes and risk factor medication, treatment options, pain control and how to get support for depression and anxiety. Secondary prevention was again highlighted.

3.9. Once the diagnosis of PAD is confirmed, NICE advocate offering a supervised exercise programme to all patients with IC. There is evidence that the provision of this service varies across the country. NICE have identified this as a high priority area for quality improvement.[6]

3.10. The incidence of CLI in the UK is estimated at between 500-1000 patients per million population. A vascular unit serving a population of 800,000 will therefore expect to see around 350-400 patients with CLI per year. Patients with CLI are often referred urgently or as emergencies requiring admission and vascular intervention in an attempt to avoid amputation.

3.11. The number of vascular interventions for PAD performed in English trusts between 2009 and 2013 was published in the National Vascular Registry (NVR) annual progress report (Table 1).[7] The rate of endovascular procedures has increased 5% over this period, the rates of surgery are stable.

Revascularisation

Endovascular				Bypass		
Year	No. of procs	% bilateral	% elective	No. of procs	% bilateral	% elective
2009	16,345	9.7	76.6	4,337	6.7	65.0
2010	16,500	9.6	76.8	4,581	7.2	65.0
2011	16,988	9.4	77.0	4,396	6.4	66.8
2012	17,214	8.3	75.7	4,248	7.1	66.3
2013	17,179	7.8	74.0	4,314	6.6	64.7

Table 1
Number of lower limb procedures (emergency and elective) for PAD performed in English NHS trusts between 2009 and 2013 (HES data).

3.12. Limb salvage interventions aim to avoid the large community healthcare costs of amputation which are greatly in excess of those following successful revascularisation.[8] Many patients can no longer cope independently in the community after amputation and may require nursing home care.

3.13. It is likely that the great increase in the number of patients with diabetes over the next decade will have the biggest impact on vascular services. Many of these patients present as an emergency, and are at high risk of amputation. Prompt treatment of the infected diabetic foot and revascularisation, if required, can minimise the risk of subsequent amputation. (see section 6.37, p25)

3.14. Acute limb ischaemia (ALI) occurs when the circulation is suddenly reduced by an embolus (a clot, often from the heart) or thrombosis within the limb arteries. The pathology is therefore different from the gradual onset of limb ischaemia due to atherosclerosis seen in PAD. ALI presents as an emergency. It is more common in the elderly, and the rate of hospital admissions for ALI has risen significantly; 60.3/100,000 population in 1999, 94.3/100,000 in 2011.[9] In some cases surgery to remove the clot is required, or the clot can be “dissolved” by thrombolysis, an endovascular approach. Despite the significant rise in the number of admissions for ALI in England, the number of interventions has not risen. More medical management may account for this. Of the interventions performed, endovascular procedures account for just 17% of the total.

Amputation

3.15. In 2010 the Vascular Society produced a Quality Improvement Framework (QIF) in an attempt to improve the care and outcomes for patients undergoing major lower limb amputation. There was an aspiration to improve patient information, pain control, rehabilitation, discharge planning and – above all – reduce high operative mortality rates. This was followed by a NCEPOD review of patients undergoing amputation in 2012-13. This reported in 2014.[10] There remains room for improvement with many aspects of the QIF not being implemented in practice.

3.16. The specific challenges identified in the NCEPOD report into amputations were: lack of clinical pathways of care; lack of early support from diabetes and acute medicine for medical optimisation; need for improved rehabilitation planning coincident with the decision to amputate; more procedures to be undertaken on elective lists during working hours; no delays beyond 48hrs from the decision to operate; and for emergency admissions to be reviewed by a Vascular Surgeon within 12 hours.

3.17. A key recommendation of the NCEPOD report was that a best practice clinical care pathway, supporting the aims of the QIF, should be developed. Work has begun to develop clinical benchmarks which can be audited via the NVR to monitor the care of patients undergoing major amputation. These benchmarks will cover the principle areas of an updated QIF to be published in late 2015. Future annual national reporting of these amputation outcomes will be used to drive up the quality of care for patients undergoing amputation.

Abdominal Aortic Aneurysm

3.18. An abdominal aortic aneurysm (AAA) occurs when the wall of the abdominal aorta weakens and stretches, caused by atherosclerotic degeneration. AAA are most common in elderly men. The more the aorta dilates, the weaker it gets, increasing the risk of rupture. Rupture of an aneurysm into the abdominal cavity is fatal if untreated. Emergency open or endovascular repair is the only possible treatment. The in-hospital mortality remains high at 30-40%, total overall mortality (including prehospital deaths) is about 85%. A national screening programme is now in place in order to detect AAA's prior to rupture.

Screening for AAA

3.19. The NHS AAA Screening Programme is based on the MASS randomised trial.[11] The service specification is available on-line.[12] Men aged 65 all receive a written invitation to a single ultrasound scan. Men with a small or medium AAA (3-5.4cm diameter) are offered regular ultrasound surveillance. Men with a large AAA, or expansion >1cm in 1 year, are referred to an accredited vascular service for investigation and consideration of treatment. There are access standards for initial outpatient appointment (2 weeks) and intervention (8 weeks from referral) that are monitored as part of the NAAASP QA process.

3.20. The introduction of NAAASP has required the formation of local screening units based on a minimum population of 800,000.[13] Men with a screen-detected AAA may only be referred to a vascular service that meets the VSGBI Quality Improvement Framework standards, and have been through NAAASP pre-implementation quality assurance. Local screening programmes are managed by the national screening team, but each service has a programme board, usually chaired by a representative of the local specialist commissioning team.

3.21. Population screening for AAA in men by ultrasound scanning has been shown to reduce disease- specific mortality by about 50% in a meta-analysis of the existing randomised trials.[14] It remains cost effective at current prevalence rates, despite the increasing cost of interventions. Since April 2013, all men in England aged 65 are offered an invitation for ultrasound screening for AAA. Similar screening programmes are also operating in Wales, Scotland and Northern Ireland.

AAA Repair

3.22. Elective repair of AAA is one of the main functions of a vascular unit. The volume of elective procedures will increase as the NAAASP comes on stream, whilst the number of operations for rupture should gradually decline. Although some elderly patients will not be suitable for operative repair, many are relatively fit and request intervention, particularly if suitable for endovascular repair.

3.23. Elective or emergency open surgery to repair an AAA is a major operation with a significant morbidity and mortality and requires adequate critical care facilities. There is no significant survival advantage to be gained from surgery to most aneurysms below 5.5 cm in diameter as the risk of rupture is less than the risk of open surgery.[15]

3.24. An alternative treatment in selected cases is endovascular aneurysm repair (EVAR) using a covered stent graft introduced from the groin, an operation that is less stressful for the patient. Not all patients have an aneurysm that is anatomically suitable for EVAR using current technology, but this is a fast moving field. The recent NVR progress report provides data on trends in procedure numbers. For elective AAA repair the proportion performed by EVAR in England has risen from 54% in 2009 to 66% in 2013.[7]

3.25. EVAR has not been shown to reduce overall mortality after 4 years compared with open repair in randomised trials. Nevertheless, there are short-term advantages in reduced early mortality, length of hospital stay and improved quality of life.[16] Issues of long-term durability and cost remain challenges. Current NICE recommendations are that endovascular repair is appropriate to offer to suitable patients.[17]

3.26. Endovascular repair is also emerging as a treatment for ruptured AAA. This is not yet recommended by NICE and the first UK randomised controlled trial (IMPROVE) showed no overall benefit for EVAR in ruptured AAA treatment.[18] One-year follow-up data has shown EVAR is associated with lower mortality in women, reduced costs, better quality of life and more patients discharged home. Further studies are required but, in selected cases, EVAR is likely to be the preferred option for ruptured AAA. Providing this service out of hours requires resources and significant organization.[19]

3.27. Thoracic aortic aneurysms can also be treated by EVAR. Open repair is associated with significantly higher morbidity and mortality. Isolated aneurysms of the descending thoracic aorta are technically easier to stent. When the ascending aorta and aortic arch are involved, a staged or combined procedure with cardiothoracic surgical input may be required. Endovascular techniques for stenting into the arch are being developed, however they are more complex.

Complex Endovascular Aortic Aneurysm Repair

3.28. In some cases the endovascular repair of an aortic aneurysm involves preservation of branch vessels with fenestrated and branched devices. In particular the renal and visceral branches may be involved in the aneurysmal disease. The great vessels from the aortic arch may also be preserved with similar endovascular technology. These cases are more complex than most infra-renal EVAR procedures. The NHS Clinical Commissioning Board published a policy on Complex endografts in 2013.[20]

3.29. The policy applies to the use of fenestrated and/or branched endovascular stent grafts, whether custom made, off the shelf, or modified at the time of operation. The recommendations focus on the careful selection of patients for these procedures in order to maximise cost effectiveness. Units providing this service should be experienced in these complex techniques and the recommended annual caseload is 24-30 cases. Incidence estimates suggest that these units will serve a population of 2.4 – 3 million. These arterial centres should therefore be highly specialised, taking tertiary referrals for this type of workload. Named endovascular surgeons and interventional radiologists should be identified as a team specializing in this type of work. The centre should have a MHRA compatible intervention suite / hybrid theatre or advanced plans to introduce such facilities (see section 5.19, p21). The policy makes provision for these centres 'hosting' visiting vascular teams from other units, with the aim of maintaining and disseminating the skills for these procedures. Should their use become more widespread then there would be scope, in the future, for more units to provide this service.

Carotid Artery Intervention

3.30. Stroke prevention is a priority for the Department of Health. A small number of patients who suffer a stroke will have had warning symptoms from a transient ischaemic attack (TIA) or temporary blindness (amaurosis fugax). These symptoms can be caused by embolization from a ruptured plaque in the carotid arteries. There is good evidence that patients with symptoms and a >50% stenosis have an increased risk of subsequent stroke. This excess risk can be reduced by carotid endarterectomy (CEA). The maximum benefit is seen in patients with 70-99% stenosis, where the number needed to treat (NNT) to prevent one stroke is about five.[21]

3.31. Recent research suggests that the risk of stroke is highest soon after the onset of symptoms and that the quicker CEA is done, the greater the reduction in the risk of subsequent stroke. NICE guidelines advocate surgery within 14 days of symptoms.[22] Meeting these timelines is a challenge for many units, requiring the development of new referral and diagnostic pathways, and close co-operation with stroke physicians and neurologists.[23] The time to surgery and the mortality and morbidity associated with CEA are all published as part of the national outcomes programme from HQIP using data from the NVR.

3.32. An alternative to CEA is carotid artery stenting (CAS), which does have potential advantages over carotid endarterectomy (no incision, no risk of cranial nerve injury). Randomised trials however have concluded that the 30-day stroke and death rates were significantly lower following CEA compared to CAS.[24]

3.33. Recommendations may change as the results of further trials become available, but at present CAS should normally be performed as suggested by NICE guidance.[25] The risk of stroke arising from technical complications during carotid stenting means that it should only be undertaken by those trained and experienced in this type of intervention. Centres performing high volumes of stenting with low audited procedural complications may continue to treat patients on an individual case basis.

3.34. Intervention for patients with asymptomatic carotid artery stenosis >75% is somewhat controversial. A small proportion of these patients are at significant risk of stroke and benefit from intervention, but identifying this small subgroup is difficult with current standard imaging modalities

3.35. Normal risk patients with an asymptomatic carotid stenosis should not currently undergo carotid stenting unless as part of a controlled trial. Data from on-going trials of asymptomatic patients are awaited.

Haemodialysis Access Intervention

3.36. Patients undergoing haemodialysis require a means of access to the circulation to allow the rapid withdrawal and return of blood so that it can pass through a dialysis machine at a rate of at least 300ml/min. This can be achieved using a double lumen central venous catheter in the short term, but long term catheter use is associated with increased infection, higher mortality and central venous stenosis or thrombosis. Central venous catheter use should be minimised. Formation of an arteriovenous fistula, preferably in the non- dominant arm, at least six months before the anticipated need for renal replacement therapy is the ideal.

3.37. Approximately 70 patients per million population start haemodialysis in the UK every year. These new access procedures plus revisions generate an annual workload of 100 –130 operations.

3.38. Most patients can be operated on under local anaesthesia and many of the operations can be performed as a day-case procedure. In addition, there is a need for up to 2 IR sessions per week per 100 patients on dialysis for preoperative imaging, postoperative surveillance and for percutaneous angioplasty or thrombectomy of failing or thrombosed AV fistulae and grafts.

3.39. At present, about two thirds of UK vascular access is provided by vascular surgeons and a third by transplant surgeons; the involvement of vascular surgeons is likely to increase as more peripheral dialysis units are opened outside transplant centres. There is a considerable under-provision of vascular access surgery in the UK, resulting in long waiting times for definitive vascular access and a much higher proportion of patients starting and continuing to dialyse on a central venous catheter compared with other European countries and Japan.

3.40. The Vascular Society recommends that patients receive vascular access surgery from any competent practitioner. In larger centres this may be a transplant service, but where none exists, or local skills demand it, vascular surgeons should be willing to provide this service. Surgeons providing vascular access need this included in their job plans, to ensure that the service is properly resourced. Dedicated operating list space needs to be provided to ensure that provision of this service is not squeezed by the demands of more immediately life-threatening vascular cases. Lists in non-arterial centres can be used for A-V fistula procedures. When there is a dialysis unit in a non-arterial centre, the level of input from the visiting vascular service should be increased in order to ensure adequate cover for the additional workload generated by access procedures.

3.41. Surgeons providing vascular access services should audit their performance to ensure that it meets acceptable standards.

Venous Disease

3.42. Although rarely a threat to limb or life, chronic venous disorders represent a significant component of the workload of a modern vascular unit. The expert assessment and treatment of patients with acute and chronic venous conditions should be considered a core service.

3.43. Varicose veins are one of the most common reasons for referral to a vascular service. Recent NICE guidance has stated that patients with symptomatic varicose veins should be offered intervention, in addition to patients with complicated venous disease.[26] This may result in an increase in numbers of patients referred and offered varicose vein treatments. In compliance with NICE recommendations, a vascular service should have ready access to colour duplex imaging as the first line investigation of venous disease. The vascular service should be able to offer a range of superficial venous interventions, including an endovenous thermal ablation procedure, ultrasound guided foam sclerotherapy and traditional surgery (including phlebectomies). Ideally, units should be able to offer concomitant endovenous thermal ablation and avulsions in appropriate patients.

3.44. In recent years, vascular surgical departments have become increasingly involved in the management of acute deep vein thrombosis (DVT), particularly ilio-femoral and upper limb DVT. Catheter directed or pharmaco-mechanical thrombolysis procedures are increasingly recognised as having a role in some patients to reduce post thrombotic syndrome severity.[27] These interventions should now be offered by departments with the necessary multidisciplinary skill mix and appropriate specialists. Close working between vascular surgery, haematology and acute medicine is now required to

deliver the best outcomes to patients.

3.45. Endovascular and open procedures for the management of chronic deep venous occlusive disease should only be offered by specialist centres with specialists trained in these complex procedures.

3.46. With an ageing and increasingly overweight population, the incidence of chronic venous ulceration is expected to increase significantly. Vascular units should manage these patients in an appropriate multidisciplinary setting, with the specific involvement of specialist nursing staff trained in the assessment and treatment of leg ulcers. Services should offer appropriate vascular assessment, be able to deliver compression therapy and provide timely assessment and endovenous ablation of superficial venous reflux.

Lymphatic Disorders

3.47. Patients with impairment of the lymphatic drainage develop chronic leg swelling (lymphoedema) and are at increased risk of infection in that limb. Most patients can be treated with a combination of massage and compression bandaging, but surgery is occasionally needed in severe cases. Appropriate conservative management from specially trained nurses is commonly available only in oncology centres, but often they will not accept external patient referrals unless their lymphatic obstruction is due to cancer. This continues to be an area of serious under-provision in the NHS and vascular specialists should develop local arrangements with their oncology colleagues for the effective management of patients with lymphoedema. Only a small number of patients develop such severe limb swelling that they require surgical treatment, which is appropriately provided only in a few specialist centres.

Other Conditions Requiring Vascular Care

3.48. Rarer conditions that require a vascular specialist include mesenteric artery disease, renovascular disease, arterial/graft infections, vascular trauma, upper limb vascular occlusions, vascular malformations and carotid body tumours. All can be successfully treated by surgeons and/or interventional radiologists with appropriate training/experience and in units with adequate back up.

3.49. Vascular specialists should be readily available to assist colleagues from other specialties in the event of unexpected vascular trauma. This may either be at the arterial centre or in a non-arterial hospital within the network. Protocols must be in place to ensure 24/7 availability of the vascular team for the immediate treatment of patients suffering iatrogenic vascular trauma. This will be more challenging when it occurs at a non-arterial site and arrangements should be in place for the transfer of vascular instruments and grafts when necessary (see section on the Non-Arterial Centre, p22).

3.50. Vascular surgeons may also undertake transthoracic endoscopic sympathectomy, a procedure that can alleviate symptoms of hyperhidrosis or severe peripheral ischaemia in the hands. They also perform thoracic outlet surgery to alleviate upper limb neurological symptoms, to prevent recurrent axillary vein thrombosis and to minimise the complications associated with occlusive and aneurysmal subclavian arterial disease.

4. The Multi-Professional Vascular Service

Vascular Surgeon, Anaesthetist, Interventional Radiologist, Radiographer, Scientist, Nurse Specialist, Podiatry, Physio/OT/Prosthetics.

The Vascular Consultant Surgeon

4.1. The Vascular Surgeon has the necessary clinical skills to provide care for patients with diseases of the arteries, veins and lymphatics. They have a sound knowledge of the relevant basic sciences and the roles of vascular medicine, vascular surgery and endovascular intervention in the treatment of vascular diseases. For non-invasive diagnosis they work closely with vascular scientists in the vascular laboratory utilizing haemodynamic assessments of vascular physiology and vascular ultrasound. They understand the role of a wide range of diagnostic imaging investigations that may be required to care for the patient.

4.2. The role of the vascular surgeon is evolving in response to changes in the way vascular diseases are managed. There is now more medical management of cardiovascular disease. Advising patients on the best treatment options (medical, endovascular or open surgery) requires more communication and decision making skills. Planning and performing EVAR procedures is now a common activity. Other endovascular procedures (peripheral arterial and venous) are increasing in number. Wound management for diabetic and venous leg ulcer patients is increasingly supervised by the vascular surgeon. Many vascular surgeons work in renal failure services, providing renal access surgery and, in some units, renal transplantation. The exact combination of specialist services provided will be determined by local requirements as well as the training and competencies of those providing it.

4.3. A workforce survey for Vascular Surgery in the UK was carried out in 2013. The report is available on the Vascular Society website.[28] The current estimate for the UK population ratio of vascular surgeons is 1 per 137,000 population. International provision is closer to 1 per 100,000. There are a number of upward pressures which suggest the UK ratio needs to move in this direction with more Consultants required in the future. Amongst these pressures are current overstretched job plans, the need to comply with working hours safety limits, rebalancing the workforce gender ratio (currently 92% male), dual consultant procedures, and the proposed move towards 7-day working. The implication of these projections is that current training numbers will need to rise in order to meet this future demand.

4.4. The survey highlighted current workforce differences by UK nation, with estimates suggesting a current under-provision of consultant Vascular Surgeons in Scotland, Wales and Northern Ireland.

4.5. Job Plans: (see Appendix 1, p35 for a job plan template for a consultant Vascular Surgeon). The weekly job plan for a vascular surgeon should be negotiated locally and should include sufficient outpatient clinics, all day operating lists, endovascular lists, day surgery, and renal access lists as required for the local service. Emergency work, either when on call or when dealing with unexpected urgent surgery, is onerous in vascular surgery and job plans should be designed locally to reflect the amount of on-call commitment expected. In addition, it is essential for multi- disciplinary team (MDT) meetings to be included in consultant job plans. The RCS England has a checklist for the approval of job descriptions which provides useful guidance.[29]

4.6. Elective work should not be programmed to coincide with emergency duties. These emergency duties should be scheduled as fixed commitments within the consultant's weekly job plan. The vascular surgeon needs to be supported by an appropriate team; this may involve a combination of junior doctors, nurse specialists, surgical care practitioners and specialty registrars. Provision of this support out of hours is a particular challenge outside of larger units, and is another driver for centralising arterial services within networks.

4.7. Sustainable on-call rotas are a fundamental consideration for the Vascular Surgical Consultant job plan. The workload is urgent in nature with a high level of out of hours work. The EWTR requires a maximum 48 hour working week. It is recommended that an optimal vascular service should comprise of at least six vascular surgeons for on-call assessment, management and open surgery of the emergency take. A rota with a similar number of endovascular surgeons and interventional vascular radiologists offering endovascular intervention is also required. The exact numbers will depend upon the population size. Where clinical services cover larger populations in excess of 1 million a 1 in 8 rota or larger may be required. Centralisation of services with a larger number of consultants on one site facilitates reliable surgeon of the week models to provide consultant delivered care for emergencies.

4.8. Where services are unable to accommodate such changes and provide appropriate levels of care, consideration should be given to increasing the number of vascular and endovascular surgeons, or merging with adjacent units to provide a large enough team to care safely for the patients.

4.9. For complex interventional procedures, teams comprising more than one specialist (in either vascular surgery, endovascular intervention, or both) working together are becoming routine. Such practice needs to be supported by NHS trusts seeking to provide improved care for their patients.

The Vascular Anaesthetist

4.10. There is evidence that the outcome after major arterial surgery is related to the caseload of both surgeons and anaesthetists. Anaesthesia for all patients undergoing major vascular surgery should therefore be provided by a consultant experienced in vascular anaesthesia.

4.11. Vascular anaesthesia is increasingly recognised as a sub-speciality within its own right and has its own specialist society, the Vascular Anaesthesia Society of Great Britain and Ireland (VASGBI). The central skills and knowledge required by vascular anaesthetists include risk-assessment and optimization of co-existent medical conditions in the high risk patient prior to major surgery. In the peri-operative period, knowledge of invasive cardiovascular monitoring, cardiac and vasoactive drugs, methods for organ protection, management of major haemorrhage and maintenance of normothermia are all required. Additional skills include spinal cord protection, visceral perfusion and one lung ventilation.

4.12. Vascular Anaesthetists should be involved in the decision making process for vascular patients. There should be mechanisms for them to contribute to MDT decision making, and facilities for pre-operative assessment with vascular anaesthetic input. There should be a nominated clinical lead for vascular anaesthesia to assist in unit dialogue between vascular surgeons, IR and other appropriate specialists. This helps to build teamwork which is central to achieving good outcomes.

4.13. Anaesthetists undertaking major vascular surgical cases should be supported by adequately trained assistants who work regularly in vascular theatres.

4.14. Emergency anaesthetic cover for vascular surgery should ideally be available from a vascular anaesthetist 24/7. However if this cover involves anaesthetists without regular sessions in vascular theatres, provision should be made for them to spend time in a supernumerary capacity with a consultant anaesthetist who has a regular vascular commitment.

4.15. Further details are available from the Royal College of Anaesthetists website.[30]

The Interventional Radiologist

4.16. Interventional radiologists are radiologists who have undergone additional specialist training in the practical elements of interventional procedures. Interventional Radiology (IR) procedures are minimally invasive, targeted treatments performed under imaging guidance. A range of procedures are performed in oncology, urology, gynaecology, GI and hepatic conditions as well as vascular disease. Diagnostic radiology remains a core element of IR. There are however additional clinical responsibilities on the interventional radiologist for pre-intervention assessment, consent and follow–up.

4.17. Interventional Vascular Radiologists and Vascular Surgeons have traditionally worked in collaboration to provide endovascular aneurysm repair and angioplasty and stenting for the treatment of peripheral and aortic vascular disease. With the acquisition of specialty status and the development of a new curriculum, trainee vascular surgeons are becoming trained in a range of endovascular techniques. It is likely that vascular patients will continue to require the expertise of vascular surgeons and interventional vascular radiologists, however both of these specialist groups should recognise and utilise the skills of their colleagues, and should have knowledge of the relative benefits of endovascular and surgical procedures for common vascular problems.

4.18. In some units, complex endovascular procedures are performed by appropriately trained endovascular surgeons while, in other centres, surgeons and interventional radiologists work as a team. Providing the arterial centre has appropriately trained clinicians and has satisfactory audited outcomes that meet national guidelines, endovascular interventions may be performed by vascular surgeons or interventional radiologists.

4.19. The VSGBI, RCR (Royal College of Radiologists) and BSIR recognise the changing roles of specialists in the provision of care to patients with vascular diseases. Their aspiration is to train specialists with the necessary clinical and team-working skills to provide comprehensive care for patients with vascular diseases

4.20. Regular MDT meetings underpin the planning of endovascular procedures. These should occur at least once a week. The decisions in these meetings should be recorded and follow established care pathways. Time for these meetings should be available in the working week, and recorded as direct clinical care in IR Job Plans.

4.21. Provision of emergency services places pressures on interventional vascular radiologists that are similar to those described above for vascular surgeons. Currently many hospitals do not have sufficient vascular interventional radiologists to provide a 24/7 emergency service. Collaborative clinical networks should apply to vascular radiology units, in a similar manner to those for vascular surgical units, for patients who require immediate vascular imaging or interventional treatment out of hours. Commissioners of vascular services should consider whether the rationalisation of vascular surgery to larger volume hospitals should include interventional radiologists, as well as surgeons, in order to address these manpower problems. Appropriately trained endovascular surgeons may also be able to contribute to this out of hours provision in some units.

Interventional / Vascular Radiographers

4.22. Interventional Radiographers possess skills in ensuring the best quality images are obtained with the minimum patient dose. They have detailed knowledge of the safe and appropriate use of ionizing radiation, interventional equipment and procedures.

4.23. Interventional Radiology Nurses possess the skills of a theatre / recovery nurse with a detailed knowledge of the equipment and procedures performed within IR.

4.24. Dedicated vascular radiographers and IR / theatre scrub nurses are required for elective and emergency endovascular procedures. A minimum requirement for patient safety is one member of staff providing direct scrubbed assistance who is experienced with the equipment. A Vascular Radiographer to assist with imaging and IR / theatre staff to assist with monitoring of the patient, depending on whether the procedure is performed under LA or GA with anaesthetic input.

The Vascular Scientist / Sonographer

4.25. Vascular scientists provide routine and emergency clinical services to vascular surgeons, other physicians and GP's. They are usually based in a Vascular Studies Lab / Unit (see section 5.5 p20). This is an essential part of the vascular service, providing the ability to diagnose and monitor peripheral arterial and venous disease of the lower limbs, the upper limbs, the abdomen and the neck, using ultrasound and other non-invasive techniques. These studies provide not just imaging but also haemodynamic information which can be especially useful for vascular diagnosis, decision making and management.

4.26. Vascular Scientists are Band 6 when in a training role and when fully qualified become Band 7. They clinically assess patients to determine the most appropriate diagnostic tests to perform, taking into account likely treatment options. A wide range of colour duplex ultrasound examinations are performed and the scientist has the sole responsibility for producing a full diagnostic report of the scan findings. This involves analysis of the haemodynamic imaging information obtained as the scan is performed. It is then communicated in a clear and concise report to the referring clinician, identifying any technical limitations and recommending when alternative imaging is required. The scan may need to be adapted or extended depending on observations and measurements made during the examination. The results are often reported to the patient before they leave the department. The Vascular Scientist is also expected to recognise conditions or act on results that require urgent medical attention, and liaise with medical/surgical staff to admit or review the patient urgently, either in the vascular studies department, the next clinic, or at the arterial centre when appropriate.

The Vascular Nurse Specialist

4.27. Vascular nurse specialists (VNS) contribute to both inpatient and outpatient care. Whilst no two VNS posts will be identical in terms of roles and responsibilities, there should be a reasonably high level of autonomous practice. The VNS can provide out-patient clinics which are independently run based on agreed protocols and pathways. These may be condition-specific clinics such as claudication, venous clinics, abdominal aortic aneurysm and lower limb ulceration, or can be generic vascular clinics depending on the VNS experience and level of competency.

4.28. The VNS can provide timely review of inpatient referrals to establish diagnosis, refer for investigations, and to triage patients' needs and urgency. This will include assessment of whether the patient requires urgent vascular consultant review.

4.29. The VNS can support allied specialities –such as Diabetic Foot Services – and can provide the role of the vascular specialist within the Diabetic foot MDT.

4.30. When providing vascular services in modern networks with Arterial and Non-Arterial centres, maintaining continuity and co-ordination between units is extremely important. This can be difficult to achieve. The VNS is however well placed within the vascular team to assist with this vital part of service delivery.

4.31. It is envisaged therefore that the role of the VNS will become increasingly important in the delivery of vascular services generally, especially at Non-Arterial Centres. It is recommended that, during any reconfiguration, their role is reviewed and developed as required in order to support consultant colleagues in out-patient clinics, facilitate management of inpatient referrals and act as a link for patients being worked up for inpatient treatment at the arterial centre. It is anticipated that VNSs will need to adopt a much more proactive role, acting as the patient's advocate and the principle point of liaison between the network sites. In most cases it is likely that the existing VNS complement will need to be increased, with at least one VNS, working to the model described, allocated per site. One option would be to introduce a degree of rotation so that VNSs have commitments at both the arterial centre and linked Non-Arterial site. This would encourage professional development and team working as well as providing a degree of cross-cover.

4.32. The VNS at the non-arterial centre should have remote access to central patient information systems, such as digital patient records and radiology systems, to ensure that information relating to patient care is up to date and readily available. All VNSs in the network should be able to attend the vascular MDT meetings either physically or remotely. Clinical governance arrangements need to be established and time protected for the VNS to attend clinical governance sessions.

4.33. There should be access to vascular consultant mentorship/supervision, provided either at the arterial centre or locally, by a visiting vascular consultant. There should be a degree of protected time for the VNS to complete continued professional development.

4.34. The VNS can also play an important role in vascular research and audit and is involved in the training and education of both community and hospital nursing staff.

Podiatry

4.35. Podiatrists commonly see people who may have PAD in primary and secondary care. In the latter they are often key members of the diabetic foot team. Podiatrists are often well placed to screen for and detect PAD early. With severe limb threatening PAD the speed of diagnosis and access to specialist care is especially important. This principle is captured well in the slogan 'time is tissue'. The college of podiatrists have issued the following mission statement: "Podiatry will play a leading role in the early detection, diagnosis and best clinical treatment of people with PAD to help save limbs and more lives". (www.scpod.org.uk)

4.36. This will require improved training in PAD recognition for podiatrists. A training route for podiatrists with a special interest in PAD is also planned. Such vascular specialist podiatrists would be able to work within the multidisciplinary vascular team in secondary care. The contribution of such podiatrists needs to integrate with and compliment the role of the VNS to the vascular service.

Physiotherapy and Occupational Therapy

4.37. Vascular patients are often elderly or disabled and require specialist physiotherapy to aid their rehabilitation following vascular intervention. Amputees in particular need specialist facilities and equipment in a physiotherapy gym to rehabilitate to the stage where they can safely be discharged from hospital.

4.38. Supervised exercise classes are of significant value in the treatment of claudication and should also be provided in the gym by suitably trained physiotherapists with experience of exercising patients with cardiovascular disease.[6]

4.39. Occupational therapists provide home assessment visits and co-ordinate safe discharge back into the community. This is particularly important for amputees.

Limb Fitting and Rehabilitation

4.40. PAD is one of the major indications for lower limb amputation. Vascular surgeons most commonly perform these operations. Patients need local access to a limb fitting service and although this need not necessarily be on the same site, there should be close collaboration with the prosthetists using a team approach, tailored to the individual needs of each patient. A pre-amputation visit by the rehabilitation team is often valuable. A specialist rehabilitation unit is a more appropriate environment than an acute surgical ward for amputees who no longer require active medical treatment, but have not yet reached the stage where they can manage at home.

Collaborations with other Medical and Surgical Specialties

Cardiac Surgery

4.41. In some centres, cardiac surgeons are involved with Thoracic Endovascular Aneurysm Repair (TEVAR). Ascending and arch aneurysms may require open surgery and full or left heart bypass. The management of thoracic and thoraco-abdominal aneurysms plus dissections should be based on close collaboration between regional cardio-thoracic units, the vascular surgeons and IR specialists at the arterial centres.

4.42. Peripheral arterial complications requiring vascular intervention occasionally occur after cardiac surgery. These often require emergency referral to the on call vascular surgeon and immediate repair. Clear referral and transfer pathways should be in place to deliver this care.

Cardiology

4.43. Patients with arterial disease frequently have cardiac disease, as the risk factors for peripheral arterial and cardiac disease are similar. Cardiac assessment and optimisation of cardiac status can improve the results of surgery, particularly in high risk patients undergoing aortic interventions. This should be managed in the majority of cases by agreed protocols, but cardiology input in complex cases (including pre-operative catheterisation and angioplasty/stenting) may occasionally be required.

4.44. Interventional cardiologists are skilled in the management of atherosclerosis of the coronary vessels. Unless they can demonstrate that they have received training in the management of peripheral vascular disease (and have the necessary competencies), they should not undertake interventions in this area.

Care of the Elderly Medicine

4.45. Patients with vascular disease are often very elderly. The NCEPOD review of the care of elderly patients undergoing surgery makes the following recommendations that are applicable to elderly vascular patients.[31]

a) Routine daily input from medicine for the care of the elderly should be available to appropriate patients undergoing vascular surgery.
b) Co-morbidity, disability and frailty need to be clearly recognised as independent markers of risk in this elderly population. This requires skill and multidisciplinary input including early involvement of elderly care medicine.
c) Delays in surgery for the elderly are associated with poor outcome. They should be subject to regular and rigorous audit in line with agreed standards.
d) All elderly patients should have a formal nutritional assessment during their admission so that malnutrition can be identified and treated.

Clinical Laboratory Services

4.46. Blood disorders may initiate or exacerbate vascular problems, and close collaboration with the haematology service is needed to deal with these patients effectively. There is frequently a need for blood replacement during major vascular interventions, although with continued development of modern surgical methods and the routine use of haemostats and cell salvage, the requirement for blood products is reducing. Nevertheless, vascular interventions should not be undertaken unless there is ready access to blood and blood products for transfusion.

4.47. Infective complications of surgery have particularly serious implications for patients with prosthetic arterial grafts. There should be an agreed unit policy on prophylactic antibiotics based on microbiology advice.

Dermatology

4.48. The management of leg ulceration involves an integrated approach between the vascular, dermatological and community leg ulcer services. This is a large and increasing workload that benefits from good co-ordinated care between dermatology and vascular surgery.

Diabetology (The Multi-disciplinary Diabetic Foot Team)

4.49. Patients with diabetes form a significant and increasing part of a vascular practice. The care of patients with diabetic foot problems across the modern vascular network involving both the Arterial and Non-Arterial centre is described in detail in section 6.37 (page 25). NICE clinical guidance NG19 underpins this combined care with diabetologists leading the multidisciplinary foot team which includes podiatrists, specialist nurses, orthotists, vascular surgeons, orthopaedic foot surgeons, radiologists and microbiologists.[32] The specialists involved in such a team will be determined by local interest and expertise.

Plastic Surgery

4.50. Once revascularisation has been achieved for critical leg ischaemia, collaboration with plastic surgeons may be needed to provide skin cover for soft tissue defects arising either from ulcers, from removal of gangrenous tissue or from fasciotomy incisions. Many vascular surgeons will be familiar with common skin grafting methods, for which plastic surgery advice is not needed. Complex reconstruction and microvascular free flap transfer needs plastic surgery input, and should only be undertaken by a vascular specialist with training in microvascular suture techniques. This also applies to arterial injuries in neonates. Hand surgery expertise may also be helpful in the management of gangrenous fingers to preserve maximum function.

Renal Services

4.51. Vascular patients are susceptible to acute kidney injury (AKI) either as a result of contrast induced nephropathy or following intervention. Facilities for haemofiltration must be available in HDU and ITU. Where AKI is recognised, the involvement of a nephrologist, or a physician with an interest in renal medicine, is required to minimise the risk of permanent renal failure.

4.52. Patients with vascular disease often have significant chronic kidney disease and expert nephrology input may help to minimise the adverse effect of surgical intervention on renal function. Nephrologists provide valuable assistance on the need for – and timing of – dialysis in patients with established renal failure.

4.53. The management of renal artery stenosis and vascular access for dialysis require close collaboration between nephrologists, vascular, renal transplant and interventional specialists to provide optimal care.

Stroke Medicine

4.54. Neurologists or other physicians who manage the stroke service or rapid access TIA clinics collaborate closely with the vascular service, both for duplex ultrasound imaging of the carotid arteries and for vascular procedures in those patients where intervention is indicated. It is important that acute or hyper-acute stroke units (providing 24/7 thrombolysis) are closely linked to the arterial centres. The recommended service configuration is for such acute stroke units to be co-located at the arterial centre. Agreed protocols and close MDT working are needed to ensure timely access to carotid intervention.

Other Surgical Disciplines

4.55. Vascular injuries may occur during the course of any surgical intervention in any surgical discipline. Local pressure or packing to control haemorrhage is needed until a vascular specialist can arrive to assist, or the patient is stable for transfer; this will depend on local protocols. These events are rare and should not dictate service configuration. Hospitals without a vascular service should develop clear arrangements with adjacent vascular units for a vascular specialist to travel to the patient when such emergencies arise in theatre, as patient transfers are often inappropriate in this setting. Vascular specialists from an adjacent site need to be consulted in advance regarding availability when vascular difficulties are anticipated before the surgery, such as when a tumour is seen to be encroaching around major vessels on pre-operative scans.

5. Facilities and Infrastructure

5.1. The facilities required to deliver vascular services will differ between the Arterial centre and the Non-arterial centre. The organisation and facilities required at the Non-arterial centre are described in more detail in section 6, p22. Although the non-arterial centres are not sites where arterial surgery or complex endovascular procedures are carried out, they should still aim to provide as much outpatient and diagnostic services for vascular patients as possible. Day-case interventional vascular radiology procedures are also an important element of the non-arterial centre service.

5.2. Increasingly in the arterial centres, more complex procedures, facilitated by constantly evolving new technology, are being performed on patients who are often elderly with significant co-morbidities. This places significant demands on the service in terms of infrastructure and staff to deliver first class care, 24/7. Investment is therefore often required at newly designated arterial centres to meet the requirements for hybrid theatres, ITU/HDU support, diagnostics and on call rotas.

The Vascular Ward

5.3. The nursing care of vascular in-patients requires specialist skills, combining aspects of general surgical nursing, critical care, limb and wound assessment, tissue viability, wound care, rehabilitation, care of the disabled and care of the elderly. A ward dedicated to the care of vascular patients is essential to ensure an appropriate skills mix of nurses who have been specially trained in the care of vascular patients. The input of physiotherapists, occupational therapists and social workers is central to the successful discharge of frail and disabled patients. This process is best managed in the context of regular discharge-planning meetings.

5.4. The older the patient demography in the population served, the bigger will be the demand for vascular beds. If local rehabilitation and nursing home facilities are limited, this will also increase pressures on vascular bed capacity by delaying discharge after medical treatment is completed. Based on current experience, and depending on local case-mix, a population of 800,000 will require approximately 20-25 beds on wards for dedicated vascular patients, excluding rehabilitation, short stay, day-case and intensive care unit (ITU) or high dependency unit (HDU) beds.

The Vascular Laboratory

5.5. All arterial centres should have a vascular laboratory. This provides both duplex ultrasound scanning of the vascular system and tests of vascular physiology. The exact arrangement to provide these diagnostics varies between centres, but they are essential requirements. Clinical vascular scientists often provide this service; it can be supplemented by input from vascular sonographers.

5.6. A population of 800,000 generates between 4,500 to 6,000 tests per year in the vascular laboratory and requires a minimum of 3-4 full-time clinical vascular scientists with appropriate clerical support. Workload is rising, particularly with the expansion of services dependent on ultrasound such as renal access. This workload excludes duplex ultrasound scanning for the diagnosis of acute deep vein thrombosis, which is more often provided in the radiology department.

5.7. The equipment required in the Vascular Laboratory will depend on the size of the unit and range of services provided. A number of high resolution imaging ultrasound duplex scanners with colour, power and pulsed Doppler modalities will be needed. These should be able to record images. Maintenance, calibration and quality assurance is important for this equipment.

5.8. Examination rooms should have adjustable couches, scanning stools/chairs, lighting control and air conditioning when indicated. Rooms for physiology tests will include a treadmill exercise machine.

5.9. More details on the specifications required for non-invasive duplex vascular investigations are available on the Society of Vascular Technologists website (www.svtgbi.org.uk/professional-issues/).

5.10. Many duplex examinations are carried out away from the laboratory, on the wards and in clinics. This provides immediate diagnostic information which can assist with acute ward problems and complications. In clinics it provides for a one-stop clinic visit resulting in diagnosis and a management plan.

Vascular Radiological Diagnostics

5.11. CT and MR angiography can also be used for vascular diagnostics. High quality CT imaging requires access to scanners capable of isometric volume reconstruction at 1mm minimum and appropriate image processing software. These are expensive items and require a strategy of sustained long-term investment in hardware and staff.

Vascular Outpatient Clinics

5.12. Clinics need to be appropriately staffed by nurses with expertise in ulcer and wound dressing. Sufficient examination rooms and nurses must be available to prevent delays while wounds are being redressed after consultation.

5.13. Hand-held Doppler ultrasound machines should be available for venous assessment and for measuring the ankle/brachial pressure index. It is recommended that all centres in the vascular network offer single visit clinics with access to duplex imaging for the majority of patients.

5.14. Many specialists also employ portable duplex devices that may be used for investigation, or as part of an endovenous therapy. Foam sclerotherapy, and endo-thermal venous ablation are increasingly performed in the outpatient area. Specialists who base interventions on the results of their own diagnostic imaging should have received appropriate training.

Day Case and Short Stay Facilities

5.15. There needs to be facilities for day care and 23-hour stay for the vascular service. These facilities are required for patients undergoing diagnostic angiography, selected interventional procedures, varicose vein treatment and renal access work. Written protocols for the management of complications must be in place.

5.16. Endovenous procedures, renal access and varicose vein surgery all require a clean/sterile environment with a recovery area. This may best be provided through a day-case facility, although some of these services are increasingly being undertaken in outpatients. Such day care does not need to be at the arterial centre and often provision nearer to the patient's home may be preferable.

Operating Theatres and Hybrid Interventional Theatres

5.17. Arterial surgery and endovascular procedures are technically complex and theatre personnel need to be specially trained in the use of specialist instruments, stents, prosthetics and techniques. Theatre nurses with specific training in this area are valuable. Theatre staff need to be capable of operating cell salvage devices for blood conservation.

5.18. A vascular theatre also requires stocks of specialist grafts, stents, catheters, wires, instruments, haemostatic agents and sutures that are stored nearby, as they are often needed without delay.

5.19. Many interventions are no longer just open surgery but will be a combination of open and endovascular or purely endovascular. For this type of work a hybrid endovascular theatre is recommended. This combines access for open surgery (with lighting, table clamps, sterile air exchange, and full anaesthetic facilities) with the ability to introduce high quality rotational fluoroscopic imaging. For the safe performance of endovascular aneurysm repair, specific guidance on the facilities required has been issued by the MHRA.[33] These recommendations arose after reports of adverse events related to EVAR performed with inadequate facilities. The MHRA guidance therefore concludes with the following; "it has been recognised that problems with facilities and equipment may have contributed to adverse outcomes from EVAR. We therefore recommend that Trusts providing EVAR services, follow these recommendations to ensure that adequate facilities are available to perform EVAR safely and successfully".

5.20. Many vascular operations take longer than a half-day session and so arrangements should ensure that vascular teams have access to sufficient all-day theatre lists for their elective workload. In addition, many vascular procedures are unscheduled and there should be easy access to additional urgent theatre time as required. A 24/7 emergency CEPOD theatre must be readily available at the arterial centre to undertake emergency vascular procedures.

ITU, HDU and PACU (post-anaesthesia care unit)

5.21. A Critical Care facility is essential for the care of patients treated for a vascular emergency, particularly those with a ruptured aortic aneurysm. The majority of elective vascular patients can be managed in a HDU or PACU rather than an ITU.

5.22. Both ITU and HDU beds must be available on site at the arterial centre for the vascular service, in sufficient numbers to prevent cancellation of elective procedures due to lack of facilities. The size of the critical care ward will vary according to population size and the influence of other specialties using the facilities.

Major Trauma Centres / Emergency Departments

5.23. It is recommended that newly designated arterial centres are co-located with major trauma centres or trauma units with an accident and emergency department. If an existing vascular service is sited in a hospital without a trauma or emergency department, there must be robust mechanisms available for the direct admission of vascular emergencies. Many patients needing vascular expertise will present to an emergency department; if the vascular service is not in the same hospital, there need to be clear protocols for the management of such patients. Emergency clinicians and ambulance services should be involved in the development and monitoring of emergency transfer pathways.

6. The Non-Arterial Centre in the Vascular Network

6.1. There is no single model for the vascular service at a Non-Arterial (NA) Centre since this will depend on local factors such as geography and pre-existing service configuration. There are however a number of key factors to consider which will be common to all. These include provision of outpatient clinics, timely review of inpatient referrals, day-case lists (surgery and endovascular) and supporting allied specialities such as Diabetic Foot Services. Specific recommendations for the care of urgent diabetic foot problems and critically ischaemic limbs at the NA centre have been incorporated into this guidance below (see sections 6.37 & 6.57)

6.2. In many areas a 'hub-and-spoke' type arrangement already exists and, in such cases, it is worth reassessing the model of service provision in light of the recommendations in this document. Of much greater importance is the potential impact of reorganisation on hospitals which currently have an established vascular service but which will be redefined as Non-Arterial Centres during reconfiguration. Maintaining a high quality visiting service at these centres is essential.

6.3. More detail on the organisation and management of the reconfiguration process for new networks, focusing on the scope of service and specification for non-arterial centres is available on the Vascular Society website.[34] Potential financial models and the governance roles of the steering committee are covered in this document.

6.4. Although the recommendations below focus on the Non-Arterial centre, the standard of service provided should be equivalent across networks including the Arterial centre. It is imperative that proposed changes to service provision are communicated effectively to relevant parties throughout the reconfiguration process.

Vascular Consultant Presence at Non-Arterial Sites

6.5. Vascular presence at NA sites is primarily required to provide outpatient clinics; perform day-case lists; support and manage ward referrals on inpatients admitted under the care of other specialties; and deal with patient related administration. The number of sessions required to fulfil these duties will depend on the size of the hospital and the number and size of co-dependent specialities. These sessions should be spread sensibly through the week. A vascular presence is not required Monday to Friday from 9.00am to 5.00pm. For NA sites with acute medical and/or surgical 'takes' the aim should be to ensure a presence on part, or all, of 3 to 5 days of the working week, which will enable inpatient referrals to be seen within 48hrs wherever possible. Smaller and less acute NA sites may not require this level of vascular presence. The temptation to timetable surgeons to be present at NA sites outside of specific sessions 'just in case of' an on-site vascular emergency should be avoided.

6.6. In order to provide a comprehensive service it is recommended that each NA site is allocated a minimum of 2 surgeons, with the number of delegated surgeons and sessions increased accordingly depending on the size of the NA unit. This helps develop professional and referral relationships with other specialities and GPs and facilitates cross-cover. It is likely that about 40% of an individual consultant's job plan will be devoted to the NA site, for those consultant's with a split site contract based at the arterial centre. Whatever arrangements are put in place, it is imperative that in the event of gaps in on-site presence, there are clear pathways in place describing the management of urgent referrals and vascular emergencies.

6.7. In most cases of reorganization, consultants at NA sites are unlikely to have regular junior medical support, and the service will be predominantly consultant delivered. If there are pre-existing arrangements with middle-grade support then these may be retained as part of delivering the agenda of teaching and training. In practice, this type of support is likely to be unpredictable because of commitments to general surgery rotas, and should be regarded as supernumerary.

Vascular Nurse Specialists (see 4.27, page 16)

6.8. It is envisaged that the role of the Vascular Nurse Specialist (VNS) will become increasingly important in the delivery of vascular services generally, especially at Non-Arterial Centres. In most cases it is likely that the existing VNS complement will need to be increased, with at least one VNS allocated per site in the network. One option would be to introduce a degree of rotation so that VNS have commitments at both the arterial centre and linked Non-Arterial site. This would encourage professional development and team working as well as providing a degree of cross-cover.

Emergency Cover

6.9. All Trusts will have systems in place for vascular cover and the initial call regarding a vascular emergency will need to be directed to the on-call vascular surgeon at the arterial centre. Emergencies deemed to require admission or urgent assessment will need to be transferred to the centre. There will, however, be rare occasions in which it may be necessary for a vascular surgeon to travel to the patient. In all circumstances, the call for assistance will be directed to the arterial centre and the on-call vascular surgeon will determine the most appropriate way to manage the case.

6.10. General Surgery Consultants at the NA centre no longer have sufficient expertise in vascular surgery to manage emergencies presenting 'on take'. However, they should be sufficiently skilled to assess and triage patients appropriately, with referral to the emergency vascular surgeon when indicated.

6.11. Ambulance services will need to be informed of the changes to vascular services. Consideration should be given to developing local protocols for the direct transfer of vascular emergencies, particularly ruptured AAA, to the arterial centre, bypassing non-arterial sites. In the event that a vascular emergency presents at a Non-Arterial Centre there should be very clear guidelines to facilitate prompt ambulance transfer to the arterial centre when required. These arrangements are similar to those used to manage major trauma cases. National guidance has also been published for the care and transfer of ruptured AAA.[35]

6.12. If an unforeseen vascular emergency occurs at the NA site the initial call for help should again be directed to the on-call vascular surgeon at the arterial centre, who will have to determine the best course of action. If a vascular surgeon is available locally, they can be detailed to attend the case. If there is no vascular surgeon available locally it will be necessary for a surgeon from the arterial centre to deal with the emergency if transfer is impossible. It is therefore important that adequate vascular instruments and operating trays are kept and maintained at Non-Arterial Centres for such emergencies. This also applies to unplanned emergencies with Interventional Vascular Radiology procedures occurring in the angiography room at the NA centre. Bailout equipment such as covered stents to deal with bleeding should be available.

Outpatient Clinics

6.13. These form one of the main components of the service at NA sites, enabling patients to be seen closer to home. Clinic templates will need to be reviewed as part of any reorganisation in order to ensure there is sufficient capacity for the predicted demand. Booking systems should be able to flex the initially agreed template according to demand, in order to ensure that clinics are used as effectively as possible. Templates should be flexible enough to enable urgent referrals to be seen within a week, but there should also be a facility for very urgent cases to be seen at the NA unit within a shorter timeframe if clinically necessary. The system should also enable cases presenting urgently to A&E, or from GPs, to be seen in the next available clinic at the NA Centre, rather than being admitted as an emergency to the arterial centre.

6.14. It is recommended that, where appropriate, new patients should be offered a one-stop service, with consultation and duplex scanning taking place at their initial visit. This is convenient for patients and reduces the demand for follow-up appointments.

Vascular Laboratory Support

6.15. An appropriately resourced Vascular Laboratory, in terms of both personnel and equipment, is recommended at the NA centre if the service is to be run as efficiently as possible, especially in terms of providing one-stop clinics and urgent investigation of inpatients from other departments such as Stroke and Diabetes. The Vascular Laboratory should have systems in place to provide follow-up of patients after arterial intervention, avoiding the need for further follow-up appointments after the first post-procedure visit.

6.16. Cross-site cover by vascular technologists is recommended within the network in order to cover significant gaps in service at NA sites.

Other Diagnostic Services

6.17. As far as possible most of the relevant diagnostic services should continue to be provided at Non-Arterial Centres within the network. In addition to duplex ultrasonography, patients should have ready access to CT and MR angiography. Image transfer is increasingly being facilitated by new PACS systems but, where these are not yet in place, systems should be adopted to ensure rapid transfer of relevant imaging.

6.18. For the most part it should be possible for most preoperative workup to be carried out at the Non-Arterial Centre, although more complex cardiorespiratory assessment such as cardiopulmonary exercise testing and stress echocardiography may only be provided at the arterial centre.

Inpatient Referrals

6.19. There should be a well described system for making referrals, ideally electronically, or via a vascular secretary/PA at the NA site, with the stated aim that patients are seen within 48hrs whenever possible. If consultant or VNS review cannot take place within a reasonable time frame, or a more urgent opinion is required, the referrer will need to be directed to the arterial centre on-call consultant to discuss the best course of management.

Day-case Lists

6.20. These serve the dual purpose of maintaining a vascular presence as well as treating patients locally and will form the bulk, if not all, of the operating at Non-Arterial sites. The overwhelming majority of day-case work will involve treatment of varicose veins and vascular access work. Interventional vascular radiologists or suitably trained endovascular surgeons should also undertake elective day case peripheral angioplasty work at the NA site in order to support the local service.

6.21. When day-case general anaesthesia lists are performed there should be provision for on-site care, rather than transfer, of the rare patient who requires an overnight stay.

6.22. Vascular access work might be restricted to local and regional anaesthetic cases, which constitute the majority. This type of work may also involve placement of Hickman lines and implantable ports. More complex cases, such as those requiring general anaesthetic or an overnight stay in hospital, will be the subject of local discussion.

Interventional Radiology (IR)

6.23. There are a number of reasons for vascular IR work to continue in Non-arterial centres. These include capacity issues in the arterial centre, the commitment to treating patients closer to home and the maintenance of non-vascular IR services. That said, it is important that there are agreed guidelines in place regarding this activity. Good MDT working will be pivotal in ensuring appropriate case selection and quality control. The complexity of cases manageable within this framework is for each network to determine and will be dependent on local expertise. Complex elective cases, hybrid cases and the majority of emergency cases will need to be performed at the arterial centre.

6.24. For day-case endovascular procedures it is clearly important that vascular cover is agreed, with protocols in place to deal with complications.

6.25. In-patient work should preferably be restricted to patients under other specialties e.g. Renal and Diabetes, whose treatment is discussed with the vascular team, but who remain under their admitting team for overall care.

Multi-Disciplinary Team (MDT) Working

6.26. This is now recognised as a key factor in driving quality of care provision. In order to be manageable the number of MDT's within a network should be rationalised. A number of different models exist: a large central weekly MDT in which all units combine all aspects of their work (carotid, peripheral, aortic, vascular access); Separate MDTs for each aspect, with input from relevant specialties; smaller NA centre MDTs to discuss cases which are suitable for local day case endovascular treatment with more complex cases re-discussed in the network central MDT.

6.27. The technology now exists to enable multiple site participation at the network MDT meetings, avoiding the need to travel, and efforts should be directed at scheduling to enable maximal participation of all those wishing to be involved.

6.28. The long-term aim should be that all specialists involved in the vascular service participate in MDT working, with mandatory attendance to at least 50% of relevant meetings. A well-structured, well-organised MDT encourages participation and should act as a trigger to revise job plans in order to enable attendance. This information is also crucial to commissioners planning the delivery of specialised services based on the process of MDT working and should ensure that the NA sites have full participation in MDTs as a quality indicator.

Repatriation

6.29. The majority of elective patients at the arterial centre will be fit to be discharged home relatively soon after treatment and, for these, repatriation is not a major issue. An outpatient appointment with their vascular or diabetic specialist at their local hospital concludes a satisfactory episode of care.

6.30. A larger proportion of the urgent and emergency cases, however, will require prolonged rehabilitation and/or attention to social issues e.g. following amputation. The preferred solution, wherever possible, would be for these cases to be repatriated directly to either intermediate or community care without the need for repatriation to a NA site. If repatriation is deemed the most appropriate course of action, then care should be transferred to an appropriate non-vascular specialist at the NA site (e.g. Diabetes, Care of Elderly, Stroke). There will therefore be the need to increase shared care arrangements between vascular surgery and these specialties at the NA site. Such transfers will rely on the NA site's clinical staff maintaining the necessary competencies to manage post-op vascular patients. Vascular nurse specialist support in the Non-Arterial Centre should be considered vital to on-going care, along with supervision from the visiting vascular consultant. Earlier repatriation to Non-Arterial Centres would make it easier for the arterial centre to accept transfers and improve continuity for outpatient follow-up.

6.31. It is strongly recommended that there are no named vascular beds in NA sites as this has potentially serious implications for continuity of care and cover, both in and out of hours. Vascular review by visiting surgeons and locally-based VNSs will continue to be a feature of care, but vascular input should really be minimal once deemed fit for transfer.

6.32. The emphasis should be on close working between the various relevant agencies to ensure that following acute vascular treatment, patients who are no longer deemed to require an acute vascular bed at the arterial centre should be transferred promptly along the most appropriate pathway.

6.33. It is recognised that in some networks there will continue to be named vascular beds at NA sites, at least during transition periods. It is important that there are clear guidelines regarding suitability for transfer into these beds and, more importantly, how cover is to be provided, especially out of hours. In the longer term it is recommended that networks make arrangements that result in there being no vascular beds at NA sites.

Secretarial & Administration Support

6.34. Administrative support is vital in order to support the smooth running of the service at NA sites and to act as an interface with the arterial centre. The level of support will depend on the size of the Non-Arterial centre and number of vascular surgeons involved. With on-site presence 3-5 days per week and co-ordination with the arterial centre ,a full time Band 4 or above secretary will be required in many units.

6.35. At the arterial centre, particularly in networks with more than one NA site, a network co-ordinator would be important to ensure smooth transfer of patient information, and investigations. Close working between secretarial teams is crucial in order to co-ordinate booking of theatre lists to maximise utilisation and to avoid theatre cancellations for trivial reasons, such as lack of notes and investigations.

6.36. Vascular surgeons with commitments to NA sites should have ready access to a desk and PC and should be able to access relevant IT systems remotely, i.e. hub from NA centre and vice versa.

Diabetic Foot Services in the NA Centre

6.37. With active diabetic foot problems there is often the need for urgent assessment, investigation and intervention. Concern has been raised that in the NA centres of vascular networks, the vascular contribution to the diabetic foot multidisciplinary team will be reduced. This could lead to delays, poor communication and loss of continuity, resulting in suboptimal care and with an increased risk of amputation. It is therefore vital that diabetic foot care in the vascular network is organised to enable equal access to vascular expertise for the diabetic patient at both the arterial centre and the non-arterial centres.

6.38. The urgent care of diabetic patients with active foot problems (ulceration, infection, ischaemia and Charcot deformity) is best delivered by an integrated multi-disciplinary care pathway. The need for all organisations involved in the care of diabetic patients to have such pathways in place has been highlighted by Diabetes UK,[36] NICE,[32] and the All Party Parliamentary Group (APPG) on Vascular Disease.[37] Variations in amputation rates for Clinical Commissioning Group Areas has been linked to the absence of such pathways. Commissioners should ensure that all patients with diabetic foot problems have rapid and equal access to these care pathways, regardless of location, in order to reduce amputation rates.

6.39. This guidance applies to urgent in-patient cases or problems presenting to the Emergency Department (ED) in the NA centre. Many less urgent diabetic foot problems are managed via multidisciplinary clinics. The vascular input to these clinics should not be altered by the reconfiguration of services. Visiting or local vascular surgeons will continue to contribute to such clinics.

The Diabetic Foot Team. (see NICE NG19)

6.40. The makeup of the diabetic foot team in the NA hospital should follow NICE guidance. The team should be led by a diabetologist or physician with an interest in diabetes. Surgical input to the foot team should be available from both vascular and orthopaedic specialities. The local arrangements for vascular input to the team will be determined by the vascular network configuration. There may be on-site local vascular surgeons and interventional radiologists who can contribute. Alternatively, the vascular input may be provided entirely by visiting vascular surgeons and interventional radiologists from the arterial centre.

6.41. Clear lines of communication between the NA diabetic foot team and the visiting vascular team will be central to maintaining multi-disciplinary working. In many centres podiatrists play a major role in the foot team and can facilitate such communication with the vascular team. Vascular specialist nurses can also fulfil this important role. Clear protocols and pathways for referral should be in place between the NA diabetic foot team and the vascular service. Regular multi-disciplinary diabetic foot ward rounds and x-ray / imaging meetings can assist and speed up the management of these inpatient diabetic foot problems.

Emergency Treatment of Diabetic Foot Sepsis

6.42. When assessment by the NA centre diabetic foot team makes a diagnosis of acute infection, without significant ischaemia, and surgical intervention to drain and debride the foot is necessary, an emergency referral should be made. In the past this emergency service has often been provided by local vascular and general surgery teams. It may be possible in some networks to still provide this surgery locally at the NA centre. On-call orthopaedic surgeons at the NA centre may be able to offer this service. These patients can be safely managed in the NA centre under the diabetic foot team, with review and advice from orthopaedic foot and vascular surgeons.

6.43. If a satisfactory emergency service for foot sepsis cannot be provided at the NA hospital then immediate transfer to the arterial centre is an alternative solution. This can be an admission to either the diabetic or vascular ward at the arterial centre. Providing there are good arrangements to repatriate these patients back to the NA diabetic foot team, this may provide a satisfactory solution in some networks.

6.44. It is important that this surgery is carried out by experienced surgeons who have the necessary training and expertise. These procedures should not be delegated to junior surgeons who have not been trained in diabetic foot surgery.

Vascular Assessment of the Diabetic Foot

6.45. The initial assessment of the arterial supply to the diabetic foot will be by a member of the NA centre diabetic foot team (clinician, specialist nurse, podiatrist) using the NICE guidance. This specifies the history and signs to look for, together with ankle-brachial pressure measurements, to assist in making a diagnosis of ischaemia.

6.46. If the degree of concern is immediate and there is no on-site vascular presence, the on-call emergency vascular surgeon at the arterial centre should be contacted for advice. They will decide if immediate transfer as an emergency is needed. Alternatively an assessment in the NA centre by the vascular team should be available within 48-72 hours.

Referral to the Local Vascular Service

6.47. When the initial assessment suggests limb ischaemia but not with immediate threat to the limb, a local referral to the NA centre vascular team should be made. These referrals should be seen either on the wards or in clinic at the first opportunity, ideally within 48 hours of receipt of the referral (48-72 hours over weekends). If a local vascular opinion cannot be obtained in this time frame, and there is clinical concern, referral should be made to the on-call vascular surgeon at the arterial centre.

6.48. Vascular imaging should be available at the NA centre on an urgent basis for further investigation of the ischaemic diabetic foot. If access to imaging involves long delays, this will increase the need to transfer some patients to the arterial centre and reduce the ability to deliver local treatment with endovascular intervention.

6.49. In-patients with an active diabetic foot problem should be reviewed on a daily basis. The local foot team, led by diabetology, can provide this daily input., which will include the use of dressings, foot protection, and treatment of infection.

Vascular Intervention

6.50. The results of any vascular imaging should be reviewed by the local vascular team (surgeon and IR) and discussed with the diabetic foot team lead as soon as possible.

6.51. If the decision is for an endovascular intervention, then a clear decision is also required regarding where that intervention should be performed. There should be clear written vascular network guidelines regarding endovascular interventions at NA hospitals. These will dictate which interventions can be undertaken locally in the NA centre and those which require transfer to the arterial centre.

6.52. If the MDT decision is that the endovascular intervention should be performed at the arterial centre transfer should not be delayed.

6.53. When an in-patient requires arterial surgical intervention they should be transferred to the arterial centre immediately in order for this to proceed.

Timeline for Assessment, Imaging and Revascularisation of the Acute Diabetic Ischaemic Foot

6.54. It is important that treatment for ischaemia in these acute diabetic foot cases is not unduly delayed. The above process of foot team assessment, vascular opinion, imaging and finally a revascularisation procedure should not involve long delays. The principal that any delay runs the risk of on-going tissue damage must be considered at all times in an effort to minimise tissue loss and reduce the risk of amputation.

6.55. When the NA centre assessment is that revascularisation is a very urgent priority, within 24-48 hours, the use of the emergency vascular team (surgeon and interventional radiologist) at the arterial centre will often be needed to achieve this.

6.56. Suggested time lines for less urgent cases treated at the NA hospital are:

a) Diabetic foot team assessment within 24 hours (NICE guidance)
b) Vascular input and imaging within 48 hours (72 hours over weekends)*
c) Local endovascular revascularisation within 8 days.*

**time from receipt of referral by the vascular service.*

Non Diabetic Critical Limb Ischaemia (CLI) at the NA Centre

Definition: - "PAD with chronic ischaemic rest pain in the foot or ulceration / gangrene"

6.57. Detailed analysis of the overall management of PAD has been issued by NICE.[6] In addition, the need for urgent and co-ordinated management of CLI to avoid amputation has been highlighted by the All-Party Parliamentary Group.[37] As with the acute diabetic foot, patients with CLI must have equal access to care pathways whether presenting at the arterial or the non-arterial unit in the vascular network. Commissioners of vascular services should ensure that these pathways are in place, resourced and delivered. Minimising delays within these pathways is especially important, including transfers between centres in both directions. Delays due to lack of available beds must be avoided. Written transfer protocols need to be safe and clearly communicated.

6.58. Leg ulcers are common in the elderly hospital population. A large proportion will be venous but some will be arterial or arterio-venous. Severely painful ulcers of the leg, with exposed deeper structures or necrotic tissue and absent pulses should be considered for more urgent management. Although ulcers with these features may not directly meet the criteria for CLI, they should be referred to the vascular service using the CLI pathway.

CLI Presentation at the NA Centre

6.59. CLI will present in the NA centre to other non-vascular specialties, in the following ways:-

a) **In-patients**. Admitted under another specialty, often acute medicine or care of the elderly. Clinical assessment raises a concern about the presence of CLI. This may or may not be related to the condition for which the patient was admitted. This can be a new diagnosis or the patient may already be known to the vascular service.

b) **Emergency Department.** Referrals from general practitioners to acute medicine or surgery or patient self-referral to the ED.

c) **Out Patient Department**. The diagnosis of CLI may be made or suspected in a non-vascular clinic. This may be a coincidental diagnosis whilst the patient is being assessed or investigated for a separate condition. Alternatively, this may be the suspected diagnosis for the problem leading to the referral to the clinic.

6.60. In the above settings the initial clinical assessment will be by non-vascular specialists (general surgeons / physicians, ED physicians). Once the clinical concern of CLI has been raised by this initial assessment, urgent referral to the local Vascular Service is required to confirm the diagnosis and plan management. Robust mechanisms must exist in the NA centre for these urgent referrals to be communicated to the local on-site Vascular Service the same or next working day. Secretarial, Managerial or Specialist Nurse contact details must be readily available at all times

6.61. In-patients should be seen and assessed on the ward the first day that a vascular specialist is next on site (3-5 days per week). This expertise can be supplemented by other health care professionals such as Vascular Nurses and Podiatrists who may have the expertise to assess patients for CLI.

6.62. In some cases where the degree of ischaemia is judged by the vascular specialist to be less severe, the patient may be discharged after completion of their current in-patient care and further vascular investigations arranged as an outpatient.

6.63. For patients presenting to the ED or the outpatient department, the degree of urgency will need to be taken into consideration before referral to the Vascular Service. Patients not requiring immediate admission for management of the CLI can be referred urgently to the next vascular outpatient clinic at the NA hospital. These referrals should reach the local NA vascular clinic administration the same or next working day.

6.64. Where there is immediate concern about the severity of the CLI, the patient should be discussed with the on-call emergency vascular surgeon at the arterial centre. They may arrange for the patient to be admitted to the arterial centre as an emergency. Alternatively, they may decide that the patient can wait until the next vascular clinic at the NA centre. A local referral can then be made.

MDT for CLI

6.65. As with the diabetic foot, the imaging obtained for patients with CLI at the NA centre can be discussed at a local MDT meeting to decide on local peripheral angioplasty and stenting. Those not suitable will need discussion at the network MDT, if time allows, and transfer to the arterial centre for treatment if required.

6.66. An important principle is that whenever possible, patients with CLI will be discussed at a MDT meeting (local or central). Access to revascularisation should therefore be equitable across the network.

6.67. When the patient requires complex endovascular intervention, or arterial surgical intervention this should be organised at the arterial centre with either immediate transfer, or urgent scheduling of the case on a planned procedure list.

Timeline for Revascularisation in CLI

6.68. As with the ischaemic diabetic foot it is important that treatment for CLI is not unduly delayed. The above process of initial assessment at the NA centre by a clinician from another specialty, getting a vascular opinion, MDT decision and a revascularisation procedure should not involve long delays.

6.69. When the NA centre assessment is that revascularisation is a very urgent priority, within 24-48 hours, the use of the emergency vascular team (surgeon and interventional radiologist) at the arterial centre will often be needed to achieve this.

6.70. The following are suggested time lines for cases less urgent than this, treated as in-patients at the NA centre. These are timed from receipt of the initial referral by the NA centre vascular service.

a) CLI with tissue loss: vascular assessment and imaging within 48 hours. (72 hours over weekends).
b) CLI with tissue loss: endovascular revascularisation within 5 days.
c) CLI no tissue loss: vascular assessment and imaging within 8 days
d) CLI no tissue loss: endovascular revascularisation within 14 days.

6.71. The severity of ischaemia can vary widely in CLI. In some cases (for example rest pain with no ulcer or infection) the management will be on an urgent outpatient basis at the NA centre. Some of these cases will tolerate a longer interval before revascularisation of between 2-4 weeks. Treatment delays greater than this should be avoided.

Amputations

6.72. Toe, ray and transmetatarsal amputations can be performed at the NA centre providing there is local surgical expertise. These procedures should be performed by or closely supervised by a consultant surgeon. The indication may be for the control of infection or removal of necrotic tissue following revascularisation.

6.73. These procedures can be performed on operating lists at the NA centre. There should be vascular lists in the NA centres for non-arterial procedures (mainly varicose veins). These can also be used for ‘minor’ amputations.

6.74. More proximal amputations for ischaemia, at or above the ankle, should be performed at the arterial centre. Where necessary, emergency transfer should be made to allow the amputation to occur without delay. The care at the arterial centre should follow the amputation quality improvement framework guidance.

6.75. Many patients will benefit from rehabilitation at the NA centre after initial recovery from the amputation procedure at the arterial centre. Clear protocols for the repatriation of amputees back to the NA centre should be in place to optimise the rehabilitation and on-going care of these patients.

7. Training and assessment of Competence

7.1. The advent of the new Vascular Specialty in 2013 was accompanied by a new Vascular Curriculum[38] and has led to the appointment of new vascular trainees. The first of these trainees will complete training in 2019. Until this time, general surgical trainees with a vascular interest and a certification date before 31st December 2018 will continue to follow the 2010 General Surgical Curriculum.[39] Currently, the latter trainees seeking appointment to vascular surgical posts should have spent a minimum of the last two years of their specialist registrar training in recognised vascular training units (see below). Specifications for training units and goals for trainees have been specified by the VSGBI in its document on Training in Vascular Surgery.[40] It is important that the competencies of vascular specialists are clearly identifiable to their NHS Trust and to the public.

7.2. Trainees in Vascular Surgery will undergo core training (CT1-2) followed by a period of six indicative years of specialty training (ST3-ST8). The purpose of the vascular curriculum is to train vascular surgeons up to CCT level, who will be able to work independently and to the standard of a consultant. As such, most of their skills will relate to the management of 'everyday' vascular elective and emergency surgery and this forms the basis of the curriculum, with the competencies – both non-operative – and operative being completed by the final year of training. This curriculum also allows a degree of flexibility to respond to the changing needs of our patients and the development of new models of healthcare delivery, and to incorporate technological advances, particularly in the endovascular field. The syllabus includes elective and emergency Vascular Surgery topics which need to be completed by all trainees to enable them to manage the conditions l isted in the Scope and Standards of Vascular Surgical Practice key topics.

7.3. The syllabus also includes specific competencies in elective and emergency gastro-intestinal surgery to complement the management of intra-abdominal vascular conditions. These will normally be obtained during one indicative year of upper and lower gastro-intestinal surgery to be undertaken during intermediate training in ST3/ST4.

7.4. Some complex vascular and endovascular procedures are performed in only a few specialised centres and so do not require every trainee to reach a stage of full competence by the time of CCT. It is expected that trainees wishing to work in such centres will seek further experience and mentorship after CCT, although all trainees will be expected to have knowledge of these procedures so that they can initiate appropriate referral to a specialist centre. Early exposure to endovascular techniques is encouraged and this may be achieved by one endovascular training session per week.need to collaborate and lead effective teams in order to provide the necessary range of interventions on a 24/7 basis.

Stages of Training

7.5. The syllabus may be considered in 3 stages. Satisfactory completion of the core (early years), intermediate and final stages will lead to the award of a CCT.

Core Stage

7.6. In the core stage (early years training), the Vascular Surgery trainee may not have even decided upon a career in Vascular Surgery. They will undergo broad-based core surgical training, while being able to sample a range of surgical specialties. The objectives will be to attain the knowledge, skills and behaviours required of all surgeons (i.e. the common competencies), together with some initial competencies relevant to the specialty of Vascular Surgery. At the end of this period of training, the trainee will have decided upon a career in Vascular Surgery, and will seek to enter Vascular Surgery training.

Intermediate Stage

7.7. Following successful competitive national application and interview for entry into vascular training at ST3 level, the Intermediate stage (ST3 & 4) emergency and elective vascular surgical experience is developed to enable the trainee to have a breadth of experience of the common vascular surgical emergencies, as well as gaining exposure to all of the elective vascular specialist areas. In addition, competence to manage patients undergoing vascular procedures within the abdomen will require training for one year in gastrointestinal surgery. One to two years of emergency general surgery also provides useful experience in this area.

Final Stage

7.8. The final stage (ST5-8) includes both vascular surgical and endovascular procedures and it is expected that by the end of ST8, the trainee will be able to manage competently unselected vascular surgical emergencies when on call. It is anticipated that certain complex emergencies may still need the assistance of more experienced or subspecialist colleagues. The specialty components of the final stage include the breadth of conditions likely to be encountered in specialist practice. The degree of specialisation may vary depending on individual career aims. The necessary skills should be acquired in 4 indicative years.

Structure of Training

7.9. All three stages of Vascular Surgery training allow exposure to emergency care. All trainees should include a regular on-call commitment in their job plans. In addition the use of six month rotating posts, with trainees working for different consultants every six months, allows a breadth of experience to cover all of the subspecialty areas of Vascular Surgery.

Training Progression

7.10. Progression through training is demonstrated by acquisition of the levels of knowledge and clinical and technical skills determined for each stage. In the early years trainees attain the required competencies to enter specialty training at the ST3 level. In the Intermediate and final stages for each topic within each section of the syllabus, levels have been set for the end of intermediate training at ST4, the middle of final training at ST6 and the end of final training at ST8. Stages have been divided in this way so that during the ARCP process, trainees' progress can be assessed and modified to ensure all necessary skills are acquired.

7.11. The design of the specialty sections is comprehensive. For some trainees however, acquisition of every single topic may not be appropriate or necessary. The level of expertise can be chosen by the trainee in discussion with the TPD according to career aspirations. Furthermore, in some areas it is unlikely that full competence will be gained because of technical complexity. The levels of skill have been adjusted accordingly in these areas.

7.12. It is incumbent on the trainee that the levels of competence achieved are recorded in the appropriate logbooks together with relevant research, records of training courses and an audit of personal cases performed. It is vital that vascular trainees keep detailed records of their training progression and competency assessments within the ISCP. This portfolio will continue into consultant practice. Trainees should aim to gain competency in all areas of the relevant curriculum and should be guided by the agreed quality indicators and guidance for completion of training.

7.13. Support for trainees should be available locally through both clinical and assigned educational supervisors. All trainees should also maintain contact with their TPD and be aware of the support available through the TPD and their local educational and training boards (LETBs).

7.14. An Annual Review of Competency Progression by the local training programme director and the SAC liaison member will record progression on the ISCP. The ARCP panel will make recommendations regarding future placements on the regional vascular training programme to ensure comprehensive training. Specific deficiencies or advanced competencies which cannot be addressed regionally may require Out of Programme Experience (OOPE).

7.15. The new vascular trainees will be expected to attend a residential induction programme at the outset of ST3 and further residential training courses at ST5 and ST7 levels. These courses have been developed by the Vascular SAC and Vascular Society and are administered by the Educational Committee of the Vascular Society.

7.16. The Intercollegiate Fellowship of the Royal College of Surgeons (FRCS) examination in vascular surgery will commence in 2017. Trainees on the General Surgery 2010 curriculum will continue with the subspecialty examination in Vascular Surgery until this time.

7.17. There is a separate European Board of Surgery Qualification in vascular surgery (FEBVS – Fellowship of the European Board of Vascular Surgery), which can be taken by those within six months of their CCT. The purpose of this vascular examination is to ensure consistency of training standards across Europe. Although it currently has no official standing in most member countries with regard to certification, the FEBVS is recognised in Sweden and Switzerland.

7.18. Depending upon clinical, local university and academic support, Academic Clinical Fellows (ACFs) can be appointed at either CT (core training) year 1-2 or at ST (specialty training) year 3 in vascular surgery. Currently the Specialist Advisory Committee for Vascular Surgery and The Vascular Society are exploring solutions to allow the transparent appointment of ACFs into Vascular Surgery. This will involve benchmarking at ST3 National Recruitment. Unrestricted local appointment of ACFs has been advised against, due to the lack of transparency and also the potential that it may destabilise small training programmes.

Specialist Vascular Training Units

7.19 Vascular training is provided in specialist units with surgeons who are in dedicated vascular practice.[40] They also need to have been trained as educational and/or clinical supervisors and be registered for the Intercollegiate Surgical Curriculum Programme (ISCP). Vascular surgery units that wish to provide training must demonstrate (1) a high volume of work, (2) outcomes in line with national defined standards and (3) a consultant rota which provides a sustainable 24/7 emergency surgical and IR service. Consultants should not have any elective commitments when on call. The rota may be supported by non-consultant career grades (Associate Specialists, Staff Grades & Clinical Fellows).

7.20. Most vascular training units have insufficient specialty trainees to provide middle-grade cover, especially at night. There will be only approximately 120 vascular trainees in the UK, because a ratio of 1 trainee to 3 consultants is required to conform to workforce planning requirements. The timetable for vascular trainees from ST5 upwards should maximise their supervised elective and emergency vascular experience. Shift-working will not deliver this experience. Alternative arrangements such as on-call from home, or long-day rather than night working are required.

7.21. If there are more approved training places than trainees, placements will be allocated on the basis of the quality of training and outcomes. However, popular units must ensure that there is sufficient capacity for each trainee.

7.22. Specialist vascular units should have an elective and emergency vascular workload, that provides sufficient supervised experience for trainees to achieve the expected competencies for their level of training. Trainees should work within a team with one assigned educational supervisor and at least 2-3 clinical supervisors during a year, to ensure adequate supervision and experience. If there is more than one trainee on a unit, then ideally they should be at different stages of training.

7.23. The volume of work should be sufficient to achieve outcomes in line with national standards for all index procedures (open AAA repair, EVAR, carotid endarterectomy, infra-inguinal bypass, major amputation, arterio-venous fistula and varicose veins). Whenever possible, all elective and emergency procedures (part or whole) should be performed by a trainee under consultant supervision, if a trainee at the appropriate level is available. Sufficient elective and emergency experience cannot be delivered by shift-working.

7.24. The training unit should be recognised by the UK NHS AAA Screening Programme as an AAA treatment centre. A dedicated vascular hybrid interventional suite with high-quality fixed imaging equipment, theatre-specification room with adequate radiation protection, full anaesthetic facilities and trained staff should be available. Detailed requirements of this have been published by an Expert Vascular Advisory Group in association with the MHRA.[33]

7.25. Wards for vascular patients are required, with nursing staff experienced in looking after these patients. The unit should also have dedicated vascular outpatient clinics at least twice a week, with links to diabetic foot clinics and other specialties such as IR and stroke-prevention, plus vascular access clinics.

7.26. 24/7 access to ITU, HDU and post-operative care facilities are essential. There should be access to a CEPOD theatre during daytime/evening hours to avoid delays for patients who require urgent intervention.

7.27. In addition, a 24/7 vascular emergency rota and 24/7 access to on-site diagnostic and interventional vascular radiology facilities are required, including digital subtraction angiography, spiral CTA and MRA. Units should also provide regular exposure for vascular trainees in axial imaging and IR, appropriate to their level of competence and subspecialty ambitions. Trainees should be able to access non-invasive vascular ultrasound facilities, with accredited clinical vascular scientists or sonographers, and regular sessions for vascular trainees to obtain experience in duplex ultrasound.

7.28. Weekly MDT's with nursing staff, physiotherapists, occupational therapists, interventional radiologists and relevant physicians (anaesthetists, cardiothoracic surgeons, diabetologists, nephrologists, stroke physicians) are essential.

7.29. Outcome data should be recorded or audited independent of the clinician who performed the procedure, and all index data should be submitted to the NVR. A climate which encourages clinical audit, research and participation in relevant multicentre randomised clinical trials is encouraged.

7.30. Consultant clinical supervisors should be registered with the ISCP, maintain a CPD portfolio and be trained in assessment and giving feedback. Educational Supervisors should have completed their School of Surgery/Deanery training requirements and should have allocated SPA time for supervision of trainees. Clinical Supervisors must have time for teaching in outpatients, on ward rounds and in the operating theatre.

7.31. There should be access to a procedural skills centre with appropriate facilities to allow trainees to achieve adequate competence on simulators before treating patients, according to the national framework for simulation training. Adequate provision must be in place for attendance at regional training courses and/or funding to permit trainees to attend the key national courses recommended in the vascular curriculum.

8. Audit, Governance & Quality Improvement

8.1. Vascular services must be accompanied by a comprehensive programme for audit of clinical outcomes. The data system needs to be based on an adequate information technology (IT) infrastructure and needs to be sufficiently detailed, so that analysis for clinical governance purposes can take full account of case mix and physiological status. This type of audit requires financial support, not just for computer hardware and software, but also for someone to support, monitor and maintain the database in larger units. Annual volumes of particular operations per surgeon are not high in arterial surgery, and it may take up to nine years of data collection and analysis to decide whether or not clinical outcomes for an individual surgeon lie within the norm.[41] There are methods to use standard data collected in every hospital to prove evidence of safety.[42]

8.2. Vascular surgeons are required to submit their figures to the NVR and will then be provided with risk-adjusted comparative outcomes for their procedures compared with their peers in the UK. For revalidation in England, data submission is mandatory for all procedures. Elsewhere it is voluntary.

8.3. The Vascular Society has a standard that all index vascular procedures should be entered on the NVR. Surgeons must have identified time in their work programme through SPA activity to ensure both adequate data entry into national clinical audit and to quality assure the coding of vascular procedures within their unit. A minimum of 0.25 SPA (0.5 in busy units) per surgeon should be identified to support national clinical audit. Audit of outcomes benchmarked against peers should form an integral part of a vascular surgeon's annual appraisal and will be an essential requirement for revalidation.

8.4. The UK Government has indicated that it will continue to require publication of data from individual surgeons in the public domain.[43] It is therefore in the interests of the vascular specialist to become personally involved with their hospital's operation coding system to ensure that hospital activity and outcome returns to HQIP are as accurate as possible. Good outcomes are fundamental to the cost efficacy of vascular intervention. The UK has historically not compared well with international comparators for some vascular procedures. It had the highest mortality rates in Western Europe following elective AAA surgery and is among the slowest nations for uptake of new endovascular technology. Poor results also undermine the value of the NAAASP to men with an AAA. Since the national Quality Improvement Programme for AAA repair, these standards have significantly improved but it is vital that these standards are maintained and further improved upon.

9. References

1. VSGBI. Outcomes after elective repair of Infrarenal Aortic Aneurysms. [Society report]. 2012; http://www.vascularsociety.org.uk/wp-content/uploads/2012/11/VSGBI-Mortality-Report.pdf.

2. Holt PJ, Poloniecki JD, Gerrard D, Loftus IM, Thompson MM. Meta-analysis and systematic review of the relationship between volume and outcome in abdominal aortic aneurysm surgery. The British journal of surgery. 2007;94(4):395-403.

3. DoH. Cardiovascular Disease Outcomes Strategy: improving outcomes for people with or at risk of cardiovascular disease. 2013; https://www.gov.uk/government/publications/cardiovascular-disease-outcomes-strategy-improving-outcomes-for-people-with-or-at-risk-of-cardiovascular-disease.

4. HSCIC. Statistics on Smoking, England - 2015. 2015; http://www.hscic.gov.uk/catalogue/PUB17526/stat-smok-eng-2015-rep.pdf.

5. NICE. <PAD NICE 2012.pdf>. 2011; http://www.nice.org.uk/guidance/CG147.

6. NICE. Peripheral arterial disease - quality standard. 2014; http://www.nice.org.uk/guidance/QS52.

7. Waton S Johal A, Heikkela K, Cromwell D, Loftus I. National Vascular registry progress report. 2014; http://www.hqip.org.uk/assets/NCAPOP-Library/NCAPOP-2014-15/NVRProgressReport.pdf.

8. Cheshire NJ, Wolfe JH, Noone MA, Davies L, Drummond M. The economics of femorocrural reconstruction for critical leg ischemia with and without autologous vein. Journal of vascular surgery. 1992;15(1):167-174; discussion 174-165.

9. von-Allmen RS Anjum A, Powell JT, Earnshaw JJ. Hopsital trends of admissions and procedures for acute leg ischaemia in England, 2000 - 2011. Annals of the Royal College of Surgeons of England. 2015;97(1):59-62.

10. NCEPOD. Lower limb amputation: working together. 2014; http://www.ncepod.org.uk/2014report2/downloads/Working%20Together_FullReport.pdf.

11. Multicentre-Aneurysm-Screening-Study-Group. Multicentre aneurysm screening study (MASS): cost effectiveness analysis of screening for abdominal aortic aneurysms based on 4 year results from randomised controlled trial. Bmj. 2002;325(7373):1135.

12. NAAASP. Service specification for AAA screening. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/389168/S7A_1516_FINAL.pdf.

13. NAAASP. NHS screening programmes. 2015; www.aaa.screening.nhs.uk.

14. Cosford PA, Leng GC. Screening for abdominal aortic aneurysm. The Cochrane database of systematic reviews. 2007(2):CD002945.

15. UK-Small-Aneurysm-Trial-Participants. Mortality results for randomised controlled trial of early elective surgery or ultrasonographic surveillance for small abdominal aortic aneurysms. The UK Small Aneurysm Trial Participants. Lancet. 1998;352(9141):1649-1655.

16. EVAR1. Endovascular aneurysm repair versus open repair in patients with abdominal aortic aneurysm (EVAR trial 1): randomised controlled trial. Lancet. 2005;365(9478):2179-2186.

17. NICE-TA. Endovascular stent-grafts for the treatment of abdominal aortic aneurysms. 2009; https://www.nice.org.uk/Guidance/TA167.

18. Powell JT, Sweeting MJ, Thompson MM, et al. Endovascular or open repair strategy for ruptured abdominal aortic aneurysm: 30 day outcomes from IMPROVE randomised trial. Bmj. 2014;348:f7661.

19. Bown MJ Fishwick G, Sayers RD, Bell PRF. Repair of Ruptured Abdominal Aortic Aneurysms by Endovascular Techniques. Advances in Surgery. 2007;41:63-80.

20. NHS-Clinical-Commissioning-board. Complex Endovascular Stent Graft in Abdominal Aortic Aneurysm. 2013; http://www.england.nhs.uk/wp-content/uploads/2013/04/a04-p-a.pdf.

21. Rothwell PM, Eliasziw M, Gutnikov SA, et al. Analysis of pooled data from the randomised controlled trials of endarterectomy for symptomatic carotid stenosis. Lancet. 2003;361(9352):107-116.

22. NICE-Stroke. Stroke: Diagnosis and initial managment of acute stroke and transient ischaemic attack. 2008; http://www.nice.org.uk/guidance/cg68/.

23. Rothwell PM, Giles MF, Chandratheva A, et al. Effect of urgent treatment of transient ischaemic attack and minor stroke on early recurrent stroke (EXPRESS study): a prospective population-based sequential comparison. Lancet. 2007;370(9596):1432-1442.

24. Carotid-Stenting-Trialists'-Collaboration. Short term outcome after stenting versus endarterectomy for symptomatic carotid stenosis: a preplanned meta-analysis of individual patient data. Lancet. 2010;376(9746):1062-1073.

25. NICE. Carotid artery stent placement for symptomatic extracranial carotid stenosis. 2011; http://www.nice.org.uk/guidance/ipg389/.

26. NICE. NICE Varicose Vein guidance. 2013; www.nice.org.uk/guidance/cg168/.

27. NICE. Venous thromboembolic diseases: the managment of venous thromboembolic diseases and the role of thrombophilia testing. 2012; http://www.nice.org.uk/guidance/cg144/.

28. Harkin D Beard J, Wyatt M, Shearman C. Vascular Surgery UK Workforce Report 2014. 2014; http://www.vascularsociety.org.uk/wp-content/uploads/2014/07/VS-UK-Workforce-Report.pdf.

29. Royal-College-of-Surgeons-England. Job Description checklist. 2015; http://www.rcseng.ac.uk/surgeons/supporting-surgeons/regional/rspa-toolkit.

30. VASGBI. Vascular Anaesthesia. http://www.rcoa.ac.uk/system/files/GPAS-2015-15-VASCULAR.pdf.

31. NCEPOD. Elective & Emergency Surgery in the Elderly: an age old problem. 2010; www.ncepod.org.uk/2010eese.html.

32. NICE-NG19. Diabetic foot problems: prevention and management. 2015; https://www.nice.org.uk/guidance/ng19.

33. Joint-Working-Party-BSIR-VS-VASGBI. Delivering an Endovascular Aneurysm Service. 2012; http://www.vascularsociety.org.uk/wp-content/uploads/2012/11/mhra_8pp_leaflet_ammended_more_pages_web_version_pdf.

34. Working-group-of-the-Vascular-CRG Pherwani A, Brennan J. Service specification for the Non Arterial centres or Spoke units of a Hub and Spoke vascular network. 2013; http://www.vascularsociety.org.uk/wp-content/uploads/2015/08/Scope-of-work-defined-for-the-Spoke-units-of-a-Vascular-Hub-and-Spoke-network2.pdf.

35. College-of-Emergency-Medicine VS, RCR. Best practice guidelines for the transfer of patients with a diagnosis of ruptured abdominal aortic aneurysm to a specialist Vascular centre. 2011; http://www.vascularsociety.org.uk

36. Diabetes-UK. Putting feet first. 2013; https://www.diabetes.org.uk/Documents/Reports/putting-feet-first-foot-attack-report02222013.pdf.

37. All-Party-Parliamentary-Group. All-party parliamentary group on vascular disease. 2014; http://appgvascular.org.uk/reports.

38. ISCP-VS. Vascular Surgery Curriculum. 2013; https://www.iscp.ac.uk/documents/syllabus_VASC_2014.pdf.

39. ISCO-GS. General Surgery Curriculum. 2010; https://www.iscp.ac.uk/documents/syllabus_GS_2010.pdf.

40. VS-Training. Training in Vascular Surgery. 2011; www.vascularsociety.org.uk/library/education-and-training.html.

41. Irvine CD, Grayson D, Lusby RJ. Clinical governance and the vascular surgeon. The British journal of surgery. 2000;87(6):766-770.

42. Holt PJ, Poloniecki JD, Loftus IM, Thompson MM. Demonstrating safety through in-hospital mortality analysis following elective abdominal aortic aneurysm repair in England. The British journal of surgery. 2008;95(1):64-71.

43. NHS-Choices. Consultants specialising in vascular surgery in England. 2015; https://www.nhs.uk/Service-Search/consultants/performanceindicators/1026

44. Academy-of-Medical-Royal-Colleges. Advice on supporting professional activities in consultant job planning. 2010; www.aomrc.org.uk/publications/statements/doc_download/9309-advice-on-supporting-professional-activities-in-consultant-job-planning.html.

10. Appendix 1

Template Vascular Job Plan

10.1. This should be taken in conjunction with the job planning advice from the British Medical Association and NHS employers. It has been written to take account of the current imperative to centralise services, and it is appreciated that it may need to be flexible to take account of local service need. A full time post will constitute ten PAs however some trusts may wish to offer additional sessions to consultants.

10.2. **Fixed Commitments:** A consultant vascular surgeon will require at least 3 operating half days per week. These sessions will usually equate to 1PA. (This will not usually include pre- and post-operative visiting). These may be main theatre, day surgery or endovascular lists.

10.3. **Main Theatre:** As a minimum it is expected that a consultant vascular surgeon should have access to the equivalent of an all-day operating list on a weekly basis. All-day lists are more suited to the nature of the surgery than half-day lists. This amount of operating will ensure adequate access to major vascular cases to maintain competence. These lists may take place in an operating theatre, hybrid suite or an interventional radiology suite.

10.4. **Day Surgery:** A consultant vascular surgeon will require access to day surgery lists in order to deliver venous and vascular access surgery according to local need. These lists may take place outside the arterial hub and travel time will need to be accounted for as part of the job plan.

10.5. **Endovascular Lists:** Increasingly vascular surgeons are undertaking interventional peripheral procedures and require access to either a hybrid theatre or an interventional radiology suite.

10.6. **Ward rounds and Ward Referrals:** Sufficient time should be allocated in the job plan to review in-patients operated on by the consultant. In addition with the network nature of most posts, there should be time allocated in job plans for reviewing in-patient referrals both at hub and spoke sites. Around 40% of an individual's timetable may be at the NA centre.

10.7. **Outpatient Clinics:** Most job plans will include a minimum of two outpatient clinics to deliver an adequate amount of operative work for a consultant surgeon. These will usually represent 1PA each. With the current structures of clinical networks it is anticipated that job plans will include both in and outreach clinics. (With outreach clinics travel time needs to be included in job plans in addition to the time allotted to the clinic)

10.8. **Non-invasive imaging:** Although many consultants will undertake this as part of their regular clinic activity and this will be counted within these sessions, some consultants may develop or have a special interest in this area and therefore need dedicated sessions in this area.

10.9. **On call:** As units are now engaged in centralisation, no consultant should be on an on call rota more onerous than 1 in 6. The on-call consultant should be free of elective duties. Predictable activities such as ward rounds on call should be timetabled in. Unpredictable on-call commitments should be subject to a diary exercise, for new appointments it should be assumed that individuals will take a proportionate share in the unpredictable on call commensurate with the rota frequency.

10.10. **MDT:** Attendance at multidisciplinary team meetings is essential for the high quality delivery of patient care. Adequate time should be scheduled into a job plan for this. It is anticipated that this will amount to a least 1PA per week. In many services there will be more than one MDT in the service including MDTs at spoke sites and separate meetings for specialist areas such as renal access.

10.11. **SPAs:** A full time consultant post will typically be balanced between clinical PAs and supporting professional activities (SPAs) in a 7.5:2.5 ratio for a full time consultant. The SPA component is often a 1.5 minimum with the potential for an additional 1PA for specified additional activity (audit, teaching, training, governance roles). The provision of this time is essential in a high quality service.[44]

10.12. The Royal College of Surgeons of England has produced guidance on Job Plans, which can be found on the college[29] and Vascular Society website. With regard to SPA allocation they state the following: "In line with the Academy of Medical Royal Colleges, 1.5 SPAs is viewed as a minimum requirement for personal revalidation development of safe practice. We expect a job plan to allow for sufficient time for non-clinical duties and activities, therefore any job plan with only 1.5 SPAs leaves no time for teaching, undergraduate examination, research, trainee supervision, managerial input or clinical governance work outside of audit of personal practice. The College considers that a typical job description for an established surgical consultant would need 2.5 SPAs to fulfil these commitments as a 7.5: 2.5 split or be offered a contract with Additional Programmed Activities beyond ten PAs. The College recognises, however, that there might be a need for flexibility for new consultants whose duties may not initially necessitate that split. The College recommends that there should be a job plan review for every appointee within 12 months of starting their post, so that additional SPA time can be allocated should any additional activities have been undertaken by the appointee".

10.13. Established consultants are often involved with roles in running the service. This can also be beneficial for the development of newly appointed surgeons who often bring with them a wealth of ideas, having worked in a variety of units. The use of their SPA time within service development can greatly enhance a service to which they are appointed.

11. List of Abbreviations

AAA	Abdominal Aortic Aneurysm
AKI	Acute Kidney Injury
BSIR	British Society of Interventional Radiology
CAS	Carotid Artery Stenting
CCT	Certificate of Completion of Training
CEA	Carotid Endarterectomy
CTA	Computerised Tomographic Angiography
DoH	Department of Health
DVT	Deep Venous Thrombosis
EVAR	Endovascular Aneurysm Repair
EWTR	European Working Time Regulation
FEBVS	Fellowship of the European Board of Vascular Surgery
FRCS	Fellowship of the Royal College of Surgeons
HDU	High Dependency Unit
HES	Hospital Episode Statistics
IR	Interventional radiology
ITU	Intensive Therapy Unit
MDT	Multi-disciplinary Team
MRA	Magnetic Resonance Angiography
NAAASP	Abdominal Aortic Aneurysm Screening Programme
NCEPOD	National Confidential Enquiry into Peri-operative Deaths
NHS	National Health Service
NICE	National Institute for Health and Clinical Excellence
NNT	Number needed to treat
NVR	National Vascular Registry
PACU	Post-anaesthesia Care Unit
PAD	Peripheral Arterial Disease
RCR	Royal College of Radiologists
SAC	Specialty Advisory Committee
ST3-8	Specialty Training years 3-8
SVN	Society of Vascular Nurses
SVT	Society for Vascular Technology of Great Britain and Ireland
TAAA	Thoracoabdominal Aortic Aneurysm
TEVAR	Thoracic Endovascular Aneurysm Repair
TIA	Transient Ischaemic Attack
UK	United Kingdom
VASGBI	Vascular Anaesthesia Society of Great Britain and Ireland
VM	Vascular Malformation

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