Target Operating Model; Sustainable Operating Model & Feasibility Assessment

Contents

WORK IN PROGRESS: Review and update as part of final review- contents, figures, table refs.

T&F group to review and comment on draft

1. Executive Summary

1.1 Overview

Vascular surgery covers a range of surgical procedures undertaken on veins and the lymphatic system with a significant proportion of work relating to reconstructing, unblocking or bypassing arteries that are blocked by atherosclerosis. In undertaking these precision procedures, vascular surgeons restore blood flow to organs of the body helping to reduce sudden death, preventing strokes, restoring movement and reducing the risk of amputation. A further central role for vascular surgery is to address aortic aneurysms, which, when these rupture, can rapidly lead to death.

Advances in techniques and technology over the last three decades have meant it is possible to carry out a greater number of these life-saving procedures, even on extremely frail patients leading to an increase in demand for vascular and interdependent services.

There is evidence that significant numbers of vascular patients with critical limb ischaemia, carotid artery disease and aortic aneurysmal disease are not receiving timely investigation and treatment. The current model for the provision of care to vascular patients is unsustainable in the immediate and long term.

There is evidence that there are insufficient qualified and skilled staff in Scotland to be able to meet the demand and evidence to suggest there are insufficient staff in specialist training to be able to resolve these challenges. The current service model does not have sufficient volume of activity to be able to deliver best outcomes and infrastructure and financial constraints are evident.

Under the direction of NHS Scotland's Planning and Delivery Board-Sustainability Reviews, the project brief was to develop a target operating model using a population planning approach for delivery of safe, sustainable and effective vascular surgery within NHS Scotland to meet nationally commissioned outcomes. Recognising the immediacy of action required this was to be a phased approach moving initially to a sustainable operating model (phase 1) with an implementation plan to support moving to a target operating model within two years of commencement.

This report covers phase 1, the sustainable operating model recommendations and associated feasibility assessment and a summary of the target operating model direction of travel to enable informed decision making. The phase 2 report will provide the fully detailed target operating model for Scotland providing the basis to enable safe, quality and outcome focused service delivery, based on population health planning taking cognises of the interdependencies and constraints.

The recommended sustainable operating model has been developed using a population level planning approach and is data driven, evidence based using the double diamond structure to guide the design process and taking cognises of the direction of travel and principles of the target operating model. **Design Principles | HIS Engage**

The direction of travel for the target operating model involves future proofing the delivery of vascular services with an appropriately staffed and sustainable model which includes strategies for workforce planning, technology integration, and continuous improvement to ensure services remain effective and resilient.

2A. DISCOVER – Understanding the problem to be solved

Vascular surgeons address a wide range of conditions, including blocked or narrowed arteries, aneurysms (abnormally dilated arteries), and vein disorders such as varicose veins, venous leg ulcers, and Deep Vein Thrombosis. However, there are significant gaps in the provision of comprehensive vascular surgical services across Scotland.

Up to 50% of vascular patients present as emergency or urgent referrals. Given the complexity of these acute conditions, emergency vascular services are predominantly consultant-delivered. This results in a more demanding out-of-hours workload compared to many other surgical specialties. Therefore, the ability to provide an on-call rota at the consultant level is crucial for maintaining a viable vascular unit.

As treatment options for arterial surgery evolve with new technologies, interventional radiology for vascular disease has become increasingly important. This field involves a range of minimally invasive, image-guided techniques for stenting and vessel repair. However, the availability and extent of interventional radiology services vary significantly from hospital to hospital across Scotland. While most sites offer some interventional radiology procedures, the range and utilisation of these services differ greatly.

Additionally, vascular surgical services encompass a broad spectrum of care, including open surgical procedures, endovascular techniques, and hybrid approaches. The integration of these diverse treatment modalities is essential for providing comprehensive care to vascular patients. However, disparities in the availability of these services is leading to inconsistent patient outcomes.

It is also important to recognise that vascular surgical services support other specialties beyond vascular care, including renal, liver, and gastrointestinal surgery. Addressing the disparities in vascular surgical services is essential to ensure comprehensive, high-quality care for all patients across Scotland. By implementing a target operating model (TOM) aligned to our population requirements, we can improve patient outcomes, reduce the burden on emergency care, and ensure equitable access to advanced vascular treatments.

2A.1 Case for change

The current model for the provision of care to vascular patients within NHS Scotland is unsustainable in the immediate and long term. Service sustainability within the vascular services in Scotland has reached crisis point. There is a risk that the current model of delivery will no longer be sustainable past January 2025 and mutual aid has already been enacted.

Drivers for change:

- **Population factors** - including demographic pressures, substantial increases in both incidence and prevalence of diabetes and the introduction of the screening programme for men aged 65 for the detection of abdominal aortic aneurysms (AAA screening programme).
- **Improving patient care and outcomes** - the need to provide equitable access to vascular expertise in collaboration with clinical teams and to concentrate complex surgical procedures in fewer centres to deliver better patient outcomes.
- **Service delivery factors** - sustainability and availability of access to clinical expertise including on call, surgical specialty training, the benefit of multi-disciplinary team working and other issues which require a change in the way care is currently delivered.

In 2012, vascular surgery was formally recognised as a specialty in its own right, having previously been a subspeciality of general surgery. Around the same time, proposals were published to establish vascular surgery networks, consisting of arterial centres (hubs) – hospitals serving as a regional centre for vascular surgery, that have the resources to provide surgery 24x7 – that work with non-arterial centres (spoke) - hospitals, which can conduct outpatients' services including screening and some minor surgical procedures. A growing number of hospitals are now part of a vascular network, but the model defined in Provision of Vascular Services 2021 (**POVS 2021)** has not yet been fully established in Scotland,

The challenges faced by vascular services, while significant, are not unique to this speciality. These include:

1. Increasing Demand: The aging population and rising prevalence of vascular diseases are putting unprecedented pressure on vascular services.
2. Resource Constraints: Limited financial and human resources are straining the ability to provide timely and effective care.
3. Variability in Service Delivery: There are inconsistencies in the quality and availability of vascular services across different centres, leading to disparate patient outcomes.
4. Technological Advancements: Rapid advancements in medical technology require continuous updates to service delivery models to ensure the best patient care.

5. Infrastructure limitations: access to theatre, ward and diagnostic space curtails the ability to meet all the demands being placed therefore delivery in a different way will be required going forward.
6. Variation in outcomes: there are noticeable differences in the rates of vascular procedures and outcomes between different centres, for example some areas have higher rates of amputations due to peripheral arterial disease, while others have better access to preventative care and early interventions.
7. Variability in access to specialised vascular services such as endovascular aneurysm repair (EVAR) and carotid endarterectomy.

In the North, the configuration of Vascular Services is not reflective of how services are provided in the rest of Scotland (or the UK). Whilst there is a limited degree of ad hoc support and cross cover, the North region does not currently operate as a single network, with each Health Board in the North of Scotland providing independent Vascular services. The challenging situation within NHS Highland was prioritised by the task and finish group as Highland are not able to maintain vascular services in the immediate future.

The situation in Highland is summarised below:

1. Consultants are currently operating on a 1:2 on call rota, moving to 1:1 from January.
2. The current consultant vascular surgeons are predominantly in the older age categories. Persistent recruitment challenges have led to a lack of registrars and newly qualified consultants, jeopardising the long terms sustainability of the service.
3. Board escalation processes have been followed by NHS Highland and business continuity plans are currently enacted.
4. NHS Highland have made their Board aware that they will not continue to be an arterial centre moving forward.
5. NHS Highland are not compliant with the minimum requirements set out by Vascular Society of Great Britain and Ireland (VSGBI) for an arterial centre. The other centres have been benchmarked against this to inform development of the TOM and monitor improvements.

Development and implementation of a phased target operating model to allow the necessary volumes of elective activity to exist alongside emergency and on call provision to deliver the highest quality outcomes for the Scottish population is therefore a priority.

Vision for the Future

The vision for the future of vascular services in NHS Scotland is to create a patient-centred, efficient, and high-quality service that leverages modern technology and best

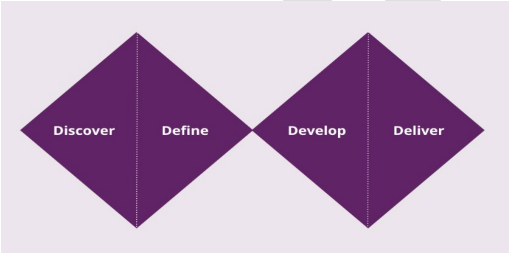
practices. The TOM will serve as a blueprint to achieve this vision by addressing current challenges and setting a clear path for improvement through delivery of a sustainable operating model whilst transitioning to the TOM.

Transitioning to a sustainable operating model before moving to a target operating model (TOM) is crucial for several reasons:

1. **Foundation for Long-Term Success**: SOM will address immediate issues such as resource constraints, regulatory compliance, and will create a stable foundation for more ambitious changes.
2. **Risk Mitigation**: By focusing on sustainability first, we can identify and mitigate risks. This reduces the likelihood of disruptions and enhances stakeholder trust.
3. **Incremental Improvement**: Implementing a sustainable operating model allows for incremental improvements. This step-by-step approach makes it easier to manage change, measure progress, and make necessary adjustments before moving to a more comprehensive TOM. It also allows learning and adjustment as necessary to minimise the impact of change.
4. **Resource Optimisation**: Focusing on sustainability helps optimise the use of resources, including financial, human, infrastructure and technological assets. This optimisation is essential for supporting the more complex and resource-intensive changes required by a TOM.
5. **Stakeholder Engagement**: Engaging stakeholders in the transition to a sustainable operating model builds support and buy-in for future changes. It demonstrates the commitment to responsible practices and prepares stakeholders for the more significant transformations associated with a TOM.

2A.2 Approach

The double diamond approach, a structured design process that emphasises understanding and solving complex problems through four key phases:



1. Discover
2. Define
3. Develop
4. Deliver

This approach was informed by population health data to ensure the service planning is comprehensive, patient centred and fit for the population of NHS Scotland.

DISCOVER	In this phase extensive data on the current state of vascular services, including patient demographics, health outcomes and service utilisation patterns were collated and analysed. This involved engaging with key stakeholders, undertaking site visits to meet with service providers, core team members and representatives of key interdependent services; undertaking interviews with key partners such as the Scottish Ambulance Service (SAS), and collating information from key data sources such as the vascular registry, SMR01, Health Improvement Scotland (HIS), Public Health Scotland (PHS) and the service providers. Stakeholder mapping was also undertaken to identify key stakeholders including clinical advisory, interdependent service, operational delivery and Governance and accountability members.
DEFINE	In this phase the data was analysed to pinpoint specific challenges and opportunities. This included identifying disparities in service availability and quality, as well as understanding the root causes of these issues. This allowed clear evidence-based objectives and outcomes for our population-based service planning efforts to be articulated. The data has also been modelled to estimate the increase in demand to help inform future requirements of the TOM. Fulfilment of these will be crucial for successful implementation of the TOM. A task and finish group of key stakeholders was established to review options and recommend the evidence-based SOM and TOM.
DEVELOP	In this phase potential options to address the identified challenges were generated to address the identified challenges as part of the phased planning approach (Sustainable Operating Model (SOM)) and the data continues to be used to define the detail of the Target Operating Model (TOM). This phase has and continues to involve collaborative workshops with stakeholders to co-create the SOM and the TOM and undertake a feasibility of implementation assessment of the recommended options. Solutions that are scalable, sustainable and aligned with population health needs are being prioritised.
DELIVER	Finally, in this phase, we will provide an implementation plan and monitor the impact on patient outcomes and service efficiency. This includes establishing robust evaluation frameworks to measure success and identify areas for further refinement. Continuous feedback from stakeholders is integral in this phase to ensure services remain responsive to evolving population health needs.

To ensure long term success the approach focuses on delivering sustainable solutions that adapt to future changes in population needs and healthcare advancements. This involves development of a TOM that outlines the optimal structure, processes and resources required to maintain high quality vascular services. The TOM will include strategies for workforce planning, technology integration, and continuous improvement to ensure the services remain effective and resilient.

By utilising the double diamond approach and focusing on sustainability, the aim is to create a more equitable, effective, and patient centred vascular surgical service that meets the needs of our population.

Planning and Delivery

WORK IN PROGRESS: Insert Governance structure and route

Clinical Advisory Group (Task and Finish Group)
In line with The Vascular Society Top Tips for Vascular Reconfiguration (**vascular-reconfiguration-top-tips-2018.pdf**) this group comprised of local vascular surgeons, interventional radiologists, specialist nurses, vascular scientists

WORK IN PROGRESS: Insert stakeholder mapping and attendance as appendix and reference here

to ensure representation from those potentially involved in the reorganisation. The group was chaired by the Medical Director of Forth Valley who has experience of previous vascular reconfiguration into a network model being one of the Boards affected and also had independent vascular consultant.

As tasked by the PDB to recommend a sustainable and target operating model a task and finish group consisting of members identified by the stakeholder mapping exercise and endorsed by the PDB was established.

The first stage in the reorganisation process was to get agreement in principle on the clinical model and what we are trying to achieve. This process was led by the vascular task and finish group and informed by:

- Provision of services for people with vascular disease 2021 (POVS 2021) (**https://vascularsociety.org.uk/_userfiles/pages/files/povs/povs-2021.pdf**).

WORK IN PROGRESS: Review and conclude referencing and add reference list as appendix

- Royal College of Radiologists and British Society of Interventional Radiology Provision of Interventional Radiology Services (POIRS 2014).

- NHS England National Vascular Service Specification (Specialised Vascular Services).
- Previous reconfiguration work undertaken in the West and lessons learned to allow movement at pace given the fragility of the current model.
- Data provided from hospitals currently providing vascular services, the vascular registry, PHS, HIS, SAS and SMR01.

The guidelines from the Vascular Society for the Provision of Vascular Services (POVS **2021**) provide comprehensive specifications for both arterial and non-arterial centres within a vascular network. These guidelines emphasise the importance of integrated vascular networks to ensure high quality and safe vascular care. They cover aspects such as specialist teams, multi-professional collaboration, and the need for timely intervention.

In arterial centres, high-volume and complex interventions are performed, while non-arterial centres focus on less complex procedures and rehabilitation. This structure ensures that patients receive comprehensive and safe vascular care, balancing accessibility with the need for specialised treatment. Therefore, the task and finish group recommend using these guidelines as a baseline for developing a robust target operating model.

The task and finish group were also mindful of the TOM while developing a sustainable operating model to ensure:

- alignment with long term goals.
- all components of the service work together seamlessly.
- efficient allocation of resources and investments in areas with the most significant impact.
- adaptable and resilient to future challenges.

Target Operating Model

The task and finish group recommends expanding the vascular network model to establish a North of Scotland Network comprising of two arterial centres to address the remote and rural and current resource and infrastructure locality challenges. It is proposed there would be an arterial centre in NHS Tayside working collaboratively with NHS Grampian which will also work as an arterial centre and NHS Highland would cease to be an arterial centre. Whilst this approach does not fully align with the guidelines, the group suggests this as a sustainable model to address the identified challenges. This would provide 4 networks with 5 arterial centres supporting the population of Scotland.

WORK IN PROGRESS: Refer to relevant section/appendices and figures that show this in more detail here

Operational Implementation Group
Refer to The Vascular Society Top Tips for Vascular Reconfiguration (vascular-reconfiguration-top-tips-2018.pdf).

WORK IN PROGRESS: Review and conclude referencing and add reference list as appendix

Patients and Public

WORK IN PROGRESS: Summarise work done and add appendix

2A.3 Scope

To define a target operating model for delivery of safe, sustainable and effective vascular surgery within NHS Scotland to meet nationally commissioned outcomes, and a plan to support delivery of this within two years of commencement.

This will be completed through a phased approach. Phase 1 involved the development of recommendations for a Sustainable Operating Model which will address the immediate, short-term risks to service continuity. Phase 2 will focus on the development of a Target Operating Model.

This report outlines the principles of the target operating model and includes a feasibility assessment.

Out of scope

- Implementation.
- Resourcing to deliver, this will remain the role and responsibility of provider Boards.
- Scheme of delegation that sets out which decisions specific groups and individuals can make.
- Resolving identified issues with interdependent issues however these will be noted within the report.

2B. DISCOVER – Current Operating Model & Readiness for change

2B.1 Service Providers

Within Scotland there are currently six vascular arterial centres as shown below:

Figure Z shows the population size of each Board and the overall population covered by the service provider (denoted in blue). For example, NHS GG&C covers its own Board population but also covers Forth Valley and the Western Isles.

Figure Z:

Service Provider Board (across top) and Referring Board Population (down Side)

Health Board	NHS GG&C	NHS Grampian	NHS Highland	NHS Lanarkshire	NHS Lothian	NHS Tayside
Ayrshire & Arran				365228		
Borders					115985	
Dumfries & Galloway				146442		
Forth Valley	312030					
NHS Fife						371824
NHS GG&C	1192016					
NHS Grampian		590374				
NHS Highland			320000			
NHS Lanarkshire				664226		
NHS Lothian					938830	
NHS Tayside						416759
Orkney		22341				
Shetland		22956				
Western Isles	25855					
Total	**1529901**	**635671**	**320000**	**1175896**	**1054815**	**788583**

According to the guidelines (POVS **2021**) eight hundred thousand people has become the established minimum population for UK vascular networks (an arbitrary figure from the AAA screening programme):

- Across most of the UK, a network population size of >1.2 million people is needed to provide the volume of aortic cases to drive better outcomes and
- At least 3 UK vascular networks serve populations of around 2 million people.

Figure Z highlights that reconfiguring the North of Scotland into a network will help align closer with these guidelines and also indicates that with a population of over 5 million, the resource and infrastructure locality and availability, and the unique remote and rural challenges faced in Scotland, the network model with single arterial centres within each vascular network may require to be adapted to meet the needs of the Scottish population. For example, 2 arterial centres working in a hub and spoke model may be required as part of target operating model in the North of Scotland which does deviate from true adherence to the guidelines albeit key to unlocking the unique challenges faced.

To inform planning the sustainable and target operating models the current provision and network arrangements were collated and are summarised in Figure Y:

Figure Y:

NHS Region	Services	Specialisation/Notes	Network Arrangements
NHS Lothian	Full range of vascular surgical services, including complex open and endovascular aortic surgery	National centre for managing thoraco-abdominal aortic disease and providing a dedicated specialist service	Part of the South-East Scotland Vascular Network, collaborating with NHS Borders
NHS Greater Glasgow and Clyde	Full range of vascular surgical services including complex endovascular aortic surgery	The largest health board in Scotland, handling a significant volume of vascular cases	Part of the West of Scotland Vascular Network, collaborating with NHS Ayrshire and Arran, NHS Lanarkshire, and NHS Forth Valley. Also now cover the Western Isles patients
NHS Tayside	Full range of vascular surgical services including complex endovascular aortic surgery	Experience in complex endovascular aortic surgery	Part of the East of Scotland Vascular Network, collaborating with NHS Fife and assisting NHS Highland
NHS Highland	No longer able to provide vascular surgical or Interventional radiology services. Due to develop as a spoke service	Faces unique challenges due to the rural and remote nature of the region, impacting service delivery	**Does not currently work in a network model**
NHS Grampian	Full range of vascular surgical services including complex endovascular aortic surgery	Faces challenges recruiting consultant vascular surgeons	**Does not currently work in a network model**
NHS Fife	Provides a spoke service with index arterial cases undertaken by Fife surgeons in NHS Tayside	Full range of spoke services including outpatient clinics, renal access, varicose vein interventions	Part of the East of Scotland Vascular Network, collaborating with NHS Tayside

Currently there is a WOS, South-West and South-East of Scotland network arrangement with no North of Scotland network currently in place. NHS Tayside works collaboratively with NHS Fife. This model is shown in Figure XX:

Current Service Providers (across top) and Referring Board Population (down Side)

Health Board	South East	South West	West	NHS Grampian	NHS Highland	NHS Tayside
Ayrshire & Arran		365228				
Borders	115985					
Dumfries & Galloway		146442				
Forth Valley			312030			
NHS Fife						371824
NHS GG&C			1192016			
NHS Grampian				590374		
NHS Highland					320000	
NHS Lanarkshire		664226				
NHS Lothian	938830					
NHS Tayside						416759
Orkney				22341		
Shetland				22956		
Western Isles			25855			
Total	**1054815**	**1175896**	**1529901**	**635671**	**320000**	**788583**

2B.2 Key Stakeholders

The fourteenth Citizens' Panel survey was recently published at the time of writing this and citizens were specifically asked questions around NHS reform which was helpful given the specialist nature of some vascular procedures and helps inform our approach. To make sure we understand what patients, carers and the public think and give them the chance to shape services we will pivot into the citizens panel engagement that has been listening to what matters to people in developing the TOM. The Major Service Change Framework (published in October 2024) will also be reflected.

Within the panel survey it was explained that sometimes it is safer to provide services in a specialist unit to ensure a patient receives the highest quality care with the best outcomes. 84% of respondents strongly agreed or agreed they were willing to travel further for specialist services if it will result in better outcomes for them which is positive given the model being proposed.

Panel members were asked how long they are prepared to travel to receive a range of services. Respondents were most likely to be willing to travel regionally for routine impatient hospital care where a stay in hospital is needed for immediate care (55%) and to access outpatient hospital services (62%). With regards to specialised outpatient and inpatient hospital services, respondents were most likely to say they would be willing to travel regionally (43%), while 33% said they would be willing to travel nationally anywhere in Scotland and 24% said they would only be willing to travel locally to access this type of service. Given the geography of Scotland then travel times are important and were raised as a key matter. Links to the Transport for Health programme are established within the context of remote, rural and island framework and this will be strengthened for the TOM.

The panel were also asked about how they think access to services should be maintained when the NHS faces workforce shortages. Respondents were provided with a list of options and asked for their top two preferences. For 9 in 10 respondents (90%) expanding the range of NHS health and care professionals who provide services, while ensuring they have appropriate training and clinical support, was a top or second top priority. This was followed by providing services in the same locations but for reduced hours (60%) and reducing the number of locations at which services are provided. This again is positive and demonstrates a realistic approach from our citizens moving forward given the challenges with recruitment and retention.

Proposal Benefits of Models

The benefits we expect for patients are:

- Continued improvement of the clinical outcomes, in particular lower limb amputation, working towards achieving the best rather than average performance
- Development of skills and expertise so that patients are better able to manage their condition and recovery.
- A transparent and effective vascular network, that benefits from shared clinical expertise and clear effective pathways of care.
- Increased access to outpatient clinics in spoke units with the potential to deliver digitally.
- Improve sustainability of the existing vascular services.
- Clear lines of accountability and clinical governance across the network that puts clinicians and patients at the heart of performance monitoring and service development.
- A sustainable specialist workforce; consultant surgeons, IR consultants and specialist nurses and the wider multi-disciplinary team.
- Standardised methods and promotion of best practice across the clinical teams.
- A more productive and efficient service (minimisation of duplication and waste).
- Improved opportunities for training, research and innovation.
- Reduced length of stay for patients and more effective pathway links with community providers to support timely repatriation of patients following surgery.

The Nationally Instigated Service Change approach and the position we have established in relation to vascular with now be reflected in mapping out the next steps we now need to take to apply this and bring forward a plan.

2B.3 Service Parts

In considering development of the SOM and TOM interdependent services play a crucial role in the effective delivery of vascular services and require carefully factored into population health planning. Details on the following services were collated and the challenges that require consideration as part of the TOM are detailed below.

Co-located services • Emergency Department • Intensive care / Critical care • Interventional vascular radiology • Anaesthetics • Vascular Laboratory • Vascular diagnostic radiology	**Interdependent services** • Stroke service • Diabetes specialist hospital services and diabetic community services • Renal inpatient and outpatient units • Interventional cardiology including TAVI (trans aortic valve implantation • Cardiac surgery • Major trauma centres and trauma units • Scottish Ambulance Services (SAS)
Related services • Rehabilitation services • Prosthetic service • Podiatry • Orthotics • Community AHP & Social Work placement	**Relevant networks and screening programmes include:** • Cardiac/Stroke networks • Renal networks • Critical Care networks • Trauma networks • AAA screening programme

POVS 2021 highlights the integration needed between vascular services and a wide range of other medical specialities therefore by understanding the current arrangements we can develop the TOM.

Scottish Ambulance Service (SAS)

The Ambulance Service plays will play a pivotal role in delivery of the newly proposed sustainable operating model and target operating model for vascular services.
The new operating models will fundamentally change the way in which vascular patients are being managed within the North and East Region moving forward, and this will require SAS to adapt resourcing levels and model to ensure they are able to manage the changing demand on services whilst maintaining a safe responsive service to patients presenting with other Emergency and Urgent care needs.

In the North of Scotland for patients that required vascular services, SAS have historically conveyed patients to Raigmore in Inverness. Implementation of the new target model will result in patients initially being taken to Raigmore and then subsequently onward transferred to Ninewells in Tayside. This will result in additional inter-hospital emergency transfers and in some instances, secondary transfers and will require emergency ambulance resources to be ‘out of the inverness area’ for considerable periods of time on return journeys to and from hospital (Raigmore Hospital – Ninewells Hospital). There is therefore a requirement to ensure that there are sufficient resources in place to cover existing demands within the area.

Modelling work has been carried out using AmbSim specialist software, to identify the resources required to deliver the new North of Scotland model and maintain current response times to patients. Modelling has indicated that there would be a requirement for an additional double crewed A&E Ambulance 24/7 located in or around the Inverness areas.

Alongside the additional demands on SAS capacity in the North, there will also be the requirement to provide emergency transfers from within the Fife sub-region to both Ninewells hospital and the Royal Infirmary which will see a reduction in available resources within the East Region as well and a potential impact on patient response times. The impact of this is currently being modelled.

If the Planning and Delivery Board were to endorse the proposed operating model, a full risk assessment would also be required which would be the responsibility of the Scottish Ambulance Service as part of standard processes.

EMRS & Air Teams considerations

Vascular patients are a group with high rates of co-morbidity and vascular emergencies can present with critical illness. This may therefore result in additional professional to professional clinical advice calls and requests for escorted transfers using our Scot STAR EMRS North and West teams. This is work that is outside current funded remit and may, depending on demand levels, require additional funding.

For the time-critical vascular emergencies (leaking abdominal aortic aneurysm, critical ischaemic limb, acute intestinal ischaemia) then helicopter transfer would be a reasonable option with or without a Scot STAR EMRS team. It will be important to assess potential demand and funding required to cover the costs associated with the use of air assets.

If air assets were required, it is important to note that there are also challenges in flying into Dundee by either rotary or fixed wing. Dundee airport does not have out of hours cover. Search and Rescue (SAR may not fly into Ninewells, this would need to be assessed. If this is feasible, there would be additional costs associated for the use of SAR.

WORK IN PROGRESS: Currently being double checked by SAS to ensure correct detail is being summarised here

More widely for SAS the increased burden of long-distance road transfers is significant with both ARI and Ninewells being 2-2.5 hours by road, and the journey may need to be on 'blue lights'. This could potentially increase shift overruns, overtime payments, and also impact staff wellbeing.
There could be potential risk of an increase in moral injury and distress for staff in moving a patient who is dying from a leaking aortic aneurysm and has a high chance of not surviving the journey, by road or air, knowing that time is critical.

Consideration as part of the TOM should be given to a clinical and geographic bypass criteria for certain patients with unequivocal vascular emergencies who might be better being moved directly to the vascular centre.

WORK IN PROGRESS: Discuss and agree at next T&F group-SAS request

Current operating model challenges:

1. **Workforce Shortages**: There is a significant shortage of specialised healthcare professionals, including vascular surgeons, interventional radiologists, specialist vascular nursing, diagnostic staff and vascular scientists. This shortage impacts the ability to meet the growing demand for vascular services. Recruitment and retention has been a key issue, particularly in the North of Scotland.
2. **Increasing Demand**: The aging population and the rise in chronic conditions such as diabetes and hypertension have led to an increased demand for vascular services. This puts pressure on existing resources and has led to longer waiting times for patients.
3. **Geographical Disparities**: Ensuring equitable access to specialised vascular care across different regions of Scotland has been challenging. Patients in remote or rural areas are facing difficulties in accessing timely and specialised care.
4. **Technological Advancements**: Keeping up with rapid advancements in medical technology and ensuring that all healthcare facilities are equipped with the latest tools and equipment are a logistical and financial challenge.
5. **Infrastructure locality and access**: There is a disparity in availability of hybrid theatres, access to theatres and postoperative ICU beds. Establishing and maintaining specialised infrastructure requires substantial investment therefore ensuring the right resource is appropriately funded and in the right place to deliver for the population is essential.

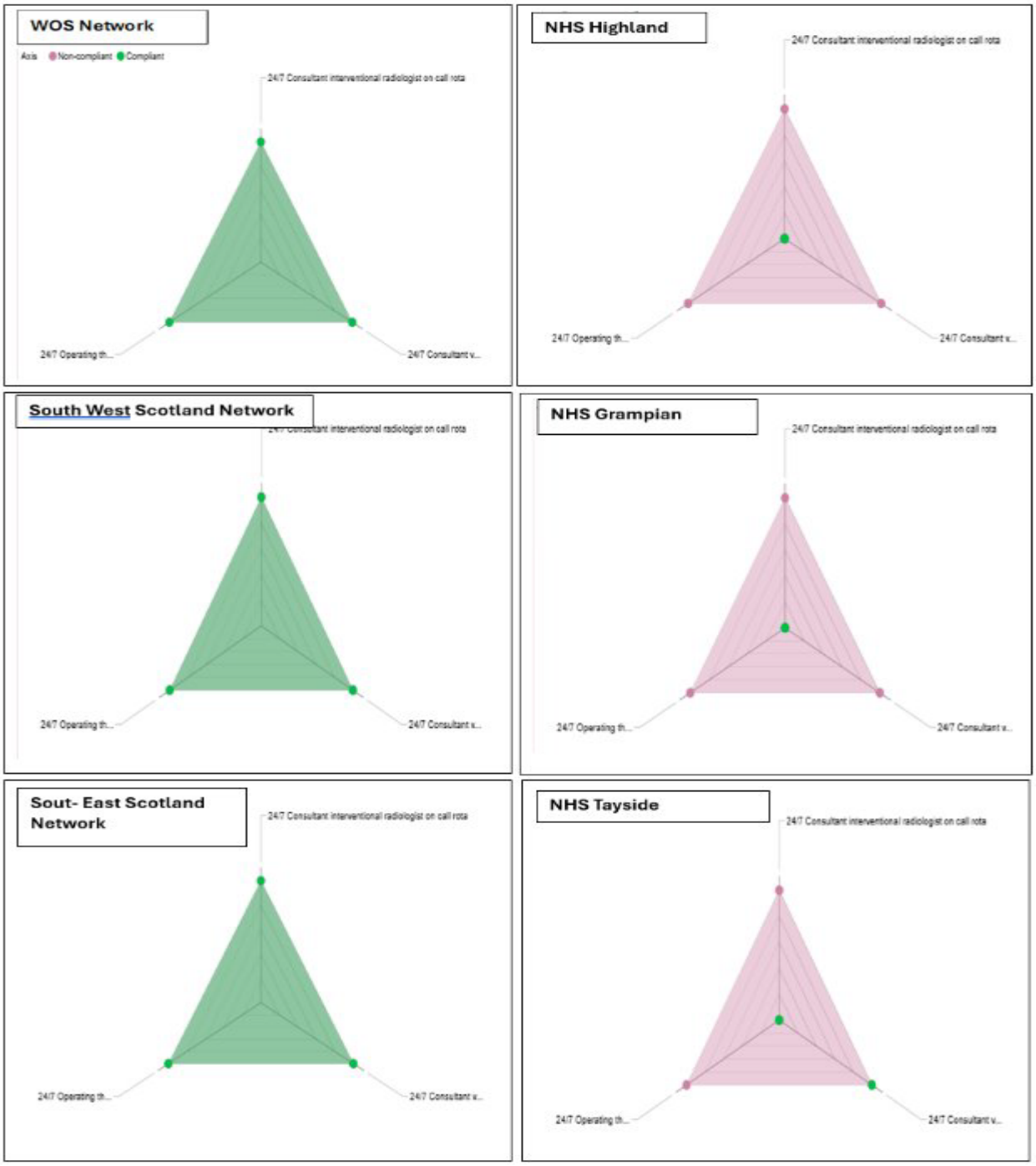
Addressing these challenges requires strategic planning, investment in workforce development, and ongoing efforts to improve service delivery and patient care, therefore require to be addressed as part of the target operating model.

To understand availability of resource and infrastructure across NHS Scotland information was collated. Within the current model NHS Scotland employs a regional vascular network model with associated arterial centres in the West and East to deliver vascular services. In the North there is no functional network although collaborative working does take place. The network model in the East and West ensures that specialised care is accessible across different regions through collaboration between hospitals and healthcare providers.

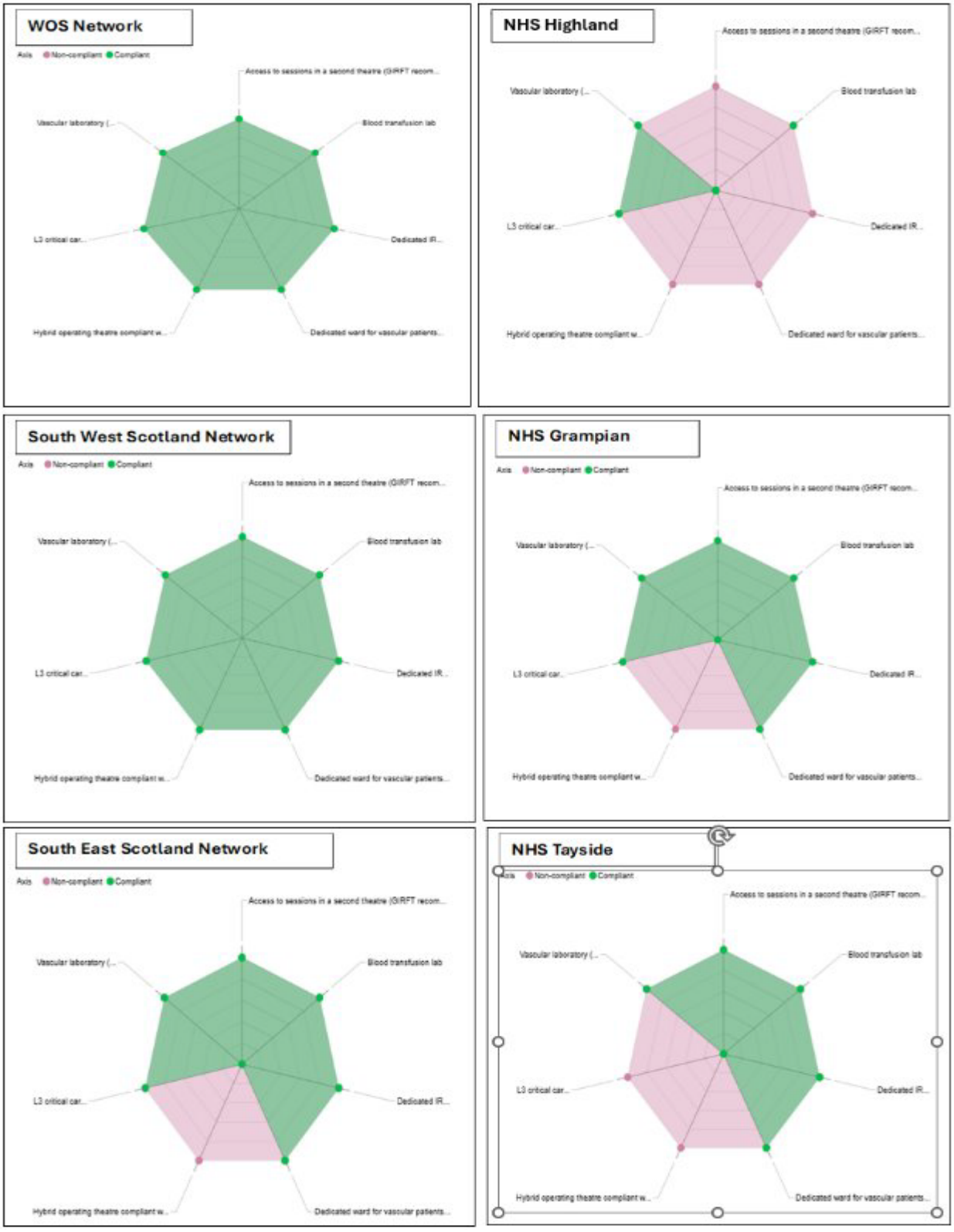
The current status across NHS Scotland in relation to staffing and infrastructure has been mapped against the guidelines (POVs2021) on what arterial centres should provide as a minimum. This is summarised in the following radar diagrams:

Staffing	**Infrastructure**
24/7 Consultant vascular surgeon on call rota	Level 3 critical care beds
24/7 Consultant interventional radiologist on call rota	Dedicated ward for vascular patients (GIRFT supports provision of monitored recovery beds on the vascular ward
24/7 Operating theatre, 'hybrid theatre' and interventional radiology room readily available and appropriately staffed	Access to sessions in a second theatre (GIRFT recommend that this is 7 days a week)
	Hybrid operating theatre compliant with MHRA guidance for performing aortic procedures
	Dedicated interventional radiology suite with day care beds
	Vascular laboratory (or equivalent)
	Blood transfusion laboratory

WORK IN PROGRESS: Review and display as landscape-IMS reviewing if a clearer visual can be provided for next 2 figures

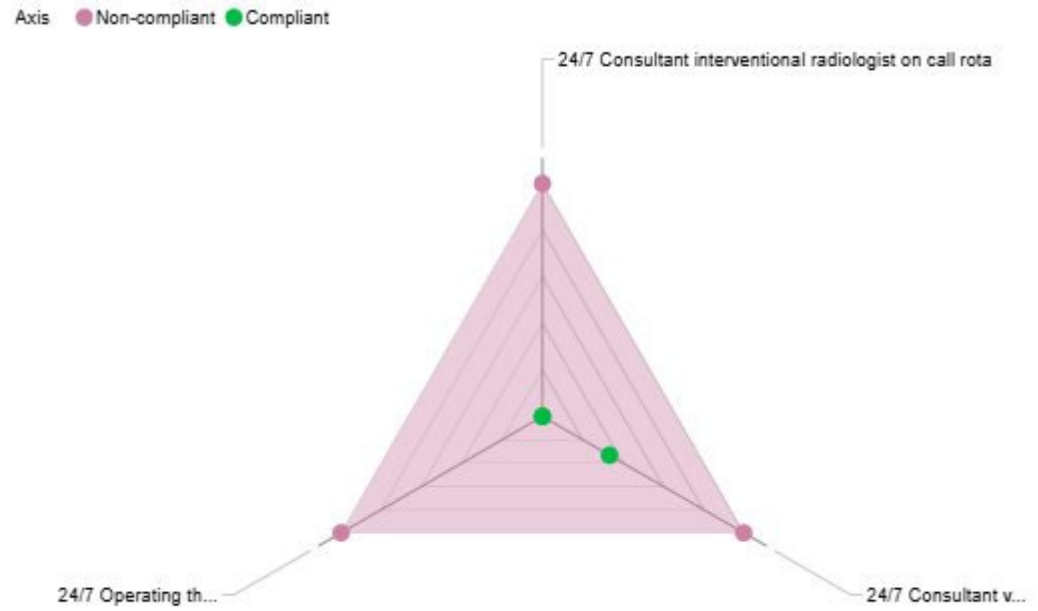


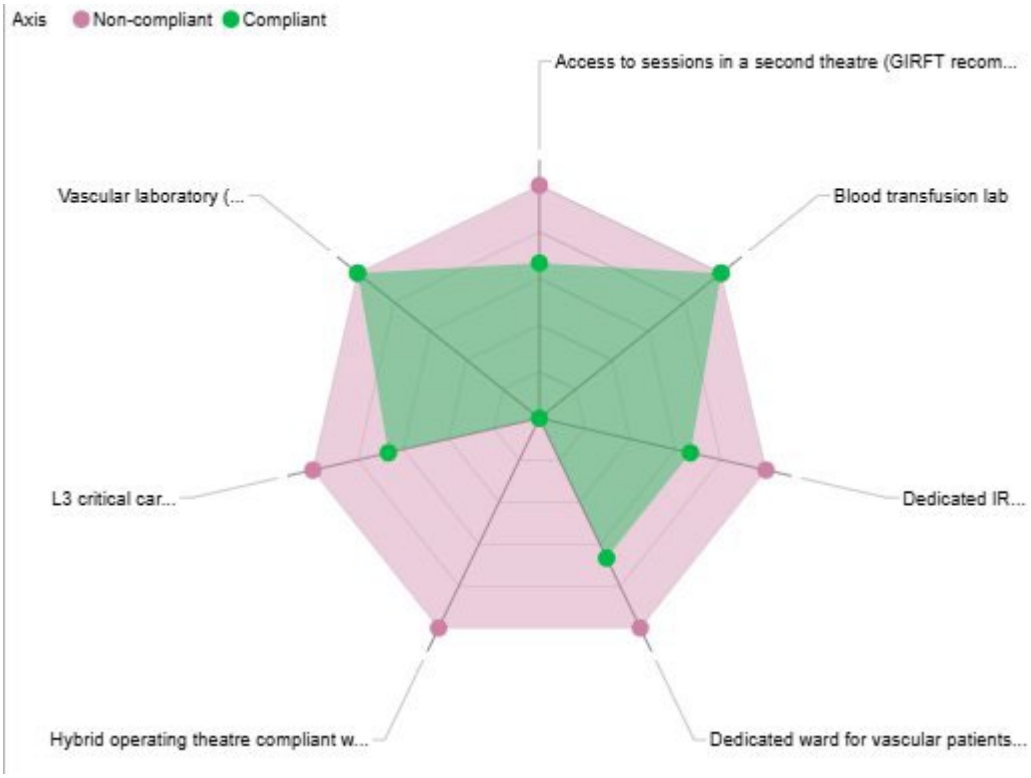
In terms of staffing the West and South East of Scotland have a workforce more in line with the guidelines. In contrast NHS Grampian, Tayside and Highland are in a more vulnerable position under the current delivery model.



This is a similar situation when we review the infrastructure.

By forming a North of Scotland network, NHS Grampian, Highland and Tayside can enhance access to staffing and infrastructure, ensuring better alignment with the guidelines across the network.





2B.4 Patient Pathways & Systems Mapping

WORK IN PROGRESS: P Blair updating for review and discussion at next meeting

To understand the impact of any changes and develop the TOM the pathways have been mapped and are summarised below:

	Stages	PAD Pathway	AAA Pathway	Carotid Artery Disease Pathway	CLTI Pathway	Venous Leg Ulcer Pathway	Carotid Endarterectomy	Emergency Open Surgical AAA Repair	Elective Open Surgical AAA Repair	Emergency Endovascular AAA Repair (EVAR)	Elective Endovascular AAA Repair (EVAR)	Lower Limb Revascularisation	Major Lower Limb Amputation	Combined AAA Elective Procedures	Varicose Veins	Thoraco-abdominal Aortic Aneurysm (TAAA)	Vascular Access Surgery	Endovenous Laser Treatment (EVLT)	Dialysis Access Procedures	Thoracic Endovascular Aortic Repair (TEVAR)	Current Model	Target Model		
																						Arterial	**Non-Arterial**	**Primary care**
DIAGNOSIS	**Screening**		✓																		Hospital			
	Initial Assessment	✓		✓	✓																Hospital			
	Urgent Assessment				✓																Hospital			
	Diagnostic Imaging	✓			✓	✓															Hospital			
	Multidisciplinary Team (MDT) Review				✓																Hospital			
TREATMENT	**Elective Repair**		✓						✓		✓										Hospital			
	Surgical Intervention			✓	✓		✓						✓								Hospital			

TREATMENT	Compression Therapy					✓															Primary Care			
	Risk Factor Modification	✓		✓																	Primary Care			
	Medical Management	✓																			Primary Care			
	Supervised Exercise Therapy	✓																			Hospital			
	Surveillance		✓																		Hospital			
	Revascularisation	✓		✓	✓							✓									Hospital			
	Emergency Intervention		✓					✓		✓											Hospital			
	Wound Care				✓	✓															Primary Care			
	Rehabilitation				✓																Primary Care			
	Post-Operative Care		✓					✓	✓	✓	✓										Hospital			
Follow Up	Long-Term Follow-Up	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Primary Care			

Service Access Points: Highlight areas where services are accessible and areas with limited access. This shows where bottlenecks in the system are, including which services require more resources, input and capacities to deliver the service better. Patient Pathways: Map out the typical pathway's patients follow when seeking help, including referrals, intake processes, and ongoing care including timeline. The relationships between different service providers and how patient pathways fit in within the current system is important to represent various types of connections, such as causality, influence, communication, or dependency. When drawing connections highlight feedback mechanisms that exist within the system. These loops should show how changes or actions in one part of the system can loop back and affect other parts, creating dynamic behaviours, often in a cyclical manner.

2B.5 Policies and Regulations

Policies and initiatives aimed at improving vascular health, such as the Heart Disease Action Plan by the Scottish Government, have emphasised the importance of early detection and continuous management. These initiatives have driven an increase in outpatient visits.

2B.6 Gaps

The accuracy of vascular surgical procedure data from NHS Scotland, the National Vascular Registry (NVR) and the service providers is generally high, but there are some known limitations which are detailed below.

1. **Data Collection and Reporting**:
    a. The NVR and NHS Scotland dashboards rely on accurate data entry from hospitals and healthcare providers. Variations in data collection practices and reporting standards can lead to inconsistencies and under reporting of procedures. To overcome known areas of poor compliance each centre was asked to supply validated data. This was then sense checked by IMS, with issues queried with the service providers. Where relevant other sources of data were reviewed by IMS to sense check the data.

2. **Impact of the COVID-19 Pandemic**:
    a. The COVID-19 pandemic disrupted healthcare services, including elective surgeries. This led to a temporary reduction in the number of procedures performed and reported, which may affect trend analysis

3. **Surveillance and Inclusion Criteria**:
    a. Certain procedures, such as planned major vascular surgeries, are included in mandatory surveillance programs. However, there may be delays in achieving robust data collection across all NHS boards

4. **Surgical Site Infection (SSI) Surveillance**:
    a. The Scottish Surgical Site Infection (SSI) surveillance program includes vascular procedures, but there may be gaps in data for specific procedures until comprehensive data collection is established

5. **Regional Variations**:
    a. Differences in healthcare access and service provision across regions can lead to variations in the number of procedures performed and reported

Overall, while the data is reliable and provides valuable insights, it's important to consider these factors when interpreting the data.

These gaps have been factored in during interpretation and analysis of the data.

The accuracy of vascular surgical procedure data from NHS Scotland, the National Vascular Registry (NVR) is generally high but compliance is very poor in some areas.

3A. DEFINE – What does the data tell us?

3A.1 Epidemiological Data

Population Data:

Scotland (2025): 5,479,700

Prevalence and Incidence:

1. **Peripheral Arterial Disease (PAD)**:
    a. **Prevalence**: Approximately 200,000 people in Scotland are living with PAD
    b. **Incidence**: The annual incidence rate of PAD is around 1.5% among adults aged 50 and older.
2. **Abdominal Aortic Aneurysm (AAA)**:
    a. **Prevalence**: The prevalence of AAA in Scotland is about 1.3% in men aged 65 and older.
    b. **Incidence**: The incidence rate of AAA is approximately 0.4% per year in the same demographic
3. **Carotid Artery Disease**:
    a. **Prevalence**: Around 5% of adults aged 65 and older in Scotland have significant carotid artery stenosis
    b. **Incidence**: The annual incidence rate of carotid artery disease is about 0.5% in this age group.

WORK IN PROGRESS: IMS doing a final review of the data. Review and conclude referencing and add reference list as appendix

Sources:

- 1. Public Health Scotland's Scottish Burden of Disease Study
- 2. British Heart Foundation (BHF) Scotland CVD Factsheet

3A.2 Service Utilisation

Current model general trends observed in hospital admissions for vascular conditions:

Admission Rates

- **NHS Highland**: Moderate rate of hospital admissions for vascular conditions, with a significant portion of the population living in rural areas, which can impact access to healthcare services. Focus on reaching rural populations through mobile clinics and telehealth services.
- **NHS Tayside**: Relatively high rate of admissions, partly due to the presence of major urban centres like Dundee, which have higher population densities and associated risk factors
- **NHS Lothian**: Encompassing Edinburgh, has one of the highest rates of hospital admissions for vascular conditions. This is attributed to its large and diverse population, including a significant number of elderly residents
- **NHS Greater Glasgow & Clyde**: This region has the highest rate of hospital admissions for vascular conditions in Scotland. The high population density, combined with socioeconomic factors, contributes to the elevated rates
- **NHS Lanarkshire**: Also reports high admission rates, influenced by both urban and semi-urban populations with varying levels of access to healthcare services
- **NHS Grampian**: which includes Aberdeen, has moderate to high admission rates. The region's mix of urban and rural areas affects the overall rates of hospital admissions for vascular conditions

New Outpatient Appointments

There has been a steady increase in new outpatient appointments for vascular health over the past few years. This rise is attributed to enhanced screening programs and increased awareness of vascular conditions

Follow-Up Visits

Follow-up visits have also seen an upward trend, reflecting the need for ongoing management and monitoring of chronic vascular conditions such as peripheral arterial disease and diabetes

The approx. scale of the demand for new outpatient appointment and follow up visits is shown in the table below:

Table Z

NHS Region	New Outpatient Appointments (per year)	Follow-Up Visits (per year)
NHS Highland	1,200	3,000
NHS Tayside	2,800	6,000
NHS Lothian	3,500	7,500
NHS Greater Glasgow & Clyde	4,000	9,000
NHS Lanarkshire	3,000	6,500
NHS Grampian	2,500	5,000

WORK IN PROGRESS: IMS undertaking final review and validation .Review and conclude referencing and add reference list as appendix (1Outpatient Activity - Scottish Health and Social Care Open Data2Annual Outpatient Activity - Scottish Health and Social Care Open Data3Acute hospital activity and NHS beds information (annual)

Procedures

Trends indicate a shift towards less invasive procedures

WORK IN PROGRESS: Awaiting P Blair section for inclusion. Review and conclude referencing and add reference list as appendix

(ref 1Vascular care – State of the Nation 2024 report (NVR)). Table Y summarised the procedure types, demand, importance and if Interventional Radiologist support is required.

Procedure Type	Demand	Importance	Interventional Radiologist Support
Lower Limb Revascularisation	High	Critical for restoring blood flow in patients with Peripheral Artery Disease (PAD); prevents limb loss. These are critical for patients with chronic limb-threatening ischemia (CLTI). The demand for these procedures has increased, with a focus on ensuring timely care to prevent major amputations	Yes
Dialysis Access Procedures	High	Essential for patients requiring haemodialysis; ensures effective dialysis treatment.	No
Endovenous Laser Treatment (EVLT)	High	Minimally invasive treatment for varicose veins; improves patient outcomes and recovery time.	Yes
Carotid Endarterectomy	Moderate	Prevents strokes by removing plaque from carotid arteries. This procedure is crucial for preventing strokes in patients with significant carotid artery stenosis.	No
Abdominal Aortic Aneurysm (AAA)	Moderate	Prevents life-threatening aortic ruptures; includes both open surgical and endovascular repairs.	Yes
Major Lower Limb Amputation	Moderate	Performed in severe cases of PAD or diabetic complications; prevents further health deterioration There has been a notable rise in the number of major lower limb amputations, particularly among patients with peripheral arterial disease (PAD). This increase highlights the need for early intervention and effective management of vascular conditions	No
Elective Endovascular AAA Repair (EVAR)	Moderate	Minimally invasive repair of abdominal aortic aneurysms; reduces recovery time and complications.	Yes
Complex AAA Elective Procedures	Moderate	Includes various elective procedures for AAA; important for preventing aneurysm rupture.	Yes
Elective Open Surgical AAA Repair	Moderate	Traditional surgical repair of abdominal aortic aneurysms; used when endovascular repair is not suitable.	Yes
Emergency Open Surgical AAA Repair	Low	Performed in emergency situations to repair ruptured aneurysms; life-saving procedure.	Yes
Emergency Endovascular AAA Repair (EVAR)	Low	Minimally invasive emergency repair of ruptured aneurysms	Yes
Thoracic Endovascular Aortic Repair (TEVAR)	Low	Minimally invasive repair of thoracic aortic aneurysms; prevents life-threatening complications.	Yes
Thoraco-abdominal Aortic Aneurysm (TAAA)	Low	Complex repair of aneurysms involving both thoracic and abdominal aorta; critical for preventing rupture.	Yes

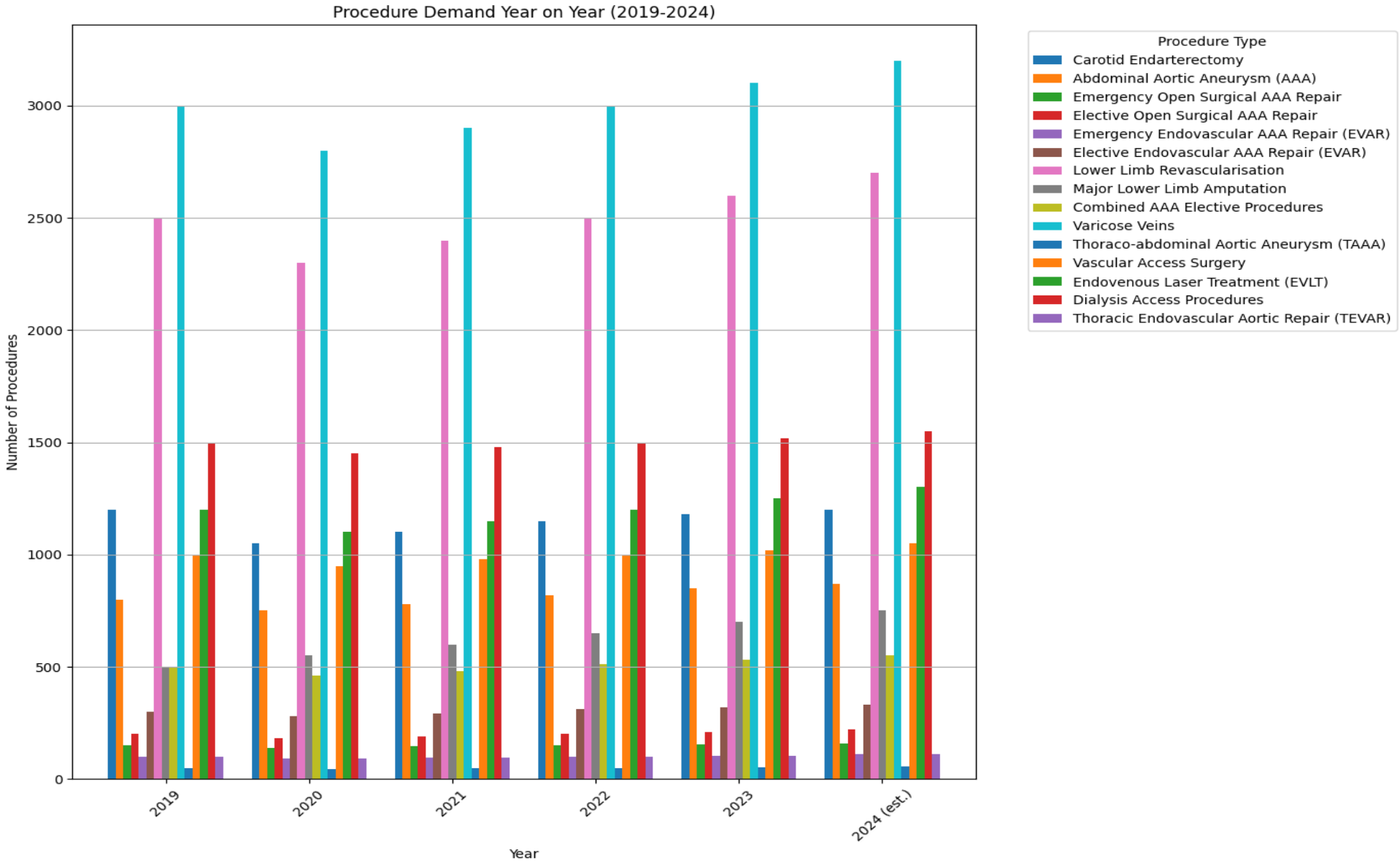
WORK IN PROGRESS: Move to appendices, summarise here and reference

The vascular procedures projected to experience the most notable growth:

1. Lower Limb Revascularisation: This includes bypass surgery, angioplasty and stenting for peripheral artery disease (PAD). The demand is expected to rise due to the increasing prevalence of PAD and diabetes.

2. Major Lower Limb Amputation: The number of these procedures has been increasing, partly due to complications from diabetes. Recent reports indicate a significant rise in diabetes-related lower limb amputations in the UK.
3. Aortic Procedures: Although incidence of AAA is slightly reducing Aortic dissection is increasing with a variety of treatment options available.

Figure U: Vascular Procedures split per procedure type 2019 to 2024



Procedure Type	2019	2020	2021	2022	2023	2024 (est.)
Carotid Endarterectomy	1,200	1,050	1,100	1,150	1,180	1,200
Abdominal Aortic Aneurysm (AAA)	800	750	780	820	850	870
Emergency Open Surgical AAA Repair	150	140	145	150	155	160
Elective Open Surgical AAA Repair	200	180	190	200	210	220
Emergency Endovascular AAA Repair (EVAR)	100	90	95	100	105	110
Elective Endovascular AAA Repair (EVAR)	300	280	290	310	320	330
Lower Limb Revascularisation	**2,500**	**2,300**	**2,400**	**2,500**	**2,600**	**2,700**
Major Lower Limb Amputation	500	550	600	650	700	750
Combined AAA Elective Procedures	500	460	480	510	530	550
Varicose Veins	3,000	2,800	2,900	3,000	3,100	3,200
Thoraco-abdominal Aortic Aneurysm (TAAA)	50	45	48	50	52	55
Vascular Access Surgery	1,000	950	980	1,000	1,020	1,050
Endovenous Laser Treatment (EVLT)	1,200	1,100	1,150	1,200	1,250	1,300
Dialysis Access Procedures	1,500	1,450	1,480	1,500	1,520	1,550
Thoracic Endovascular Aortic Repair (TEVAR)	100	90	95	100	105	110
Total Procedures	**13,100**	**12,235**	**12,733**	**13,240**	**13,697**	**14,155**

WORK IN PROGRESS: IMS undertaking review and final validation of previous data table and chart and diff way to display the graph to make it clearer

The aforementioned data has been collated and validated through a number of NHS Scotland sources including Public Health Scotland (PHS), the Scottish Atlas of Variation, the Scottish Surgical Site Infection (SSI) surveillance program and from the service providers. The National Vascular Registry (NVR) has also been reviewed and the figures for Scotland extracted from this broader dataset to ensure they specifically represent NHS Scotland. The data has then been carefully categorised to avoid double counting and to ensure the data is as robust as it can be. Each procedure type has been listed separately, and the figures represent distinct categories of surgeries. For example, emergency and elective repairs for abdominal aortic aneurysms (AAA) are listed separately to ensure clarity and avoid overlap. This information has been collated into a bespoke population level planning dashboard created by NSD's IMS team to support this and future population level planning workstreams.

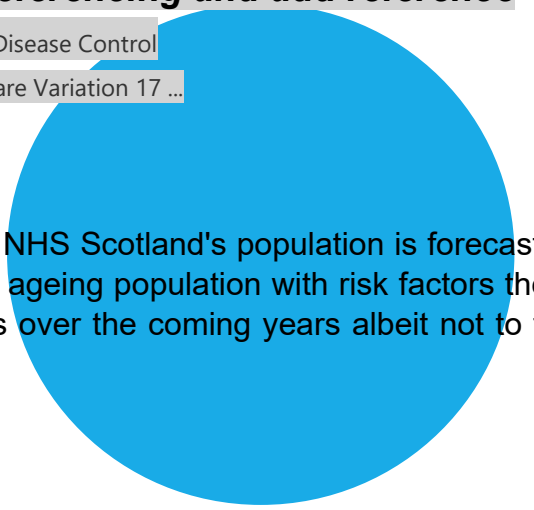
WORK IN PROGRESS: Review and conclude referencing and add reference list as appendix

Anticipated Future Demand
To determine a target operating model, it is important to understand the forecast increase in demand and understand the estimated percentage of the population who may require each procedure type over the next 5 years.

To aid the design of the target operating model the forecasted annual percentage increases for each vascular procedure type have been collated specifically for the Scottish population (Table W). These estimates are based on historical data analysis, statistical modelling, and expert input including data from PHS, National Vascular Registry (NVR) and the Vascular Services Quality Improvement Programme (VSQIP), which include detailed insights and forecasts for NHS Scotland.

WORK IN PROGRESS: Review and conclude referencing and add reference list as appendix- 1National Health Statistics Reports - Centers for Disease Control

Sources PHS, NVR and 1Cardiovascular dashboard - Scottish Atlas of Healthcare Variation 17 ...
2Scottish Atlas of Healthcare Variation - Public Health Scotland



Whilst NVR and HQIP state a fall in carotid and AAA and NHS Scotland's population is forecast to decline over the next five years, as NHS Scotland has an ageing population with risk factors there is still a forecast increase in demand of these procedures over the coming years albeit not to the same extent in previous years.

Table W:

Procedure Type	Estimated % of Population	Annual % Increase in Demand
Carotid Endarterectomy	0.05%	1.6%
Abdominal Aortic Aneurysm (AAA)	0.10%	1.2%
Emergency Open Surgical AAA Repair	0.02%	3.6%
Elective Open Surgical AAA Repair	0.03%	2.8%
Emergency Endovascular AAA Repair (EVAR)	0.01%	5.0%
Elective Endovascular AAA Repair (EVAR)	0.04%	3.4%
Lower Limb Revascularisation	0.15%	1.8%
Major Lower Limb Amputation	0.02%	1.3%
Combined AAA Elective Procedures	0.07%	1.8%
Varicose Veins	0.20%	2.9%
Thoraco-abdominal Aortic Aneurysm (TAAA)	0.01%	3.2%
Vascular Access Surgery	0.05%	2.0%
Endovenous Laser Treatment (EVLT)	0.10%	1.5%
Dialysis Access Procedures	0.08%	1.9%
Thoracic Endovascular Aortic Repair (TEVAR)	0.01%	4.0%

WORK IN PROGRESS: IMS undertaking a final review and validation of data and modelling

Both the **Estimated % of Population** and the **Annual % Increase in Demand** are crucial for effective population health planning for several reasons:

1. **Current Need Assessment**:
   - The **Estimated % of Population** provides a snapshot of the current prevalence of conditions requiring specific vascular procedures. This ensures we understand the existing burden on the healthcare system and allocate resources accordingly.
2. **Future Demand Forecasting**:
   - The **Annual % Increase in Demand** projects how the need for these procedures will grow over time. This is essential for anticipating future healthcare needs and ensuring that the system can accommodate increasing demand.
3. **Resource Allocation**:
   - By knowing both the current and future needs, we can make informed decisions about resource allocation, such as staffing, equipment, and funding. This ensures that resources are used efficiently and effectively.
4. **Infrastructure Planning**:
   - Understanding future demand helps in planning infrastructure development, such as expanding facilities or investing in new technologies, to meet the anticipated increase in procedure volumes.
5. **Policy Development**:

- Accurate projections inform policy development and strategic planning. Policymakers can create targeted interventions and preventive measures to manage the growing demand and improve patient outcomes.

6. **Risk Management**:
   - Identifying trends in procedure demand helps in risk management by preparing for potential surges in specific healthcare needs. This proactive approach can mitigate the impact of sudden increases in demand.

By combining these two types of data, we can design a target operating model that addresses both current and future healthcare needs, ensuring a robust and responsive healthcare system.

WORK IN PROGRESS: Review and conclude referencing and add reference list as appendix

3A.3 Outcomes and Disparities

Comparison of Clinical Outcomes Over Time in NHS Scotland

Based on the latest data from the National Vascular Registry (NVR):

WORK IN PROGRESS: Awaiting P Blair data limitations to support analysis of this section. IMS undertaking final review and validation.

Angioplasty / Stents: The adjusted rate of postoperative in-hospital death for lower limb angioplasty/stents in NHS Scotland was within the expected range of the national average of 1.6% for 2021-2023.

Bypass / Open Procedures: The adjusted postoperative in-hospital mortality rates for bypass/open procedures in NHS Scotland were within the expected range given the volume of cases performed, with a national average of 2.9% for 2021-2023.

Overall, NHS Scotland's performance aligns closely with the national averages, with some variations in specific categories.

The following regional disparities in mortality and morbidity based on the latest data from the National Vascular Registry (NVR):

Mortality Rates

- NHS Greater Glasgow and Clyde: Higher-than-expected mortality rates for non-elective lower limb bypass procedures.
- NHS Lothian: Instances of higher mortality rates for elective lower limb angioplasty/stents.
- NHS Tayside: Higher mortality rates for non-elective lower limb angioplasty/stents compared to the national standard.

Morbidity Rates

- NHS Highland: Morbidity rates for elective lower limb bypass procedures are slightly higher than the national average.
- NHS Fife: Higher morbidity rates for non-elective lower limb angioplasty/stents.

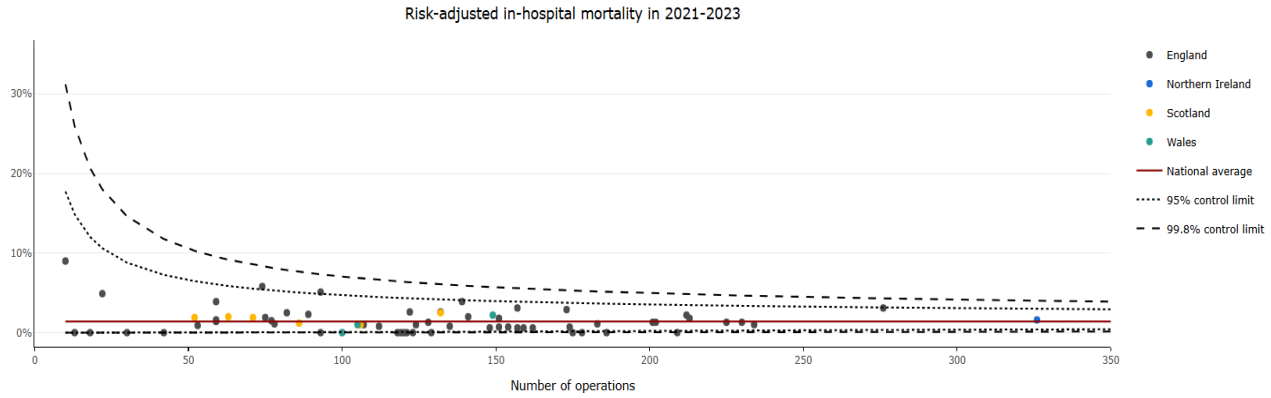
Complication Rates

- **NHS Grampian:** Higher complication rates for non-elective lower limb angioplasty/stents.

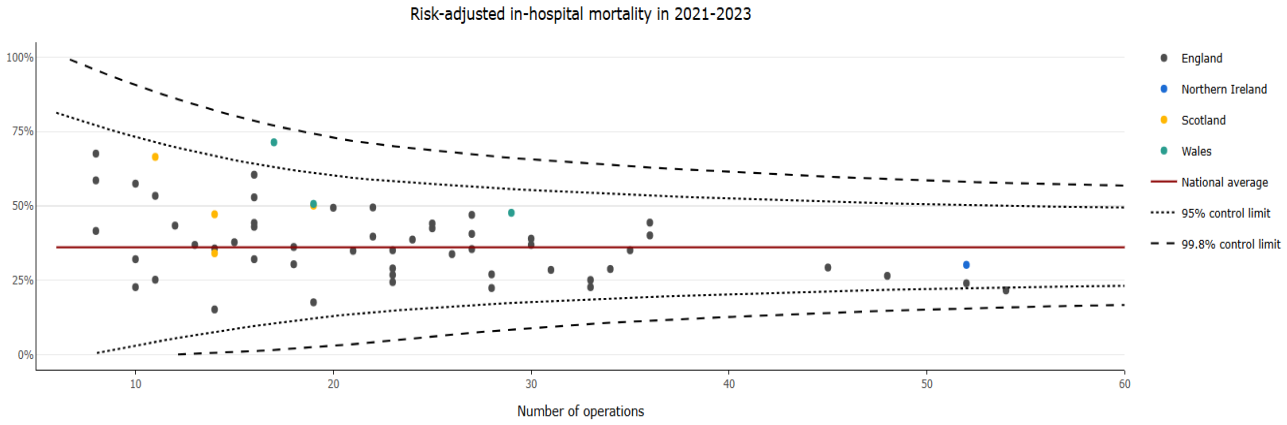
Data Source: Vascular Services Quality Improvement Programme (VSQIP) 2024 State of the Nation Report.

It is important to note that regional disparities in mortality, morbidity, and complications for vascular surgical services across NHS Scotland are influenced by socioeconomic factors, geographical challenges, variations in clinical practices, resource allocation, and patient comorbidities. For instance, NHS Greater Glasgow and Clyde has higher-than-expected mortality rates for non-elective lower limb bypass procedures, while NHS Lothian and NHS Tayside show higher rates for elective and non-elective angioplasty/stents, respectively, however case mix and co-morbidities are important factors that influence this. Additionally, disparities in data submission to the National Vascular Registry (NVR) contribute to these variations, with NHS Scotland achieving an estimated case ascertainment rate of only 60%, compared to 93% for England and 100% for Wales and Northern Ireland.

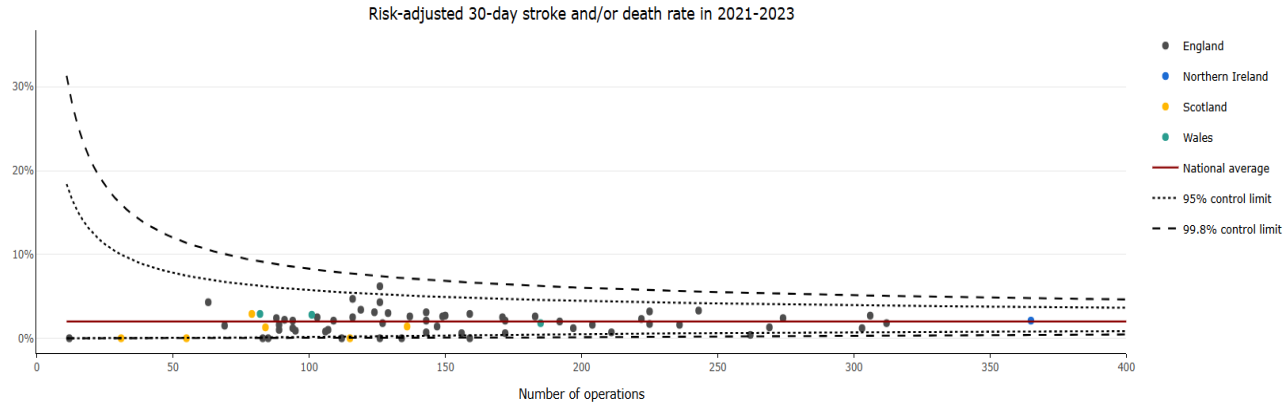
Elective AAA



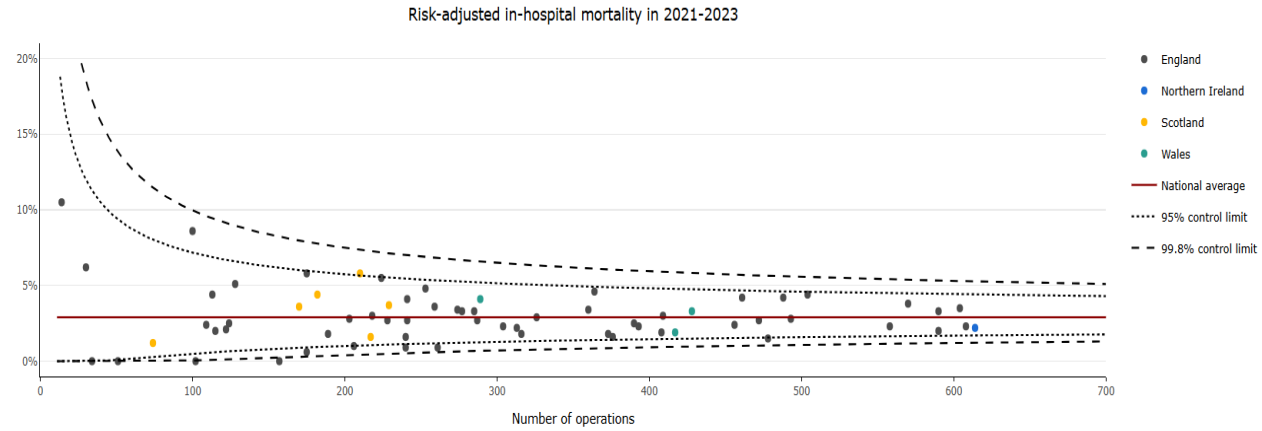
Other Aortic



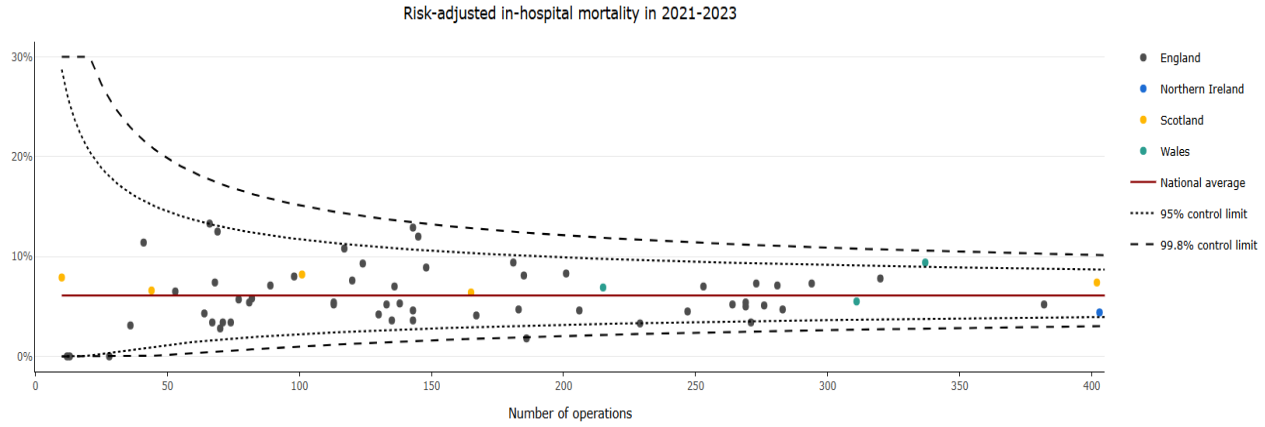
Carotid Endarterectomy



Surgical lower limb revascularisation



Amputation



WORK IN PROGRESS: IMS doing final review and validation, to be moved to appendices and summarised/referenced here

There seems to be a correlation between the number of procedures performed and the rates of mortality and morbidity. Regions with higher procedure numbers tend to have higher rates of complications, which would appear to be due to the greater complexity and volume of cases handled.

There is a published body of evidence that patient outcomes from major vascular surgery are related to caseload. Analysis (2012) of UK AAA repair in quartiles from the low volume units (mean 10 cases per year) through to the high-volume units (mean 150 cases per year) showed a consistent reduction in mortality across the quartiles from 4.4% to 1.9%.

In another published study, for both elective and emergency open AAA repair, increasing mortality benefit extends beyond 100 repairs per year.

Recent data from national vascular registries suggests a minimum threshold for open AAA repair of 13-16 cases per year.

WORK IN PROGRESS: Review reference tab and add as appendix, reference here

These trends highlight the importance of understanding regional variations in clinical outcomes to improve vascular care services across NHS Scotland, therefore we need to look at wider data and evidence to support health planning.

In summary the State of the Nation report highlights a number of important aspects of vascular care across the UK that are important for population health planning and development of a TOM. Firstly, the mix of procedures continues to change. Over the last three years, the number of procedures for elective infra-renal AAA repair and repair of ruptured AAA have decreased. The number of carotid endarterectomies has remained stable since 2021 but is almost half of the number performed in 2014. A greater number of lower limb endovascular revascularisations are being entered onto the NVR, but the case-ascertainment rate could be improved.

WORK IN PROGRESS: Explain modelling in more detail to address why this differs from earlier table due to impact of ageing popln and risk factors

The State of the Nation report recommends that NHS vascular units and vascular networks should aim to identify barriers and facilitators to the efficient collection of data on endovascular revascularisation, particularly for day case procedures and that arterial centre or non-arterial centres performing lower limb endovascular procedures should enter them on the NVR. It is f note that a new NVR outlier policy will operate from 2025, and units that do not submit any data on eligible procedures will be considered an outlier.

Addressing these disparities requires targeted interventions, including improving access to care in deprived and rural areas, standardising clinical practices, and ensuring equitable resource allocation across NHS Scotland.

3B. DEFINE - Population Needs Assessment

3B.1 Population Demographics

As of 2025, Scotland's population is approximately 5.48 million [4]. Based on the population projections and relevant literature, the vascular procedure demand is forecast to increase over the next five years driven by an aging population and the prevalence of risk factors like diabetes and high blood pressure. Scotland's trends are in line with the broader UK trends, though the growth rate may be slightly higher due to demographic factors such as Scotland's aging population and higher prevalence of certain risk factors [3, 7, 9].

Population Demographics in Scotland and Their Impact on Vascular Surgical Service Requirements

1. Age Distribution:

- **Current Data**: The population of Scotland is ageing, with a significant increase in the number of people aged 65 and over. As of 2025, the population distribution by age group is as follows:
  - 0-14 years: 850,000
  - 15-24 years: 650,000
  - 25-44 years: 1,350,000
  - 45-64 years: 1,250,000
  - 65-74 years: 700,000
  - 75+ years: 600,000
- **Impact**: The ageing population leads to a higher prevalence of vascular diseases such as peripheral arterial disease (PAD), abdominal aortic aneurysm (AAA), and carotid artery disease. This increases the demand for vascular surgical services, including revascularisation procedures and aneurysm repairs.

2. Gender Distribution:

- **Current Data**: The gender distribution in Scotland as of 2025 is approximately:
  - Male: 2,700,000
  - Female: 2,800,000
- **Impact**: Men are generally at a higher risk of developing vascular diseases, which means a higher demand for vascular surgeries among the male population. However, women also require significant vascular care, especially as they age.

3. Socioeconomic Status:

- **Current Data**: The population distribution by socioeconomic status in 2025 is:
  - Low Income: 1,500,000
  - Middle Income: 2,500,000
  - High Income: 1,500,000
- **Impact**: Lower socioeconomic status is associated with higher rates of risk factors such as smoking, diabetes, and hypertension, leading to increased vascular disease prevalence and surgical needs. Access to healthcare and preventative measures can also vary by socioeconomic status, affecting overall demand for services.

4. Geographic Distribution:

- **Current Data**: The geographic distribution of the population in Scotland in 2025 is:
  - Urban: 4,000,000
  - Rural: 1,500,000
- **Impact**: Urban areas tend to have better access to healthcare facilities, including vascular services. However, rural areas may face challenges in accessing timely vascular care, leading to potential delays in treatment and increased demand for emergency interventions.

Data Source: National Records of Scotland

WORK IN PROGRESS: IMS undertaking final review and validation of data, referencing to be added

3B.2 Risk Factors

Key risk factors for vascular diseases include diabetes, smoking, high cholesterol, and high blood pressure [5] and the aging population in Scotland will also contribute to the increasing demand for vascular procedures [6].

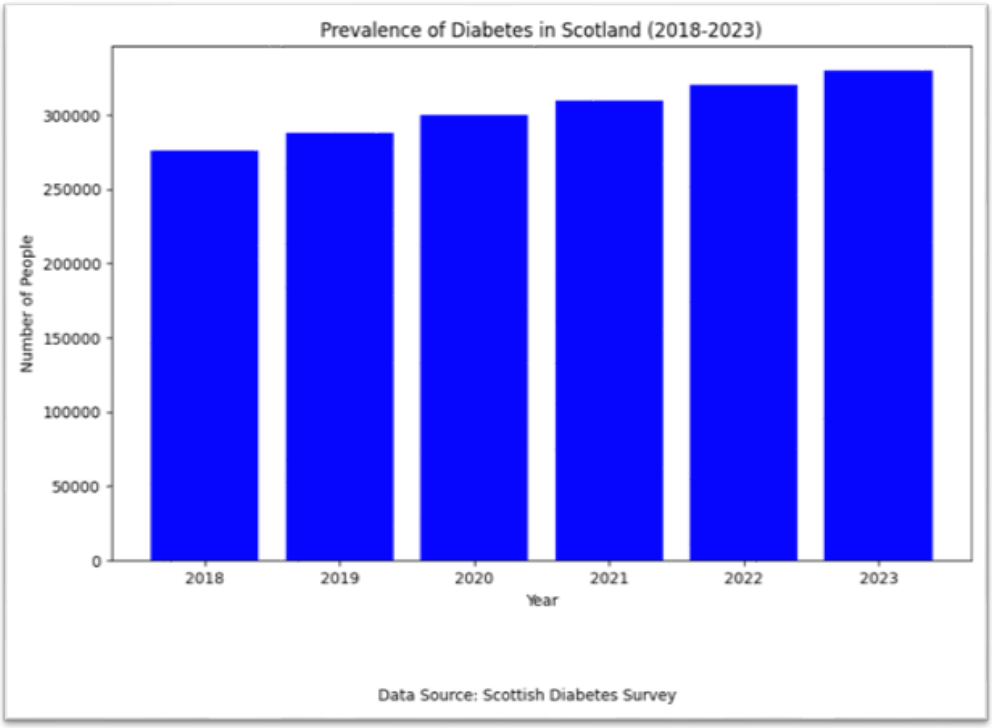
1. Smoking:

- **Prevalence**: Smoking remains a significant risk factor for vascular diseases. In Scotland, around 15% of adults smoke.
- **Impact**: Smokers are at a higher risk of developing peripheral arterial disease (PAD), abdominal aortic aneurysm (AAA), and carotid artery disease. Smoking cessation programs are crucial in reducing the incidence of these conditions and the need for surgical interventions.

2. Diabetes:

- **Prevalence**: The number of people with type 2 diabetes in Scotland continues to increase (Fig.1). As of the latest data, over **320,000 people** have been diagnosed with diabetes in Scotland [1]. Around **11%** of these individuals have type 1 diabetes, while the remainder have type 2 diabetes [1]. This represents a significant increase from previous years, reflecting the ongoing rise in diabetes cases. The trend is closely linked to rising rates of obesity, suggesting that the incidence and prevalence of type 2 diabetes will continue to grow, necessitating increased access to vascular expertise [1].
- **Impact**: Diabetes significantly increases the risk of vascular complications, including PAD and diabetic foot ulcers. This leads to a higher demand for revascularisation procedures and, in severe cases, amputations.

Figure X: Prevalence of Diabetes in Scotland



3. Hypertension:

- **Prevalence**: Approximately 30% of adults in Scotland have hypertension.
- **Impact**: Hypertension is a major risk factor for atherosclerosis, which can lead to conditions requiring vascular surgery, such as carotid artery disease and AAA. Effective management of blood pressure is essential to reduce the need for surgical interventions.

4. Obesity:

- **Prevalence**: Around 29% of adults in Scotland are classified as obese.

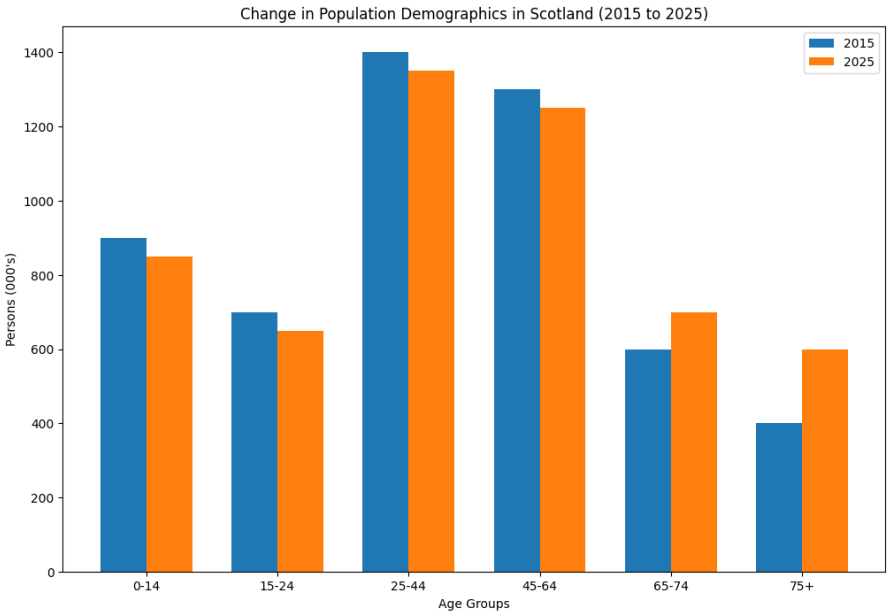
- **Impact**: Obesity is closely linked to the development of type 2 diabetes and hypertension, both of which increase the risk of vascular diseases. This results in a higher demand for vascular surgeries, including revascularisation and aneurysm repairs.

- ***WORK IN PROGRESS: Review and conclude referencing and add reference list as appendix -P***ublic Health Scotland,
  Scottish Diabetes Survey, British Heart Foundation (BHF) Scotland, Scottish Health Survey.

These risk factors collectively contribute to the increasing demand for vascular surgical services in NHS Scotland.

4. Aging Population

- **Prevalence**: The population is ageing, with a significant increase in the number of people aged 65 and over. This trend is expected to continue, impacting healthcare and social services [2].



Data Source: National Records of Scotland

- **Impact**:
  - **Aortic Procedures**: The prevalence of aortic stenosis, which often requires aortic valve replacement, increases significantly with age. About 12% of people over 75 are affected [1].
  - **Major Lower Limb Amputation**: The incidence of major lower limb amputation is higher in older adults, particularly those with diabetes and severe PAD [3].
  - **Carotid Endarterectomy**: Carotid artery stenosis, which can lead to the need for carotid endarterectomy, is more prevalent in people over 65 [3].

Comorbidities by region across NHS Scotland, based on the latest data from the Scottish Health Survey and the Scottish Burden of Disease Study highlights:

Cardiovascular Conditions

- **NHS Greater Glasgow and Clyde**: Higher prevalence of cardiovascular conditions, with approximately 15% of the population diagnosed with heart disease.
- **NHS Lothian**: Around 12% of the population has been diagnosed with cardiovascular conditions.

WORK IN PROGRESS: Review and conclude referencing and add reference list as appendix- **statistics.gov.scot : Scottish Health Survey-Local area level data**

Diabetes

- **NHS Tayside**: Higher rates of diabetes, with about 8% of the population diagnosed.
- **NHS Fife**: Approximately 7% of the population has diabetes.

Respiratory Conditions

- **NHS Ayrshire and Arran**: Higher prevalence of respiratory conditions, with around 14% of the population diagnosed with asthma or COPD.
- **NHS Highland**: About 12% of the population has respiratory conditions.

Hypertension

- **NHS Lanarkshire**: Higher rates of hypertension, with approximately 20% of the population diagnosed.
- **NHS Borders**: Around 18% of the population has hypertension.

These statistics highlight the regional variations in comorbidities, which can impact the outcomes of vascular surgical services, therefore the TOM needs to take cognises of these.

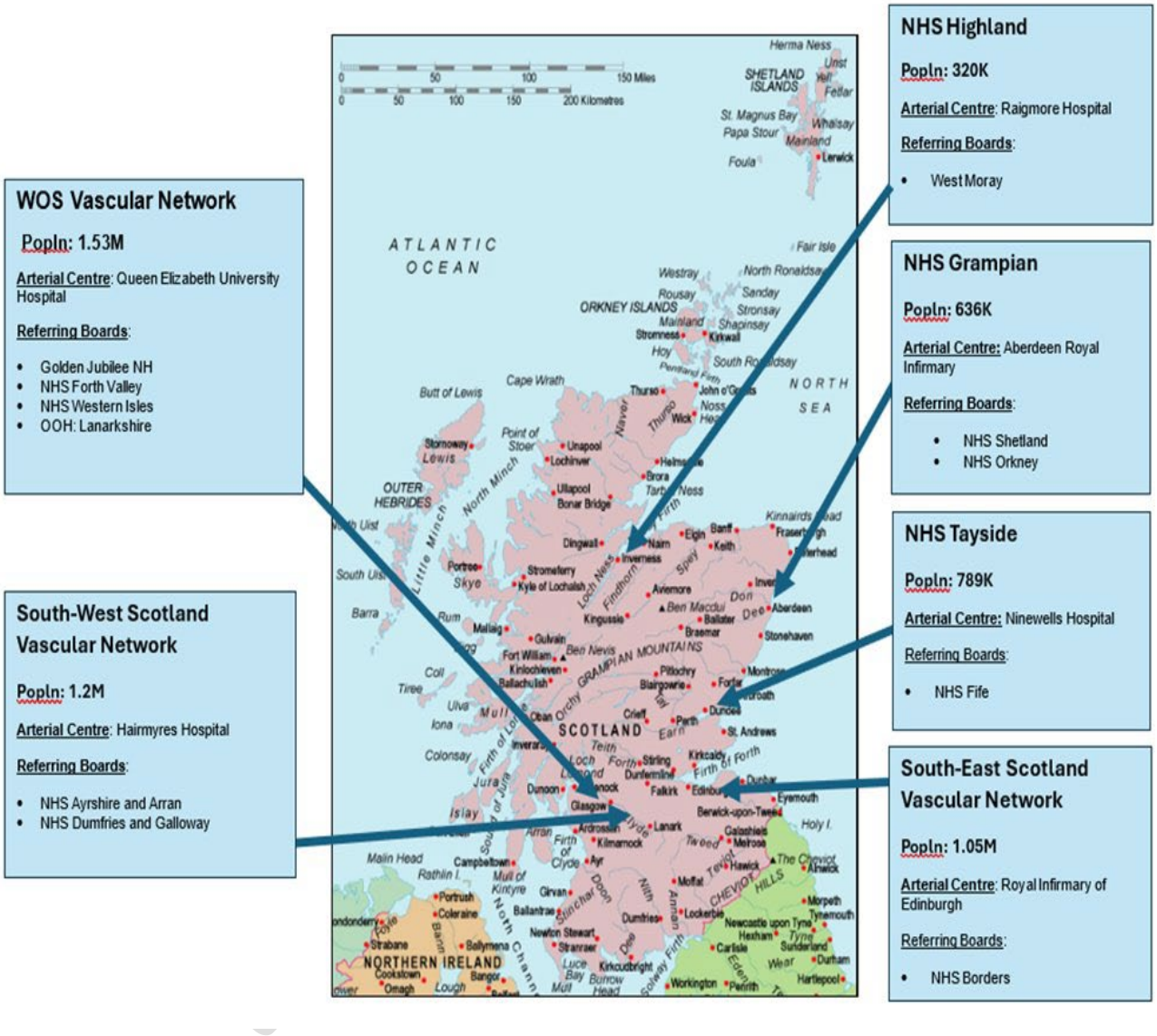
Implications for Vascular Services

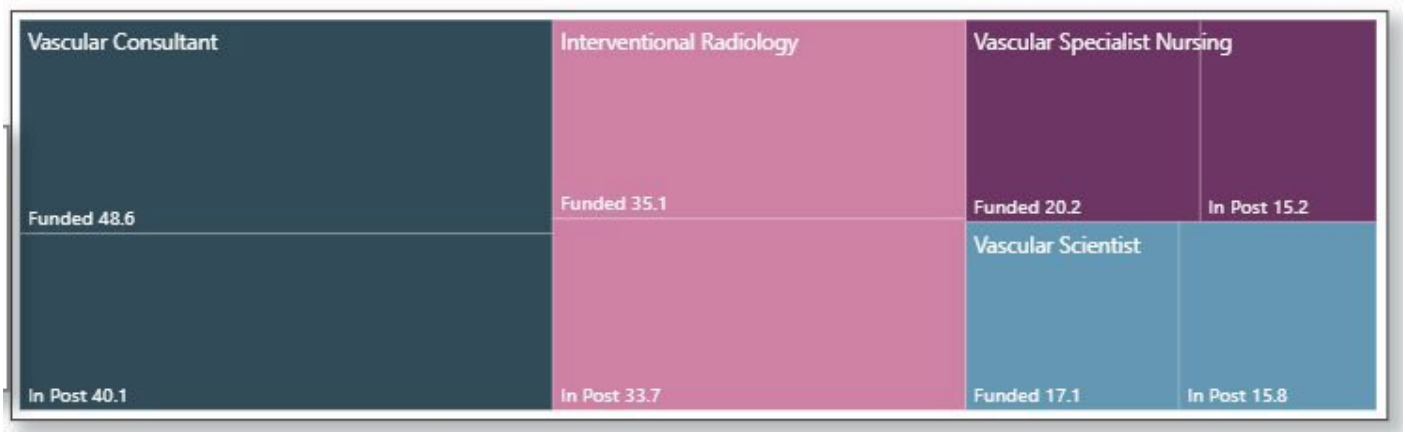
The number of people with type 2 diabetes has significantly increased, alongside an ageing population with a higher risk of cardiovascular disease. Many of these individuals require access to vascular clinicians who collaborate with other local experts, such as diabetologists and renal physicians. Early identification and management of problems can help prevent unnecessary procedures or hospital admissions and therefore it is important the TOM considers these.

3C. DEFINE - Resource Assessment

3C.1 Human Resources

The availability and distribution of funded WTE versus in post vascular healthcare professionals is outlined in Figure XX below:





Vascular Consultant

According to the current UK estimate there is 1 vascular surgeon per 129,000 population. POVS 2021 recommends that there should be provision of 1 vascular surgeon per 100,000 of population. At the time of data collection there were 48.6 WTE funded posts across Scotland with 40.1 WTE in post. Based on the population of Scotland 1 consultant per 100,000 would indicate that 55 WTE vascular consultants are required. Funded posts across Scotland are for 48.6 WTE posts which is 1 consultant per 113,268 of the population. Whilst less than the guidelines this is greater than the UK average. It is important to note that from January 2025 the position in Highland in terms of in post has worsened. Vascular surgeons should be employed by the NHS Board hosting the arterial centre with up to 40% of their time spent at network.

Figures W and V show the distribution of vascular consultants across NHS Scotland per 100,000 population in post and funded

Figure W

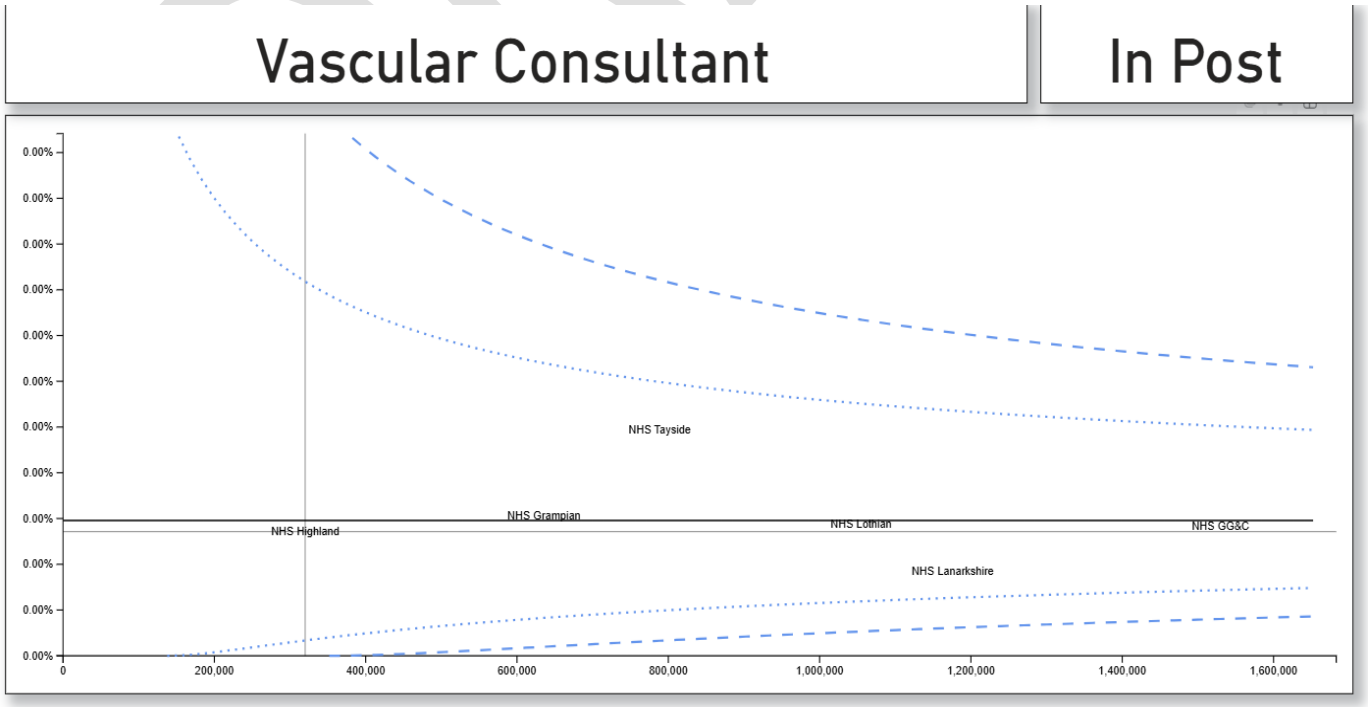
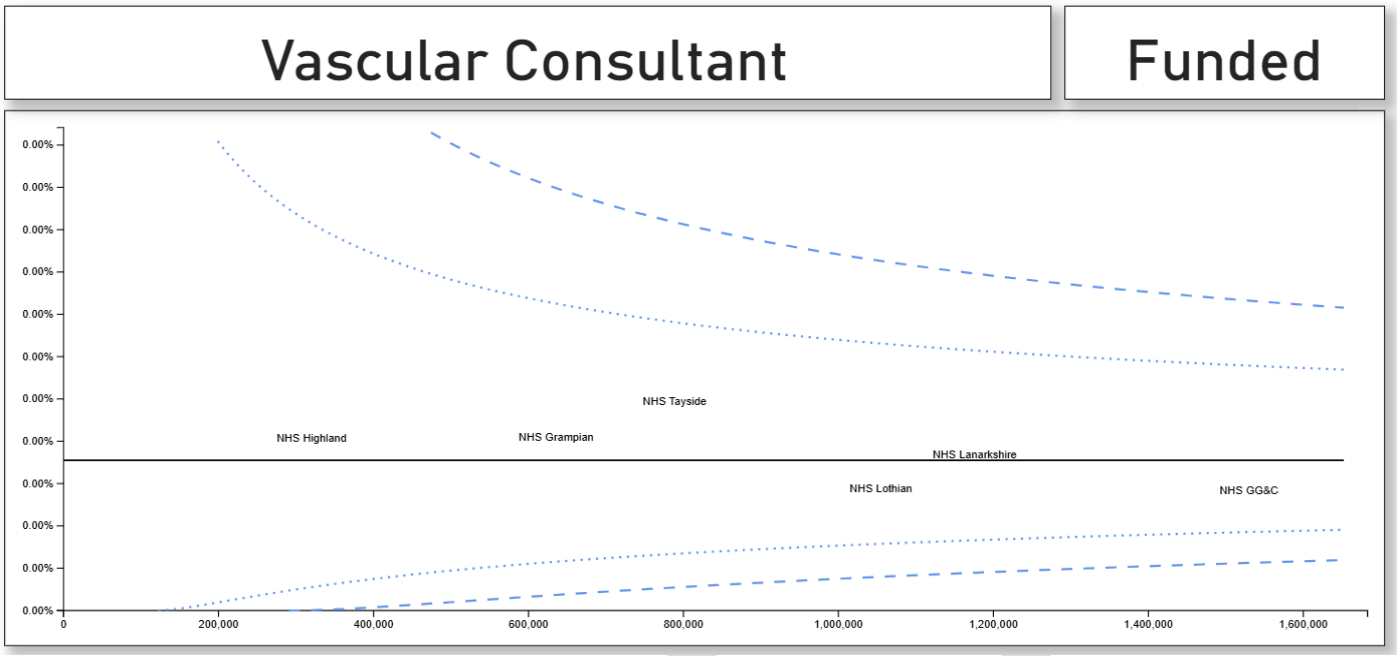


Figure V



WORK IN PROGRESS: IMS undertaking final review and validation

It is crucial to focus on recruitment, retention, training, and succession planning to address inequities across the healthcare system. By adopting a network model in the North, we can create more opportunities and make roles more appealing for trainees and other healthcare professionals. This approach ensures that resources are used effectively to promote equity and improve overall service delivery. To meet increasing demand and as per advice from the vascular network it is recommended the number of vascular trainees should be increased.

Interventional Radiologist

The current estimate is that there is 1 interventional radiologist per 100,800 population in the UK.

The BSIR recommends that there should be >1 interventional radiologist per 64,000 of UK population. To cover vascular surgical services specifically, the recommended number of interventional radiologists should be between 0.5 to 1 per 100,000 population. Given Scotland's population this translates to between 27 to 55 interventional radiologists dedicated solely to vascular services.

As of the latest data, Scotland has approximately **10.5 radiologists per 100,000 people.**

WORK IN PROGRESS: Review and conclude referencing and add reference list as appendix- **rcr-census-clinical-radiology-workforce-census-2023.pdf**

However, this figure includes all radiologists, not just those specialising in interventional radiology. The specific number of interventional radiologists is lower, and there is a reported 24% shortfall in interventional radiologists.

At the time of data collection, the centres providing vascular surgical centres reported 28.7 WTE interventional radiologists in post versus 29.1 funded. This is low given the remote and rural challenges faced in Scotland and access to IR has been identified as a significant issue by the task and finish group. A move to a North of Scotland network would again support recruitment and retention.

WORK IN PROGRESS: IMS updating funnel plot and figures- to be inserted here-summary to be updated to reflect

Vascular Nurse Specialist

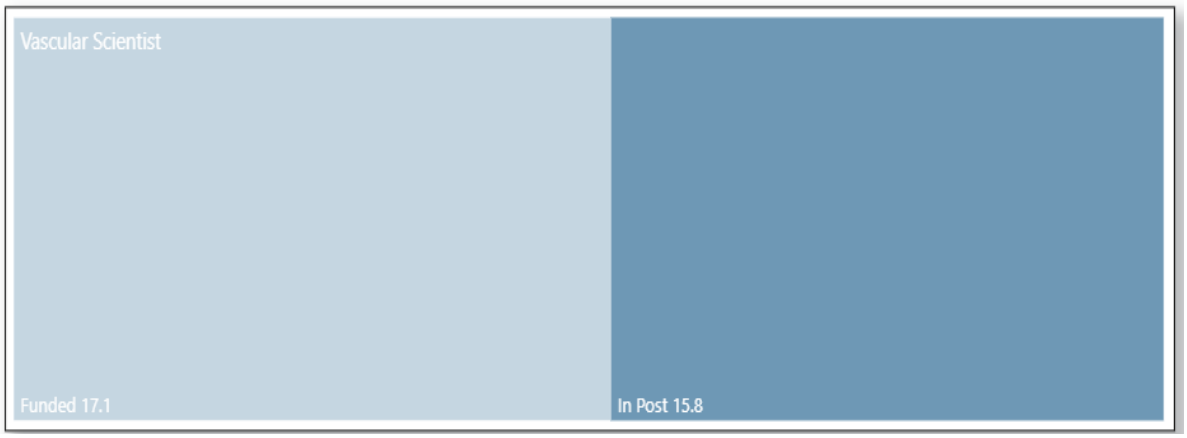
According to the Provision of Vascular Services (POVS) 2021 guidelines, the recommended number of vascular specialist nurses is **1 per 100,000 population**. This ensures that there are enough specialised nurses to provide high-quality care, support multidisciplinary teams, and improve patient outcomes. For Scotland, with a population of approximately 5.48 million, this translates to needing about **55 vascular specialist nurses (VNS)** across the country.

To provide an adequate level of service, there should be a minimum of 2.0 whole time equivalent (WTE) vascular nurse specialists (VNSs) attached to the arterial centre, and 1.0 WTE VNS per network hospital.

At present there are 20.2 funded posts and only 15.2 in post. At present vascular specialist nurses are supported by general nursing staff or specialist staff in HDU/ICU. Investment in this area will be required to move to a target operating model as evidence indicates vascular specialist nurses as trained specialists help reduce complications, improve recovery times and enhance patient outcomes.

Service Provider	Metric	Value	Sum of Value per 100k Board Pop	Sum of Total Pop	Sum of Value per 100k Total Pop
NHS Grampian	Vascular specialist nursing workforce In Post	1.0	0.17	635,671	0.16
NHS Highland	Vascular specialist nursing workforce In Post	1.0	0.31	320,000	0.31
NHS Lanarkshire	Vascular specialist nursing workforce In Post	2.0	0.30	1,175,896	0.17
NHS Tayside	Vascular specialist nursing workforce In Post	2.0	0.48	788,583	0.25
NHS GG&C	Vascular specialist nursing workforce In Post	3.0	0.25	1,529,901	0.20
NHS Lothian	Vascular specialist nursing workforce In Post	6.2	0.66	1,054,815	0.59

Clinical Vascular Scientist



There are 263 clinical vascular scientists registered with the SVT in the UK (1 per 253,000 population). To provide a sustainable service it is recommended by the POVS 2021 guidelines there should be 3.0 WTEs (or equivalent staff) at each arterial centre.

Service Provider	Metric	Value
NHS GG&C	Vascular scientists In Post	1.8
NHS Grampian	Vascular scientists In Post	2.5
NHS Highland	Vascular scientists In Post	0.0
NHS Lanarkshire	Vascular scientists In Post	2.0
NHS Lothian	Vascular scientists In Post	5.6
NHS Tayside	Vascular scientists In Post	4.0

Funding is sufficient to support 5 arterial centres, however the current location does not support 3 WTEs at each unit.

On call rotas

The importance of emergency vascular on-call rotas is well-documented. These rotas are essential to ensure that patients with acute vascular conditions, such as ischemic limbs, ruptured abdominal aortic aneurysms, and vascular trauma, receive timely and specialised care. The Vascular Society of Great Britain and Ireland (VSGBI) emphasizes that a 24/7 consultant on-call rota for vascular emergencies, ideally with a frequency of 1 in 6 or greater, is crucial for providing adequate care, therefore this needs to be factored into the TOM.

This setup ensures that there is always a specialist available to handle complex emergencies, which can significantly improve patient outcomes. The number of consultants required for safe and sustainable on-call rotas in each vascular network will depend on the population size and skill mix. Additional commitments, such as major trauma, renal transplant, specialist aortic procedures, and non-vascular commitments for interventional radiologists, may necessitate less frequent rotas due to higher volumes of out-of-hours work. For staff aged over 55, it is beneficial to consider reducing on-call commitments during the later stages of their careers.

In the SOM and TOM there will require to be specific vascular surgical on call rotas in place in all arterial centres.

Table Y summarises the responsibilities of each role and whether the role needs to be at the arterial centre, non-arterial centre or other location which helps in the planning and distribution of staff and resources effectively.

Table Y

Role	Responsibilities	Location
Vascular Nursing	Combines aspects of general surgical nursing, critical care, limb and wound assessment, tissue viability, wound care, end of life care, and rehabilitation.	Arterial Centre
Vascular Nurse Specialist (VNS)	Provides specialist vascular opinion to establish a diagnosis and formulate a treatment plan. Involves inpatient reviews, outpatient clinics, and performing interventions.	Arterial Centre and Non-Arterial Centre
Advanced Nurse Practitioner (ANP)	Supports the safe care of ward patients as a supplement to the Foundation doctor role.	Arterial Centre
Theatre Nurses	Requires knowledge and skills for both vascular and endovascular procedures at the arterial centre.	Arterial Centre
Interventional Radiology Nurses	Requires knowledge and skills appropriate to endovascular procedures at both the arterial centre and network hospitals.	Arterial Centre and Non-Arterial Centre
Ward Nurses	Should have specific knowledge and skills to care for patients with complex vascular conditions. A core of nurses should complete a designated vascular course.	Arterial Centre
Tissue Viability Nurse (TVN)	Complements the VNS service by providing complex wound advice and management.	Arterial Centre and Non-Arterial Centre
Outpatient Clinic Nurses	Needs knowledge and skills in wound care, especially in compression therapy and wound care, when TVNs are not available.	Arterial Centre and Non-Arterial Centre
Advanced Clinical Practitioner (ACP)	Comes from nursing or allied healthcare professional backgrounds and completes a master's level degree. May work at the equivalent of a middle-grade doctor's role.	Arterial Centre
Physician Associate (PA)	Has a life science or allied health degree and a postgraduate diploma. Trained to perform roles normally performed by doctors.	Arterial Centre
Radiographer	Needed for interventional radiology rooms and the hybrid operating theatre. May take on extended roles like ultrasound or line insertion.	Arterial Centre
Pharmacist	Provides high-level input for vascular patients who are often elderly, frail, and on multiple medications.	Arterial Centre and Non-Arterial Centre
Podiatrist	Leads community diabetic foot protection teams and works in hospitals alongside vascular teams. Provides community-based PAD triage and diagnosis.	Community and Hospitals
Physiotherapist	Provides experienced vascular physiotherapy input to aid recovery after surgery. Amputee care should be from a specialist physiotherapy team.	Arterial Centre and Non-Arterial Centre
Occupational Therapist	Provides home assessment visits and coordinates safe discharge back into the community.	Community
Discharge Coordinator	Allocated to people with complex discharge social or rehabilitation needs.	Arterial Centre and Non-Arterial Centre
Social Worker	Provides input for the successful recovery of frail and disabled patients after treatment.	Community and Hospitals
Network Clinical Lead	Overall responsibility for the performance of the vascular network. Chairs regular network management meetings and recruits' network medical staff.	Arterial Centre

Role	Responsibilities	Location
Network Governance Lead	Responds to serious adverse events across the network. Chairs the network morbidity and mortality meeting and acts on concerns raised.	Arterial Centre
Lead Vascular Nurse Specialist	Allocates the vascular specialist nursing team and manages nursing staff.	Arterial Centre
Lead Interventional Radiologist	Supports the interventional radiologist's role within the vascular MDT.	Arterial Centre
Lead Vascular Anaesthetist	Delivers and develops a specialist vascular anaesthetics service at the arterial centre.	Arterial Centre
Lead Clinical Vascular Scientist	Represents vascular scientists across network sites and is responsible for the governance of non-invasive imaging surveillance.	Arterial Centre and Non-Arterial Centre
Network Manager	Manages network staff, monitors the effectiveness, quality, safety, and accessibility of the service, and ensures network protocols are up to date.	Arterial Centre
MDM Coordinator	Single point of contact for referrals to the vascular MDM. Supports the smooth running of the MDT and records discussions and outcomes.	Arterial Centre
Data Manager	Ensures the completeness of NVR and HES data, supports NHS clinical coders, and provides data for governance and quality improvement.	Arterial Centre
Medical Secretaries	Important point of contact for patients to ask for advice and raise queries. Roles vary across the network.	Arterial Centre and Non-Arterial Centre

WORK IN PROGRESS: To be reviewed and finalised at T&F group

3C.2 Infrastructure

Based on the POVS 2021 guidelines the requirements for arterial and non-arterial centres are summarised below:

Requirement	Arterial Centre	Non-Arterial Centre
Specialist Teams	Multidisciplinary team including vascular surgeons, interventional radiologists, and vascular anaesthetists.	Access to vascular specialists via network arrangements
Facilities	Dedicated vascular operating theatres including hybrid theatres equipped for both open and endovascular procedures, and interventional radiology suites for minimally invasive procedures	General surgical facilities with access to advanced imaging
Emergency Services	24/7 emergency vascular surgery and interventional radiology services	On-call vascular services with transfer protocols to arterial centres
Intensive Care	Access to intensive care units (ICU) with vascular expertise	High dependency units (HDU) with protocols for transfer to ICU if needed

Requirement	Arterial Centre	Non-Arterial Centre
Diagnostic Services	Comprehensive diagnostic services including CT, MRI, and duplex ultrasound	Basic diagnostic services with access to advanced diagnostics via network
Outpatient Services	Dedicated vascular outpatient clinics and rehabilitation services	General outpatient services with referral pathways to arterial centres
Training and Education	Facilities for training and education of vascular specialists	Participation in network-wide training programs
Governance and Audit	Robust clinical governance and participation in national audits	Adherence to network governance and audit protocols

WORK IN PROGRESS: To be reviewed and finalised at T&F group

Access to hybrid theatres is crucial in modern vascular surgical services for several reasons:

- **Combination of Techniques**: Hybrid theatres integrate the capabilities of a traditional operating room with advanced imaging technology. This allows surgeons to perform both open and minimally invasive procedures in the same setting, enhancing flexibility and precision
- **Improved Patient Outcomes**: By enabling complex procedures with real-time imaging, hybrid theatres reduce the need for multiple surgeries. This minimises the risk of complications and shortens recovery times, leading to better overall patient outcomes
- **Efficiency and Safety**: The ability to switch between different types of procedures without moving the patient reduces the time under anaesthesia and the risk of infection. This improves the safety and efficiency of surgical interventions
- **Cost-Effectiveness**: Although hybrid theatres require significant investment, they can be more cost-effective in the long run. They reduce the need for multiple procedures and hospital stays, ultimately saving resources
- **Multidisciplinary Collaboration**: Hybrid theatres facilitate collaboration among vascular surgeons, interventional radiologists, and anaesthesiologists. This multidisciplinary approach ensures comprehensive care and immediate response to any complications.

Overall, hybrid theatres represent a significant advancement in vascular surgery, providing a safer, more efficient, and patient-centred approach to complex surgical care.

As part of moving to a TOM it is important that the number of hybrid theatres required to support the population of Scotland is identified.

The current arrangements across NHS Scotland are summarised below:

	WOS	SW of Scotland	SE of Scotland	NHS Fife	NHS Grampian	NHS Tayside	NHS Highland
Theatre Capacity (no or theatres)	**2**	**2**	**1.5**		**2**	**5**	**2**
Bed capacity (No. of beds)	**47**	**36**	**36**		**16**	**24**	**12**
IR (Dedicated angio-suite – no of rooms)	**0**	**1**	**0**		**0**	**0**	**0**
IR capacity (Mixed IR use)	**4**	**1**	**2**		**2**	**2**	**2**
Hybrid Theatres (No.)	**2**	**1**	**0**		**0**	**0**	**0**

WORK IN PROGRESS: NHS Fife details currently being double checked. NHS Fife work collaboratively with NHS Tayside-data being separated out. Appendix with the full breakdown provided by each site to be added and referenced as an appendix.

3C.3 Financial Resources

Whilst funding of future developments with vascular surgery is outside the remit of this review, failure to recognise the reality of ongoing funding restrictions would risk offering naïve aspirations that would ultimately fail to gain traction. The need to demonstrate value for money, improved Quality of Life, longevity of intervention and efficacy in delivery are key components when considering the future of vascular surgery.

Financial Data

- Cost of Care: Information on the costs associated with providing vascular services, including direct medical costs and indirect costs.
- Funding Sources: Data on funding sources and financial sustainability of vascular services.

Currently NHS Scotland spend £69.27m on vascular surgery according to the cost book of 23/24, with wide variation in the in-patient, day case and outpatient cost per case across Boards. The following is an extract which displays all costs on a cost per case basis.

Speciality Name	SAA20	SDA02	SFA20	SGA20	SHA20	SLA20	SNA20	SRA01	SSA20	STA20	SVA20	SWA01	SYA20	SZA01
Cost per Case	NHS Ayrshire & Arran	National Waiting Times Centre (Golden Jubilee	NHS Fife	NHS Greater Glasgow & Clyde	NHS Highland	NHS Lanarkshire	NHS Grampian	NHS Orkney	NHS Lothian	NHS Tayside	NHS Forth Valley	NHS Western Isles	NHS Dumfries & Galloway	NHS Shetland
Vascular surgery	467	0	516	1,220	1,127	1,659	2,432	0	2,215	2,611	296	0	692	0

NHS Highland currently spend a high amount on locums and will experience a potential reduction in their supplementary staffing if the sustainable model is adopted although to ensure place-based access given their recruitment and retention challenges this may be limited.

A fair pricing approach will be taken, and NHS Highland will require to pay on a cost per case basis for all out of area activity. When PLICS is rolled out this will replace the fair pricing approach.

All Boards will be appropriately funded for the activity they are undertaking on behalf of another Board, and this will be clearly described if moved to implementation through SLA.

The feasibility assessment has looked at the following to provide clarity to Boards on the specific financial impact:

- **Cost of Care**: Information on the costs associated with providing vascular services, including direct medical costs and indirect costs.
- **Funding Sources**: Data on funding sources and financial sustainability of vascular services and a cost-benefit analysis will be undertaken to compare the expected benefits of the new model against current costs.
- **Implementation**: Costs for implementation of a co-ordinated approach across NHS Scotland

WORK IN PROGRESS: To be reviewed and finalised once have final outputs from finance, SAS

The rising demand for vascular procedures in Scotland is expected to lead to substantial increases in healthcare costs. These cost increases will vary by procedure type, with major lower limb amputations likely seeing the most significant rise due to complications from conditions like diabetes.

WORK IN PROGRESS: Review and conclude referencing and add reference list as appendix

Effective resource allocation and strategic planning are crucial to managing these rising costs and ensuring that the healthcare system can meet the growing demand. This involves optimising the use of resources, investing in preventive care, and planning for future healthcare needs as part of the TOM. Effective resource allocation and strategic planning are crucial to managing these rising costs and ensuring that the healthcare system can meet the growing demand. However, it is recognised that a move to the TOM will require investment in terms of resource and infrastructure changes.

Forecasting the percentage increase in costs for vascular procedures based on the rising demand involves considering several factors, including the cost of medical supplies, staff salaries, and hospital operating expenses.

Resource allocation for vascular services in NHS Scotland is guided by the **National Resource Allocation Formula (NRAC)**. This formula considers factors such as population size, age, morbidity, and deprivation levels to ensure equitable distribution of resources.

Key points include:

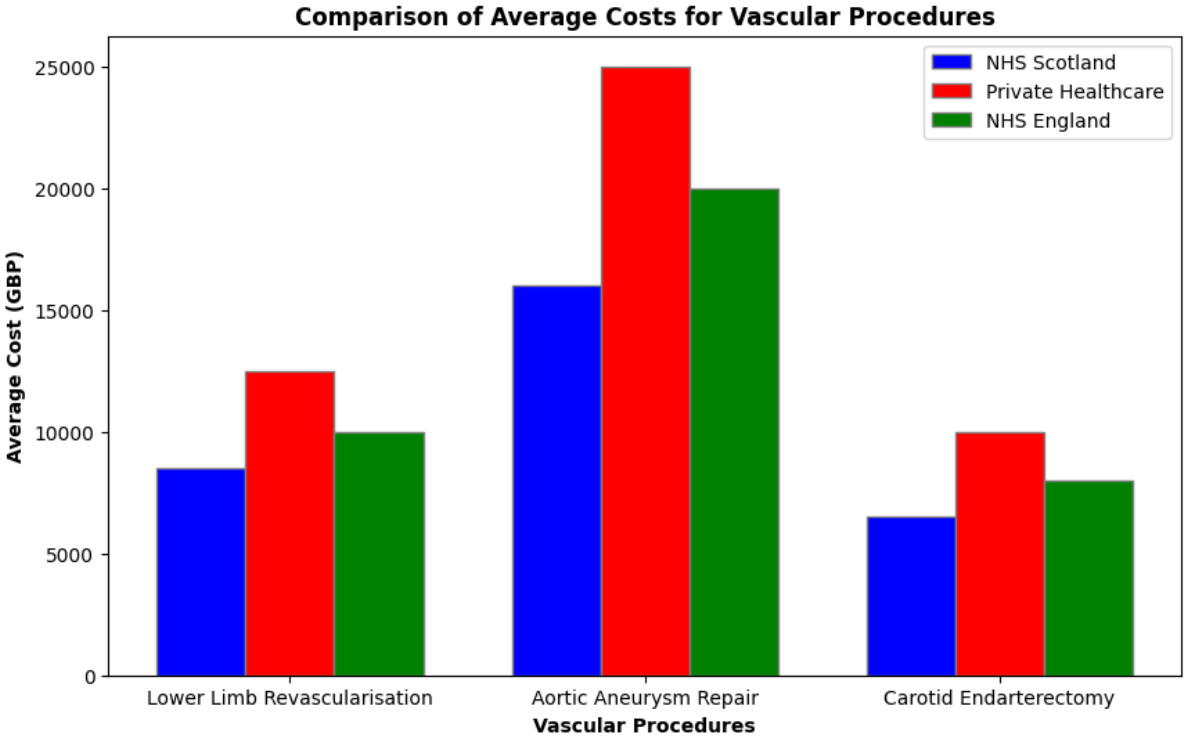
- **Budget Allocation**: Approximately 70% of the total NHS budget is allocated based on the NRAC formula.
- **Geographical Considerations**: The formula adjusts for the higher costs of delivering services in remote and rural areas.
- **Target Shares**: Each NHS board receives a target share of the budget to plan and deliver services effectively.

Comparing the average costs of specific vascular procedures within NHS Scotland, NHS England, and private healthcare is important as benchmarking these costs helps assess the benefits of any proposed changes.

Average costs for specific vascular procedures within NHS Scotland:

- **Lower Limb Revascularisation**: Costs around £7,000 to £10,000 per case currently in NHS Scotland. Private healthcare ranges from £10,000 to £15,000, and NHS England costs approximately £8,000 to £12,000 per case.
- **Aortic Aneurysm Repair**: Endovascular aneurysm repair (EVAR) costs between £12,000 and £15,000 in NHS Scotland, while open surgical repair ranges from £15,000 to £20,000. Private healthcare costs between £20,000 and £30,000. NHS England costs around £15,000 to £25,000 for EVAR and £20,000 to £30,000 for open surgical repair.
- **Carotid Endarterectomy**: Costs between £5,000 and £8,000 per case. Private healthcare costs around £8,000 to £12,000, and NHS England costs typically range from £6,000 to £10,000 per case.

These costs vary based on procedure complexity, patient condition, and the specific health board. Private healthcare is generally more expensive due to higher operational costs and additional services. Costs in NHS England are slightly higher than in NHS Scotland, reflecting regional variations in healthcare expenses and resource allocation.



Carotid Endarterectomy

- **Costs**: NHS Scotland: £5,000 to £8,000; Private Healthcare: £8,000 to £12,000; NHS England: £6,000 to £10,000.
- **Outcomes**: This procedure helps prevent strokes by removing blockages in the carotid artery. The costs are associated with the precision required for the surgery, and successful outcomes significantly reduce the risk of stroke.

WORK IN PROGRESS: Being reviewed and validated by IMS

Evidence supports that the outcomes of these procedures justify their costs by providing significant health benefits and reducing the need for more expensive or extensive treatments in the future.

For **Lower Limb Revascularisation**, the high costs are justified by the substantial improvement in patient mobility and quality of life. Effective revascularisation reduces pain and the need for alternative treatments like amputation or long-term wound care, which can be more costly and less effective.

For **Aortic Aneurysm Repair**, the costs reflect the complexity and critical nature of the procedure. Successful repair significantly reduces the risk of life-threatening ruptures, leading to increased survival rates. The benefits of preventing such catastrophic events outweigh the high costs of the procedure.

For **Carotid Endarterectomy,** the costs are justified by the precision and expertise required for the surgery. Preventing strokes through this procedure leads to significant long-term health benefits, reducing the need for extensive stroke rehabilitation and long-term care. This makes the procedure cost-effective by improving patient outcomes and reducing overall healthcare costs.

Overall, investing in these procedures can lead to better patient outcomes, reduced long-term healthcare costs, and improved quality of life, making them cost-effective in the long run.

3D. DEFINE - Population Health Needs

The data has been used to model future demand and inform the development of sustainable and target operating models. Key healthcare planning requirements include allocating appropriate resources, providing specialized training and education for healthcare professionals, and addressing potential increases in wait times. For patients, ensuring access to timely care, improving quality of life through effective procedures, and emphasizing preventive measures are crucial. Public health policy should focus on preventive health programs, increased funding and investment in vascular health services, and continuous data collection and research to monitor trends and plan for future needs.

Future Demand Planning

Forecasting the demand for vascular procedures in Scotland over the next five years involves considering the population size, the prevalence of risk factors, and historical trends in procedure rates.

The forecast annual percentage increases for each of the vascular procedures (**Figure Y**) in NHS Scotland over the next 5 years have been calculated using a combination of methods such as historical data analysis to identify trends, statistical modelling, and expert input. While these methods aim to provide reliable forecasts, it's important to note that unforeseen factors, such as sudden changes in healthcare policy, unexpected advancements in medical technology, or significant shifts in population health trends, can impact the accuracy of these projections. These forecasts are based on the most current and reliable information available at this point in time. As mentioned in Section X, it is important to acknowledge the data limitations and gaps.

WORK IN PROGRESS: Refer to relevant sections and update

Summary of Demand for Vascular Procedures

Based on the literature review, historical data, information from subject matter experts within the task and finish group and taking account of the prevalence of risk factors, the demand for various vascular procedures in Scotland is expected to increase.

The vascular procedures projected to experience the most notable growth:

1. Lower Limb Revascularisation: This includes angioplasty and stenting for peripheral artery disease (PAD). The demand is expected to rise due to the increasing prevalence of PAD and diabetes.
2. Major Lower Limb Amputation: The number of these procedures has been increasing, partly due to complications from diabetes. Recent reports indicate a significant rise in diabetes-related lower limb amputations in the UK.

3. Aortic Procedures: This includes repairs for abdominal aortic aneurysms (AAA). The demand is expected to grow, driven by the aging population.
4. Carotid Endarterectomy: This procedure, used to prevent strokes, is also expected to see increased demand due to its effectiveness in reducing stroke risk.
5. Endovascular Procedures: Procedures like Endovascular Aneurysm Repair (EVAR) and Thoracic Endovascular Aortic Repair (TEVAR) are expected to see significant growth due to advancements in minimally invasive techniques and increasing patient preference for less invasive options.

These projections are based on factors such as demographic changes, the rising prevalence of chronic conditions like diabetes, and advancements in medical technology.

The rationale for the forecast increase includes:

1. **Population Projections**: The total population of Scotland is expected to rise slightly before declining [4,8], however, the number of people aged 65 and older is projected to increase significantly [4, 8].
2. **Disease Burden Forecasts**: The burden of cardiovascular diseases, diabetes, and other chronic conditions is expected to rise due to the ageing population [3, 8, 9].
3. **Advancements in medical technology**

The overall growth in demand for vascular procedures in the UK, including Scotland, is expected to be sustained over the next several years [3, 8, 9].

Using these percentages, the number of procedures for the next five years has been estimated and are shown in Appendix xx:

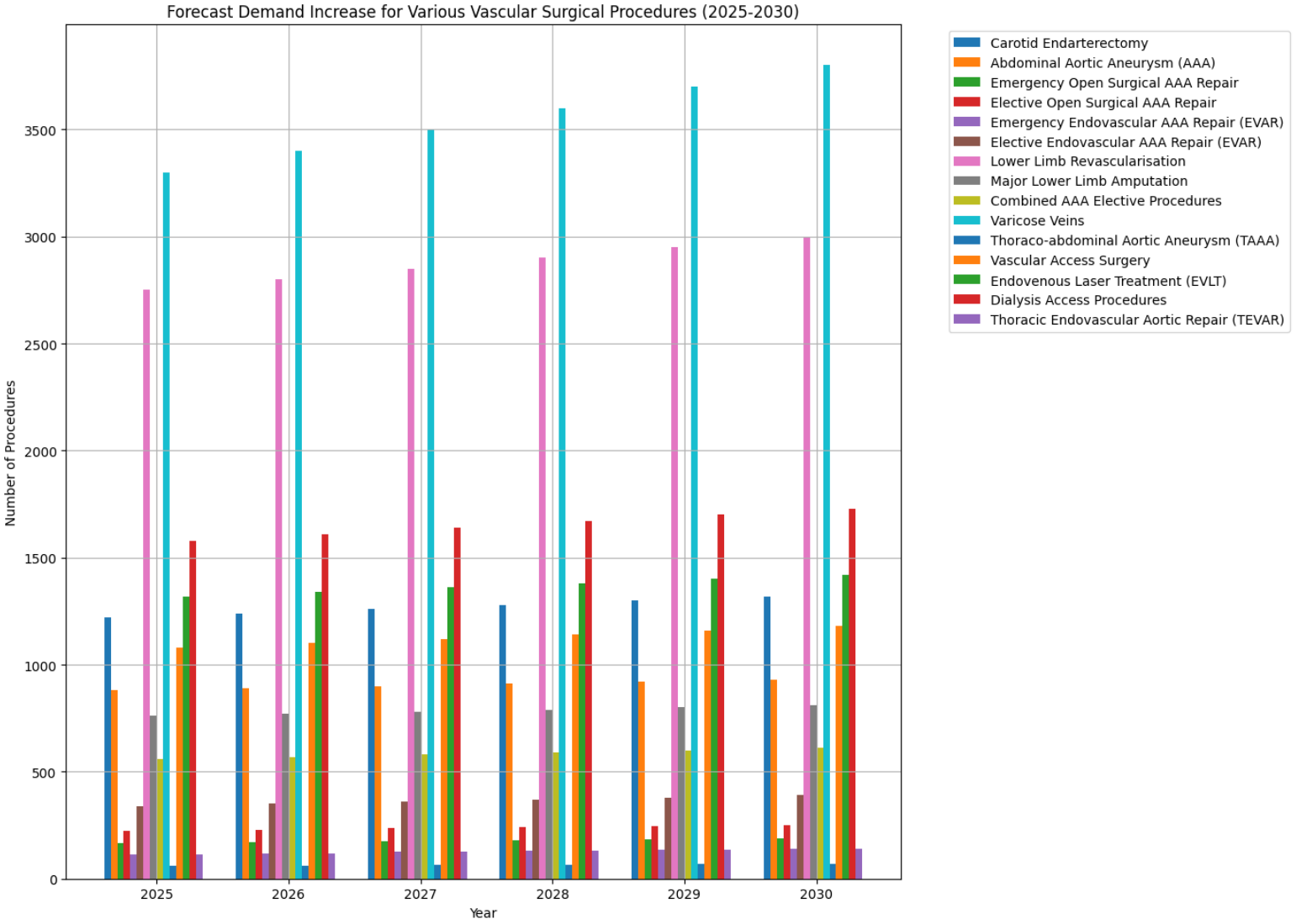
TOTAL EST. PROCEDURES	**14,470**	**14,772**	**15,074**	**15,376**	**15,678**	**15,980**

WORK IN PROGRESS: IMS undertaking final review of data vs returns from the centres, literature and VR/SMR01 to ensure modelling is as robust as possible noting the known variance in data completion by some centres in specific areas. Referencing to be added (3,7,8,9)

The "Forecast Demand Increase (%)" column represents the anticipated increase in demand over the five-year period from 2025 to 2030. This percentage reflects the overall growth in the number of procedures expected to be performed by 2030 compared to the baseline year of 2024.
For example, a forecast demand increase of 10% for Carotid Endarterectomy means that by 2030, the number of these procedures is expected to be 10% higher than in 2024.

Therefore, the SOM (Service Operating Model) and TOM (Target Operating Model) must incorporate resilience to effectively handle the anticipated increase in demand.

WORK IN PROGRESS: IMS undertaking final validation of data. Reference, summarise and move to appendix



Procedure numbers and average increase over the next 5 years is shown in the table below:

Explain the increase in AAA and carotids despite decrease in incidence

Procedure Type	2025	2026	2027	2028	2029	2030	Forecast Demand 5-year average Increase (%)
Carotid Endarterectomy	1,220	1,240	1,260	1,280	1,300	1,320	10%
Abdominal Aortic Aneurysm (AAA)	880	890	900	910	920	930	7%
Emergency Open Surgical AAA Repair	165	170	175	180	185	190	19%
Elective Open Surgical AAA Repair	225	230	235	240	245	250	14%
Emergency Endovascular AAA Repair (EVAR)	115	120	125	130	135	140	27%
Elective Endovascular AAA Repair (EVAR)	340	350	360	370	380	390	18%
Lower Limb Revascularisation	2,750	2,800	2,850	2,900	2,950	3,000	11%
Major Lower Limb Amputation	760	770	780	790	800	810	8%
Combined AAA Elective Procedures	560	570	580	590	600	610	11%
Varicose Veins	3,300	3,400	3,500	3,600	3,700	3,800	19%
Thoraco-abdominal Aortic Aneurysm (TAAA)	60	62	64	66	68	70	27%
Vascular Access Surgery	1,080	1,100	1,120	1,140	1,160	1,180	12%
Endovenous Laser Treatment (EVLT)	1,320	1,340	1,360	1,380	1,400	1,420	9%
Dialysis Access Procedures	1,580	1,610	1,640	1,670	1,700	1,730	12%
Thoracic Endovascular Aortic Repair (TEVAR)	115	120	125	130	135	140	27%

4A. DEVELOP - Proposed Sustainable and Target Operating Models

Prescription: What are we going to do about it?

With the problem clearly stated and data collated and analysed, the task and finish group identified and discussed possible solutions to co-create the SOM and TOM. Building on the work undertaken in 2011, which strengthened the West of Scotland network and centralised services, and incorporating lessons learned from relevant literature, the task and finish group explored various options to identify recommendations.

4A.1 Options Considered

Option	Strengths	Weaknesses	Decision / Rationale
Option 0: **Do nothing**	No additional investment required.	- Risk of NHS Highland being unable to maintain vascular services in the immediate future. - Consultants currently operating on a 1:2 moving to a 1:1 from Jan 2025 on-call rota. - Older age profile of consultant vascular surgeons with long-term recruitment challenges. - No registrar or newly qualified consultants to maintain the service long-term. - Escalation processes and business continuity plans have been enacted	DISCOUNTED Maintaining the status quo is not an option due to fragility and unsustainable position
Option 1: **Division of workload by vascular condition**	-	- Difficult to implement. - Group agreed it was not a feasible model.	DISCOUNTED This early suggestion aimed to alleviate immediate pressures but was discounted due to implementation challenges.
Option 2: **Highland demand covered on rotational basis between Major Trauma Centres (MTCs)**	- Immediate implementation. - Clear division of responsibilities. - Potential equity of resource allocation.	- Substantial resource requirements. - Potential for unfair practices (e.g., avoiding out-of-hours treatment). - Inconsistencies within clinical governance. - Variation in access to Out of Hours (OOH) / Interventional Radiologists (IR). - Potential for over-triaging patients. - Challenges in defining long-term patient care teams. - Potential to increase impact on Winter bed crisis.	DISCOUNTED This scenario offers immediate implementation and clear responsibilities but faces significant resource and governance challenges. The group agreed not to procced to feasibility

Option	Strengths	Weaknesses	Decision / Rationale
Option 3: Transfer Highland patients to Grampian or Tayside	- Closest proximity to NHS Highland. - Strong existing working relationships. - Good clinical governance. - Clear pathways and responsibilities.	- Existing capacity issues within NHS Grampian and NHS Tayside. - Recruitment and IR issues within NHS Grampian.	DISCOUNTED Leveraging proximity and existing relationships, this scenario faces capacity and recruitment challenges.
Option 4: Permanent division of Highland case load based on MTCs	- Clear lines of responsibility based on geography. - Predictable fixed workload. - Clear links for Raigmore. - Good clinical governance.	- Potential boundary issues. - Significant travel distance for some patients. - Recruitment and capacity issues remain for some centres.	DISCOUNTED This scenario provides clear geographic responsibilities and predictable workloads but faces boundary and travel challenges.
Option 5: Recommended by task and finish Group: North of Scotland Network	- Resources from Fife could support Lothian/Tayside. - Strong spoke services already in place in Fife - Shared workload. -Evidence of success from WOS / SW of Scotland network -Resources and infrastructure to support -Could transition in a phased approach to SOM then TOM to manage change and reduce the impact	- Significant cooperation and support required from Tayside/Fife & Lothian. - Logistics of a network.	ENDORSED to move to feasibility assessment Forming a North of Scotland network with shared resources and workload, this scenario requires significant cooperation and logistical planning.

Option 5: Creation of a North of Scotland Network

Evidence to support the proposed model:

The literature review indicates that the organisation of vascular services has significant implications for rates of amputation, particularly in patients with peripheral arterial disease (PAD) and critical limb ischemia (CLI).

1. **Multidisciplinary Teams (MDTs)**:
   The involvement of MDTs, including vascular surgeons, interventional radiologists, podiatrists, and diabetes specialists, has been associated with better outcomes for patients with diabetic foot problems and PAD. MDTs can provide comprehensive care, addressing various aspects of the disease and reducing the risk of amputation. Regular MDT meetings are essential for discussing complex cases and developing

comprehensive treatment plans. Effective coordination between MDTs and primary care providers ensures seamless patient transitions and continuity of care.

2. **Centralisation of Services**:
   Centralising vascular services in high-volume centres can lead to better outcomes. High-volume centres tend to have more experienced surgeons and better access to advanced technologies, which can improve the success rates of revascularisation procedures and reduce amputation rates [1] [2].

WORK IN PROGRESS: Review and conclude referencing and add reference list as appendix 1: Effects of the development of modern vascular services on amputation rates in Leicester, U.K. 2: Regional intensity of vascular care and lower extremity amputation rates.

Impact of hospital volume on vascular procedure outcomes

WORK IN PROGRESS: Review and conclude referencing and add reference list as appendix 1: Association between Hospital Carotid Endarterectomy Procedure Volumes and In-Hospital Mortality in São Paulo State. 2: Association of Very Low-Volume Practice With Vascular Surgery Outcomes. 3: Hospital Volume Association With Carotid Endarterectomy Outcomes.

A study in Leicester reviewed 3,036 patients who underwent arterial reconstruction, angioplasty, or major amputation for lower limb peripheral vascular disease. The results showed an increase in arterial reconstructions and angioplasties over time, while the total amputation rate slightly decreased. Published evidence indicates a significant association between hospital volume and operative mortality for both open and endovascular repair of abdominal aortic aneurysms (AAA). Higher hospital volumes are associated with lower mortality rates for open surgical repair (OSR) of both intact and ruptured AAAs. A systematic review found that elective open repair of infrarenal AAAs in high-volume centres or by high-volume surgeons is linked to lower perioperative mortality. For endovascular repair, the volume-outcome relationship is less pronounced, but higher hospital volumes may still contribute to better outcomes, especially for complex cases. Adequate institutional experience and meeting specific volume criteria are important factors in reducing in-hospital mortality.

Evidence supports the centralisation of AAA repair procedures in high-volume centres to improve patient outcomes and ensuring surgeries are performed by high-volume surgeons to further reduce operative mortality. These findings should be considered in planning and allocating resources for vascular surgery services.

Similarly, published evidence shows a significant association between hospital volume and outcomes in elective carotid endarterectomy (CEA) surgery. Higher hospital volumes are associated with lower in-hospital mortality rates for CEA. Studies indicate that hospitals performing a higher number of CEA procedures tend to have better outcomes due to greater surgical expertise, better perioperative care, and more robust clinical protocols. This supports the centralisation of CEA procedures in high-volume centres to improve patient outcomes.

3. **Early Intervention and Preventive Care**:
   Early diagnosis and intervention for PAD and CLI are crucial in preventing disease progression and reducing the need for amputation. Organised vascular services that emphasise early screening and preventive care can help identify at-risk patients and provide timely treatment [1].

4. **Regional Variations**:
   There are regional variations in the rates of amputation, which can be influenced by the availability and organisation of vascular services. Regions with well-organised vascular services and higher rates of revascularisation tend to have lower amputation rates [1] [2]. Establishing regional vascular networks facilitates collaboration between central hubs and local hospitals, ensuring patients have access to specialised care when needed, while routine and less complex care can be provided locally.

5. **Integrated Care Pathways**:
   Developing and implementing standardised care pathways for common vascular conditions, such as peripheral arterial disease (PAD), abdominal aortic aneurysm (AAA), and carotid artery disease, ensures timely diagnosis, treatment, and follow-up care.

6. **Scalability & Adaptability**:
   Designing the service model with modular components allows for flexibility and adaptability based on demand, ensuring the model can scale up or down as the population's needs change.

7. **Capacity Building**:
   Investing in training and development programs builds capacity and ensures a skilled workforce is available to support expansion.

8. **Data Analytics**:
   Leveraging data analytics optimises resource allocation, predicts patient needs, and improves decision-making.

4A.2 Recommended Model Overview

Phase 1: Sustainable Model

- NHS Highland ceases to be an arterial centre with immediate effect
- NHS Grampian and NHS Tayside form a North of Scotland (NOS) network with two arterial centres
- NHS Highland patients transfer to NHS Tayside as part of the longer-term transition to the demand being met by the NOS network
- NHS Fife patients transfer to NHS Lothian as part of the longer-term transition to the demand being met by the Southeast of Scotland network
- Southwest Scotland network remains unchanged
- West of Scotland (WOS) network remains unchanged
- Lothian network remains largely unchanged apart from additional patients from Fife aligning with regional boundaries for other specialities

- NHS Lothian (ERI) continues as the National centre for TAAA

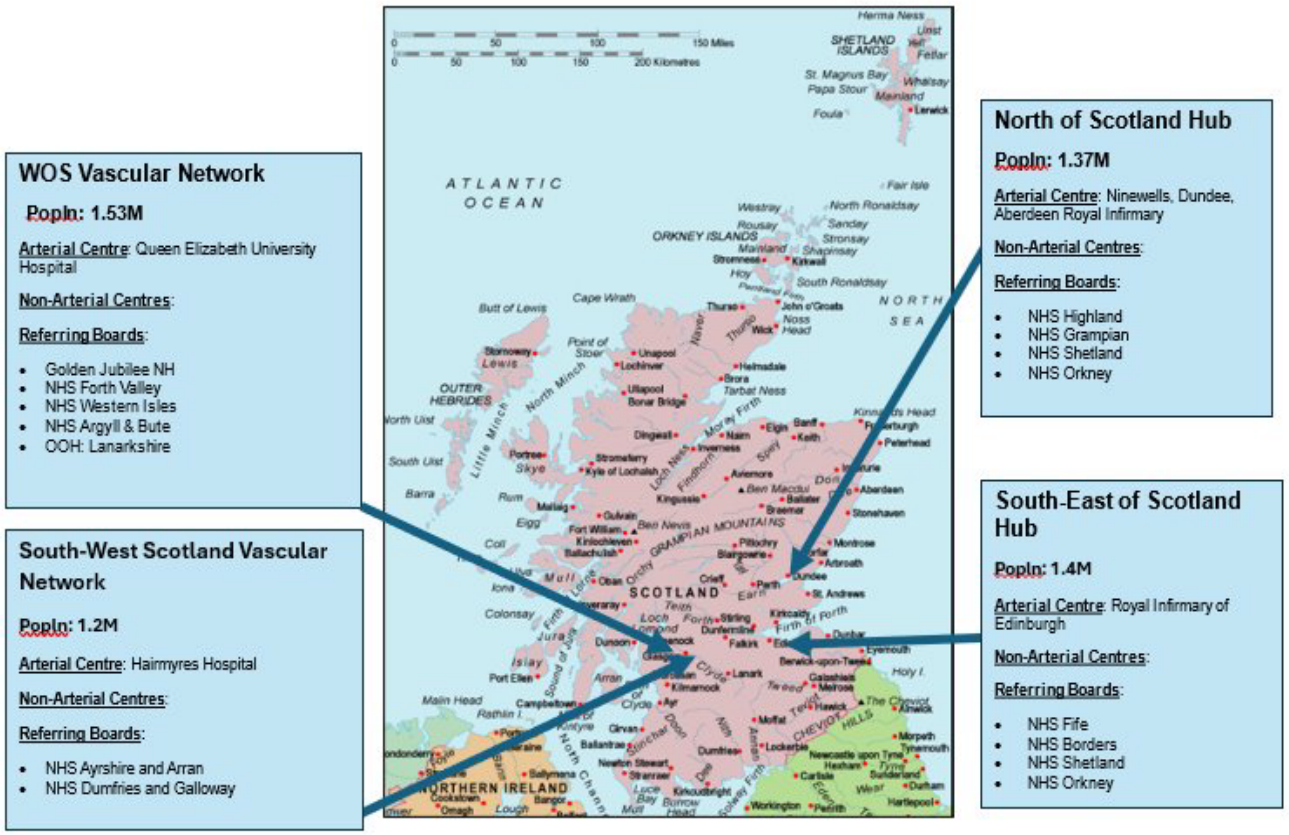
The NOS model was considered to be the most suitable for the following reasons:

- Geographical location of NOS model best for Highland patients
- QEUH in Glasgow currently receives Western Isles patients and has little capacity for any additional patients as demonstrated by the data
- UHH the recently developed hub for Southwest Scotland Vascular network under pressure due to capacity issues
- NHS Lothian as the National centre for TAAA was considered to have some additional capacity compared to other centres
- It was important not to destabilise well established arterial centres and learn lessons from previous work undertaken both in Scotland and elsewhere

It was agreed that Raigmore hospital in Inverness will become a “spoke “non-arterial unit with index arterial cases no longer being undertaken. Current VSGBI recommendations are for the following services to be maintained at “spoke hospitals “: outpatient clinics, inpatient reviews, renal access work, varicose vein interventions, minor amputations and selective interventional radiological procedures. In order for Highland to maintain these services additional staff will be required including advanced nurse practitioners and visiting vascular surgeons from the NOS network.

Phase 2: Target Operating Model

The proposed target operating model is denoted on the map below:



Current Operating Model (COM)

Current Service Providers (across top) and Referring Board Population (down Side)

Health Board	South East	South West	West	NHS Grampian	NHS Highland	NHS Tayside
Ayrshire & Arran		365228				
Borders	115985					
Dumfries & Galloway		146442				
Forth Valley			312030			
NHS Fife						371824
NHS GG&C			1192016			
NHS Grampian				590374		
NHS Highland					320000	
NHS Lanarkshire		664226				
NHS Lothian	938830					
NHS Tayside						416759
Orkney				22341		
Shetland				22956		
Western Isles			25855			
Total	**1054815**	**1175896**	**1529901**	**635671**	**320000**	**788583**

Proposed Target Operating Model (TOM)

Proposed Regions (across top) and Referring Board Population (down Side)

Health Board	North	South East	South West	West
Ayrshire & Arran			365228	
Borders		115985		
Dumfries & Galloway			146442	
Forth Valley				312030
NHS Fife		371824		
NHS GG&C				1192016
NHS Grampian	590374			
NHS Highland	320000			
NHS Lanarkshire			664226	
NHS Lothian		938830		
NHS Tayside	416759			
Orkney	22341			
Shetland	22956			
Western Isles				25855
Total	**1372430**	**1426639**	**1175896**	**1529901**

Objectives of the Target Operating Model

1. **Standardise Care Pathways**: Develop and implement standardised care pathways to ensure consistent and high-quality care across all regions.
2. **Optimise Resource Utilisation**: Efficiently allocate financial and human resources to maximize the impact of vascular services.
3. **Enhance Patient Experience**: Improve patient outcomes and satisfaction by providing timely, coordinated, and patient-centred care.
4. **Leverage Technology**: Integrate advanced medical technologies and data analytics to enhance diagnostic accuracy, treatment effectiveness, and operational efficiency.
5. **Foster Collaboration**: Strengthen collaboration and communication between primary, secondary, and tertiary care providers to ensure seamless care transitions.

The target operating model for vascular surgical services involves centralising complex and emergency care at arterial centres (hubs) while providing routine non arterial and less complex care at local hospitals (spokes). This model ensures that patients receive the right level of care at the appropriate location, optimising resource use and improving patient outcomes.

Hub (Arterial Centre): Handles complex elective surgeries, emergency surgeries, advanced diagnostics, and post-operative intensive care.

- **Complex Elective Surgeries**: Procedures such as aortic aneurysm repairs, carotid endarterectomy, and complex lower limb revascularisations.
- **Emergency Surgeries**: Immediate interventions for conditions like ruptured aortic aneurysms and acute limb-threatening ischemia.
- **Advanced Diagnostics**: High-end imaging and diagnostic services, including CT angiography and MR angiography.
- **Multidisciplinary Team (MDT) Meetings**: Regular MDT meetings to discuss complex cases and develop comprehensive treatment plans.
- **Post-Operative Intensive Care**: Specialised post-operative care for patients undergoing major surgeries.
- All leg amputations will be undertaken in the arterial centres due to the need to improve perioperative mortality rates.

Spoke (Non-Arterial Centre-Local Hospitals): Provides outpatient clinics, diagnostic procedures, non-complex elective surgeries, community-based rehabilitation, and telemedicine services.

- **Outpatient Clinics**: Routine follow-up appointments, initial assessments, and management of stable vascular conditions.
- **Diagnostic Procedures**: Basic imaging services such as duplex ultrasound and ankle-brachial index (ABI) measurements.
- **Non-Complex Elective Surgeries**: Day-case procedures like varicose vein treatments and minor amputations.
- **Community-Based Rehabilitation**: Post-operative rehabilitation and management of chronic conditions.
- **Telemedicine Services**: Remote consultations and follow-up care for patients in remote or rural areas.

To determine the number of hubs and spokes required to meet the population need for vascular services in Scotland, several factors were considered, including population distribution, geographic accessibility, and the volume of vascular procedures.

High volume centres tend to have better outcomes therefore hubs require strategically placed to handle a significant number of complex cases.

Based on the data and as recommended by the task and finish group it is proposed that….

WORK IN PROGRESS: For discussion and agreement at the next T&F group

Proposal….

- Trainee numbers in vascular surgery should be improved and recruitment and retention of staff addressed-data to be reviewed and target evidence based
- Discuss and agree consultant numbers to ensure sufficient but also taking cognises of de-skilling concerns
- Nurse Practitioners and Nurse consultant numbers need increased to facilitate spoke services -agree data driven requirements
- Diagnostic services , Vascular Laboratories and Imaging
- Primary care communication and education
- SAS early communication with vascular ST or Consultant to be facilitated
- Improve UG awareness of Vascular Surgery
- Section to be finalised

4A.3 Desired Outcomes & Benefits of the Recommended Model

WORK IN PROGRESS: Discuss and finalise at next T&F group
Review and conclude referencing and add reference list as appendix

- **improved Outcomes**: Centralising complex procedures in high-volume centres can lead to better patient outcomes.
- **Equitable Access**: Ensuring that all regions have access to specialised care through a network of hubs and spokes.
- **Efficiency**: Optimising resource use and reducing duplication of services.
- **Sustainability & Resilience**
- The proposed SOM will lead to a safe and sustainable model for patients and staff
- Vascular patients from throughout Scotland requiring specialist vascular intervention, will be discussed at an appropriate Network Multi Disciplinary Meeting (MDM) to ensure they receive appropriate advice and care.
- Compliance with SHTG recommedations and realistic medicine goals are best served by network MDM process
- Key Performance Indicators to comply with NVR /VSGBI recommendations
- Sharing of good practice and equity of access for all patients

4B. DELIVER - Feasibility Assessment

Treatment: Can the option be feasibly delivered?

WORK IN PROGRESS: Summary of feasibility assessment to be added once have final cost/benefit analysis return and final data from IMS

4B.1 Principles & Assumptions

While high volume arterial centres give better outcomes for most interventions, it is acknowledged it is essential that vascular services provided outside of the arterial centre are not neglected; therefore the principles of the SOM and TOM development has been that "*What can be done locally, should be done locally*" Whilst outpatient clinics and vascular diagnostic imaging should be offered in every hospital, inpatient arterial surgery should be undertaken in a specialist 'arterial centre' **except** when delivered jointly with other services (i.e., trauma, cardiac or cancer).

Principles for Repatriation:

Repatriation should be timely, occurring as soon as it is clinically safe and appropriate, ensuring the patient is medically stable and fit to travel. Decisions must prioritize patient-centred care, considering the best interests of the patient and their family. Early coordination and clinician-to-clinician discussions are essential for effective planning. The process involves the lead clinician and MDT deciding to repatriate, communicating with the receiving hospital, organizing transport, and transferring all necessary medical records. Follow-up care plans must be clear. Transfers should occur within two days of the decision. Delays can negatively impact patient experience, reduce bed availability, strain resources, and potentially lead to poorer clinical outcomes.

WORK IN PROGRESS: Expand, Review and conclude at next T&F

Stage	Clinical Responsibility	Details
Initial Transfer Request	Referring Clinician	Initiates the transfer request and communicates with the receiving board.
Assessment for Transfer	Referring Clinician and Receiving Clinician	Both clinicians assess the patient's condition and suitability for transfer.
Preparation for Transfer	Referring Clinician and Nursing Staff	Ensures all medical records, medications, and necessary equipment are prepared for transfer.
Transfer Coordination	Transfer Coordinator (could be a designated nurse or admin staff)	Coordinates logistics, including transport and communication between boards.
During Transfer	Escorting Medical/Nursing Staff	Provides care during the transfer, ensuring patient safety and comfort.
Arrival at Receiving Board	Receiving Clinician and Nursing Staff	Takes over clinical responsibility upon patient's arrival and ensures continuity of care.
Ongoing Care at Receiving Board	Receiving Clinician	Manages the patient's care during their stay at the receiving board.
Preparation for Return Transfer	Receiving Clinician and Nursing Staff	Prepares the patient for transfer back, including updating medical records and medications.
Return Transfer Coordination	Transfer Coordinator	Coordinates the logistics for the return transfer.
During Return Transfer	Escorting Medical/Nursing Staff	Provides care during the return transfer.
Arrival Back at Original Board	Original Referring Clinician and Nursing Staff	Takes back clinical responsibility and ensures continuity of care.
Post-Transfer Follow-Up	Original Referring Clinician	Conducts follow-up assessments and adjusts care plans as needed.

4B.2 Proposed Governance Arrangements

With the establishment of the Planning and Delivery Board, statutory accountability mechanisms have not changed. All NHS Boards are directly accountable to Ministers and Scottish Government and will continue to be. Cabinet Secretary/Director General for Health and Social Care (DGHSC) will continue to set priorities, targets, and outcome measures, which will feed into the mandate for the Planning and Delivery Board to deliver within the wider NHS.

However, the Planning and Delivery Board will draw on existing legislation (National Health Service (Scotland) Act 1978, section 12J) stating that Boards "in the planning and provision of services shall … co-operate with one another with a view to securing and advancing the health of the people of Scotland".

The NHS Scotland Planning and Delivery Board will consider national decisions which may be required to achieve service sustainability and may avoid future costs, in addition to national decisions identifying which areas may need to pause or stop due to the financial pressures. Taking a strong evidence-based approach, NHSSPDB will make recommendations on NHS Scotland decisions that will be shared with Boards, Board Chief Executives (BCEs), HSCMB and Ministers where necessary.

WORK IN PROGRESS: To be reviewed and finalised at T&F group

Governance Structure and Leadership Roles

Governance Structure

1. **NHS Scotland Board**
    a. **Role**: Overall strategic oversight and accountability for vascular services.
    b. **Responsibilities**: Ensuring alignment with national health policies, approving budgets, and monitoring performance.
2. **Vascular Services Steering Group**
    a. **Role**: Development of the Target Operating Model (TOM).
    b. **Responsibilities**: Developing and overseeing the implementation plan, ensuring stakeholder engagement, and monitoring progress.
3. **Clinical Governance Committee**
    a. **Role**: Ensuring the quality and safety of vascular services.
    b. **Responsibilities**: Reviewing clinical outcomes, patient safety incidents, and adherence to clinical guidelines.
4. **Regional Vascular Networks**
    a. **Role**: Coordination of vascular services across different regions.
    b. **Responsibilities**: Facilitating collaboration between hospitals, managing resource allocation, and ensuring equitable access to care.
5. **Multidisciplinary Teams (MDTs)**
    a. **Role**: Providing comprehensive and coordinated patient care.
    b. **Responsibilities**: Developing individualised treatment plans, conducting regular case reviews, and ensuring seamless care transitions.

Leadership Roles and Responsibilities

1. **Chief Executive Officer (CEO)**
    a. **Role**: Overall leadership and management of NHS Scotland.
    b. **Responsibilities**: Strategic decision-making, resource allocation, and ensuring the delivery of high-quality vascular services.
2. **Medical Director**
    a. **Role**: Clinical leadership and oversight of vascular services.
    b. **Responsibilities**: Ensuring clinical excellence, implementing clinical guidelines, and leading quality improvement initiatives.
3. **Director of Nursing**
    a. **Role**: Leadership of nursing services within vascular care.
    b. **Responsibilities**: Ensuring high standards of nursing care, staff training, and patient safety.
4. **Vascular Service Lead**
    a. **Role**: Operational management of vascular services.
    b. **Responsibilities**: Day-to-day management, coordination of MDTs, and ensuring the implementation of care pathways.
5. **Regional Network Coordinator**
    a. **Role**: Coordination of vascular services within a specific region.
    b. **Responsibilities**: Facilitating collaboration between hospitals, managing referrals, and ensuring equitable access to care.
6. **Clinical Governance Lead**
    a. **Role**: Oversight of clinical governance activities.
    b. **Responsibilities**: Monitoring clinical outcomes, managing patient safety incidents, and ensuring adherence to clinical guidelines.

WORK IN PROGRESS: To be reviewed and finalised at T&F group

4B.3 Operational feasibility

- ### Workforce, Facilities & Equipment

Use healthcare workforce data to ensure there are enough trained professionals to meet the demand for vascular services. Allocate resources to healthcare facilities based on geographic distribution and capacity needs.

WORK IN PROGRESS: Summarise site visits, interviews and evidence from data, add to appendix full details and reference here

WOS Vascular Network

Popln serves: 1.53M

Vascular Specialist	WTE funded	Per 100K popln cover	WTE in post	Per 100K popln cover
Vascular Consultant	11.9	0.78	11.4	0.74
Interventional Radiologists	9	0.59	12	0.78
Vascular Scientists	2	0.13	1.8	0.11
Vascular Nurse Specialists	3	0.20	3	0.20

Proposed NoS NW

Popln: 1.4M (If Fife moves to SEof S NW; 1.74M otherwise)

Vascular Specialist	WTE funded	WTE in post
Vascular Consultant	18.5	15.5
Interventional Radiologists	13.6	10.2
Vascular Scientists	6.5	6.5
Vascular Nurse Specialists	5	4

South-West Scotland Vascular Network

Popln serves: 1.18M

Vascular Specialist	WTE funded	Per 100K popln cover	WTE in post	Per 100K popln cover
Vascular Consultant	10	1.51	5	0.43
Interventional Radiologists	6	0.51	5	0.43
Vascular Scientists	2	0.30	2	0.17
Vascular Nurse Specialists	5	0.43	2	0.17

South-East of Scotland Vascular Network

Popln: 1.43M (If Fife moves to SEofS NW, 1.05M otherwise)

Vascular Specialist	WTE funded	Per 100K popln cover	WTE in post	Per 100K popln cover
Vascular Consultant	8.2	0.78	8.2	0.78
Interventional Radiologists	6.5	0.62	6.5	0.62
Vascular Scientists	6.6	0.62	5.6	0.53
Vascular Nurse Specialists	7.2	0.68	6.2	0.59

POVS 2021 guidelines

Vascular Specialist	POVS 2021 guidelines	Current in post	Current funded
Vascular Consultant	Approx 55 WTE for Scotland	40.1 WTE	48.6 WTE
Interventional Radiologists	Between 27 to 55 WTE	33.7 WTE	35.1 WTE
Vascular Scientists	3 WTEs at each arterial unit	15.8 WTE	17.1 WTE (Sufficient to support 5 arterial centres)
Vascular Nurse Specialists	Approx. 55 WTE for Scotland	15.2 WTE	20.2 WTE

- **Pathways of care**

When reconfiguring services, the whole patient pathway, from diagnosis to rehabilitation, should be both defined and written down. For 'time critical' vascular treatments pathways should include time-frame standards, and how these will be recorded and monitored.

Care Pathways and Timelines

WORK IN PROGRESS: Review and conclude at next T&F group

Scenario	Action	Responsible
Community patients (out of hours)	Directed to A&E at Raigmore Hospital	ED senior clinician contacts NHST consultant team
Inpatients at Raigmore or other hospitals	Discussed directly with Vascular Consultant/Registrar NHST	Vascular Consultant/Registrar NHST

A&E at Raigmore Hospital	**- Assess and onward referral**	**A&E team at Raigmore Hospital**
	- Discharge home, GP referral to vascular clinic	
	- Refer to a specialty at Raigmore if no vascular priority	
	- Discuss with Vascular Consultant/Registrar NHST if urgent vascular input needed	
Out of hours calls (secondary care/GPs)	**- Discharge home, GP referral to vascular service at Raigmore next day**	**Vascular Consultant/Registrar NHST**
	- Hand over to appropriate Consultant at Raigmore if no urgent vascular input	
	- Accept for immediate transfer to Ninewells Hospital	
Abdominal aortic aneurysms	**- CT scan and discuss with Vascular Consultant/Registrar NHST**	**Nearest hospital in NHS Highland**
	- Immediate transfer to Ninewells for ruptured/symptomatic aneurysm	
	- Admission to General Surgery at Raigmore/Caithness/Belford if palliative	
	- Admission to General Surgery at Raigmore if other abdominal pathology likely	
Other acute aortic presentations	**- Initial management in A&E at Raigmore**	**A&E team at Raigmore Hospital**
	- Discuss with Vascular Consultant NHST as soon as Radiology report available	
	- Possible pathways: Cardiothoracic Surgery (Aberdeen/Edinburgh), Vascular Surgery (Edinburgh/Dundee), Cardiology (Raigmore), Acute Medicine (Raigmore)	
Mesenteric ischaemia	**- Admission to General Surgery at Raigmore**	**General Surgery team at Raigmore Hospital**
	- Discuss with Vascular Consultant/Registrar NHST if revascularisation possible	
	- Immediate transfer to Ninewells for revascularisation	
	- Stay at Raigmore for resection/palliation	
Stroke/TIA	**No need to involve Vascular Surgery out of hours**	
Acute/chronic limb-threatening ischaemia	**- CT angiogram and discuss with Vascular Consultant/Registrar NHST**	**Nearest hospital in NHS Highland**
	- Immediate transfer to Ninewells	

	- Discharge home if elective treatment possible	
	- Admission to General Surgery at Raigmore if palliative	
Diabetic foot	**- Admission to Acute Medicine at Raigmore**	**Acute Medicine team at Raigmore Hospital**
	- Admission to Orthopaedic Surgery at Raigmore if immediate drainage/amputation needed	
Complication of renal access	**- Admission to Acute Medicine at Raigmore**	**Acute Medicine team at Raigmore Hospital**
	- Immediate transfer to Ninewells if urgent vascular intervention needed	
IV drug abuse related complications	**- CT angiogram and discuss with Vascular Consultant/Registrar NHST**	**Nearest hospital in NHS Highland**
	- Immediate transfer to Ninewells for vascular intervention	
	- Admission to Acute Medicine at Raigmore for sepsis treatment	
Venous conditions	**- DVT managed by Acute Medicine at Raigmore**	**Acute Medicine team at Raigmore Hospital**
	- Urgent venous access managed by parent specialty	
	- Acute haemorrhage from varicose veins managed by General Surgery at Raigmore	**General Surgery team at Raigmore Hospital**
Vascular trauma	**- A&E Consultant takes charge**	**A&E team at Raigmore Hospital**
	- Default transfer to Trauma Centre, NHSG	
	- Selected patients managed by General Surgery at Raigmore if expertise available	
	- Iatrogenic injury advice from Vascular Consultant/Registrar NHST	

WORK IN PROGRESS: To be reviewed and finalised at T&F group

• Workflow & Service Integration

Responsibilities at Each Stage of the Pathway

1. **Initial Assessment**
    a. **Responsibility**: Non-Arterial -Local hospitals (Spoke) and GPs.
    b. **Role**: Conducting initial assessments, history taking, and physical examinations.
2. **Diagnostic Imaging**

   a. **Responsibility**: Arterial centres (Hub).
   b. **Role**: Performing advanced imaging such as CT angiography and MR angiography.
3. **Risk Factor Modification**
   a. **Responsibility**: Non-Arterial -Local Hospitals (Spoke) and GPs.
   b. **Role**: Providing lifestyle advice, smoking cessation programs, and managing comorbidities.
4. **Medical Management**
   a. **Responsibility**: Non-Arterial -Local hospitals (Spoke) and GPs.
   b. **Role**: Prescribing and monitoring medications.
5. **Supervised Exercise Therapy**
   a. **Responsibility**: Non-Arterial -Local hospitals (Spoke) and community-based programs.
   b. **Role**: Providing supervised exercise programs.
6. **Revascularisation / Surgical Interventions**
   a. **Responsibility**: Arterial centres (Hub).
   b. **Role**: Performing surgical and endovascular procedures.
7. **Follow-Up**
   a. **Responsibility**: Non-Arterial -Local hospitals (Spoke) and GPs.
   b. **Role**: Conducting regular follow-up appointments and monitoring progress.

WORK IN PROGRESS: To be reviewed and finalised at T&F group

- ## Technology Integration

WORK IN PROGRESS: Discuss at next T&F group, summarise from site visits and add assessment from DAS

Invest in advanced diagnostic and treatment technologies, including telehealth services to reach underserved areas.

Telemedicine: Implement telemedicine services to provide remote consultations, follow-up appointments, and monitoring for patients in remote or rural areas

- **Virtual Consultations**: Video calls with specialists for initial assessments and follow-ups.
- **Remote Monitoring**: Use of devices to track patients' health status and provide real-time feedback.

Digital Health Tools: Utilise digital health tools such as mobile apps and wearable devices to monitor patients' health status and provide real-time feedback to healthcare providers

Advancements in diagnostic tools and techniques, such as Doppler ultrasound and CT angiography, have improved the ability to diagnose vascular conditions accurately. This has contributed to an increase in outpatient visits for diagnostic evaluations and monitoring.

Implement integrated EHRs to ensure seamless information exchange and coordination

Benefits:

- Reduces duplication of tests and procedures.
- Ensures that all providers have up-to-date information.
- Facilitates better communication and continuity of care.

- **Transport Integration**

WORK IN PROGRESS: Add in final modelling from SAS once complete

4B.4 Economic Evaluation

- **Cost-Benefit Analysis**

Aspect	Details
Current Model (Individual Sites)	- Each site operates independently, managing both arterial and non-arterial cases.
	- Higher operational costs due to duplication of services and resources.
	- Potential variability in quality of care and outcomes.
Network Model (Arterial and Non-Arterial Centres)	- Centralised arterial care at designated hubs, with non-arterial care at spoke sites.
	- Improved resource utilisation and specialisation.
	- Potential for better patient outcomes and standardised care.
Average Cost per Patient	- Current model: Higher due to duplication and inefficiencies.
	- Network model: Potentially lower due to centralised services and economies of scale.
Overall Cost Impact	- Initial setup costs relating to human resource, hybrid theatre and transport.
	- Long-term savings from reduced duplication and improved efficiency.
	- Potential reduction in emergency and complex case costs due to better management.
Opportunity Cost	- Current model: Opportunity cost of not centralising services includes continued inefficiencies and variable outcomes. Current service model is unsustainable and unaffordable, ongoing costs related to locum and mutual aid
	- Network model: Opportunity cost includes potential initial disruption during transition and investment in infrastructure.

Key Considerations:

Initial Setup Costs: Establishing arterial hubs and non-arterial spokes will require investment in infrastructure, staff training, transport and coordination mechanisms.

Long-term Savings: Centralising complex and emergency vascular care can lead to significant long-term savings by reducing duplication of services and improving resource utilisation.

Quality of Care: A network model can standardise care, potentially leading to better patient outcomes and reduced variability in treatment.

Operational Efficiency: Improved coordination and specialisation can enhance operational efficiency, leading to cost savings and better patient management.

Opportunity Costs: Transitioning to a network model may involve initial disruptions and investments, but the long-term benefits of improved efficiency and patient outcomes can outweigh these costs.

Current model is unsustainable and unaffordable.

Is it affordable and deliverable?

- *Average cost per patient.*
- *Overall cost impact and affordability, including opportunity cost.*
- *Value for money compared to alternatives.*
- *Can the proposal be delivered in terms of resource, finance, infrastructure and digital requirements?*

WORK IN PROGRESS: Add in final cost analysis from SAS, finance team once concluded. Summarise data and findings from earlier sections and reference here

4B.5 Risk Assessment & Mitigation Strategies

Centralising vascular services and moving to a hub and spoke model can present several risks, but these can be mitigated with careful planning and strategic measures.

WORK IN PROGRESS: Summarise risk register here and add full risk register as appendix and reference.

Review and conclude referencing and add reference list as appendix: The Provision of Services For Patients with Vascular Disease - NHS England.

2 : Economic evaluations on centralisation of specialised healthcare services - BMJ Open.

1The Provision of Services For Patients with Vascular Disease - NHS England2Economic evaluations on centralisation of specialised healthcare ...

Risk	Description	Mitigation Strategy	Residual Risks
Reduced Access to Specialist Care	Patients may have reduced access to specialised vascular care if local hospitals lack the necessary expertise and resources.	Establish strong referral pathways to ensure that patients who need specialised care are promptly referred to high-volume centres (hubs). Implement telemedicine services to provide remote consultations with specialists.	Potential delays in referral process; reliance on telemedicine infrastructure.
Variation in Quality of Care	There may be variations in the quality of care provided at different local hospitals, leading to inconsistent patient outcomes.	Standardise care pathways and clinical guidelines across all hospitals. Conduct regular training and audits to ensure adherence to best practices.	Ongoing need for training; potential resistance to standardised guidelines.
Resource Constraints	Local hospitals may face resource constraints, including limited access to advanced technologies and specialised staff.	Allocate resources strategically, ensuring that local hospitals have the necessary equipment and trained personnel. Utilise shared services and public-private partnerships to optimise resource use.	Limited funding for resource allocation; dependency on partnerships.
Coordination Challenges	Effective coordination between local hospitals and central hubs can be challenging, potentially leading to delays in care and fragmented services.	Implement robust communication systems and integrated electronic health records (EHRs) to facilitate seamless information exchange. Establish multidisciplinary teams (MDTs) to coordinate patient care.	Technical issues with communication systems; need for continuous monitoring.
Patient Travel Burden	Patients in remote or rural areas may face difficulties traveling to central hubs for specialised care.	Expand community-based services to provide preventive care and follow-up locally. Use telemedicine to reduce the need for travel.	Limited availability of community-based services; reliance on telemedicine infrastructure.
Impact on Emergency Services	Centralising vascular services may lead to increased pressure on emergency services at central hubs, potentially causing delays in care for other emergencies.	Implement robust triage systems and ensure adequate staffing and resources at central hubs to manage increased demand. Enhance coordination between emergency services and vascular teams to streamline patient flow.	Potential bottlenecks in triage process; need for continuous staffing adjustments.
Strain on Critical Care Units	Centralising complex vascular procedures can strain critical care units, affecting the availability of beds and resources for other critical patients.	Expand critical care capacity at central hubs and optimise bed management practices. Develop protocols for timely transfer and repatriation of stable patients to local hospitals.	Limited critical care capacity; need for continuous optimisation of bed management practices.
Disruption to Diagnostic Services	Increased demand for advanced diagnostic services (e.g., CT angiography, MR angiography) at central hubs may lead to longer wait times for other patients.	Invest in additional diagnostic equipment and staff at central hubs. Implement scheduling systems to prioritise urgent cases and ensure efficient use of diagnostic resources.	Limited availability of diagnostic equipment; need for continuous scheduling adjustments.
Impact on Surgical Services	Centralising vascular surgeries may reduce the availability of operating rooms and surgical teams for other elective and emergency surgeries.	Optimise operating room schedules and increase surgical capacity at central hubs. Ensure that local hospitals continue to perform non-complex elective surgeries to balance the workload.	Limited surgical capacity; need for continuous optimisation of operating room schedules.

Coordination Challenges	Effective coordination between central hubs and local hospitals can be challenging, potentially leading to fragmented care and communication breakdowns.	Establish integrated electronic health records (EHRs) and robust communication systems to facilitate seamless information exchange. Conduct regular multidisciplinary team (MDT) meetings to ensure coordinated care.	Technical issues with EHRs; need for continuous monitoring and coordination.

Overcoming the Risks

1. **Strengthen Regional Networks**:
    a. Develop regional vascular networks to facilitate collaboration between local hospitals and arterial centres. Ensure that all hospitals within the network adhere to standardised care pathways and clinical guidelines.
2. **Invest in Training and Development**:
    a. Provide continuous training and development programs for healthcare professionals to ensure they are equipped with the latest skills and knowledge. This will help maintain high standards of care across all hospitals.
3. **Leverage Technology**:
    a. Utilise telemedicine and digital health tools to enhance service delivery and improve access to specialist care. Implement integrated EHRs to ensure seamless information exchange and coordination.
4. **Monitor and Evaluate**:
    a. Establish key performance indicators (KPIs) to monitor the quality of care and patient outcomes. Conduct regular audits and evaluations to identify areas for improvement and ensure adherence to best practices.
5. **Engage Stakeholders**:
    a. Involve patients, healthcare providers, and other stakeholders in the planning and implementation process. Gather feedback and make necessary adjustments to ensure the model meets the needs of the population.

Consequences of Highland not being an arterial centre

Lessons learned from work undertaken in 2011 indicates that if Tier 3 vascular services are withdrawn from a site there is an initial period in which increased support and advice will be required. Maintaining a local presence and vascular surgeon ownership from someone who had previously been based at that site was previously important. The importance of specialist vascular nurses and diabetic podiatrists in assessing and following up patients within a Tier 2 centre was further highlighted along with the continued need for a training programme for specialist vascular nurses.

WORK IN PROGRESS: Awaiting P Blair summary. Conclude summary of site visits, summarise previous work done in Highland and add appendix/reference here

4B.6 Regulatory and Compliance Considerations

- ### Regulatory Requirements

Before transitioning to the SOM and TOM, it's crucial to ensure compliance with national healthcare regulations and maintain high standards of clinical governance and patient safety. This will involves obtaining necessary regulatory approvals, adhering to data protection laws, and implementing robust quality assurance processes. Staff will require to receive comprehensive training on new protocols, and patient consent and communication should be prioritised. Coordination between healthcare organisations will be essential, along with addressing legal and ethical considerations. Financial practices will require to comply with NHS policies and will require formal sign off through the Directors of finance, and technology and infrastructure will require to meet regulatory standards to support the new model effectively.

Board / Provider	Requirements to deliver the SOM	SOM Implications	Requirements to deliver the TOM	TOM Implications
NHS Highland	• NOS network to mobilise • Pathways • Repatriation principles	• Cease to be an arterial centre	• NHS Highland transitioned to a non-arterial site • Clinical pathways, transport, repatriation & funding arrangements in place	•
NHS Grampian	• Form NOS network with NHS Tayside. Fife supporting as non-arterial support	• Theatre access	•	• Selected arterial cases-novel approach under review at T&F which would make on call over 2 sites achievable (WIP as part of TOM)
NHS Fife	• Support NOS network	• Support NOS network	• NHS Fife to align with the South-East of Scotland Network	• To support the network model, additional staff will require recruited as NHS Fife will remain a non-arterial centre. This will help retain the services delivered at NHS Fife.

				• A review with NHS Fife will require under taken to ensure that the impact on staff is minimised and that this transition takes account of measures to reduce the i mpact.
NHS Tay side	• Form NOS network with NHS Grampian . Fife supporting as non-arterial support	• Hybrid theatre access	• NHS Fife transition to SE network	• Additional bed/ward capacity
NHS Lot hian	• Support arterial cases from NHS Fife	• Support the NOS model by managing demand for NHS Fife arterial patien ts while developing readiness for TOM.	• NHS Fife to align with the South-East of Scotlan d network • IR space / Hybrid theatre ac cess / finance to support • Dedicated wound clinic	• Recruitment to posts to the network in conjunctio n with NHS Fife to support the transition to the TOM
SAS	• Funding & recruitment for additional double crewed A&E a mbulance 24/7 located in/ around Inverne ss area	• Adapt resourcing & delivery models • Defined clinical & geographic b ypass criteria for certain	• WIP-to be modelled via AmbSI M	• WIP-to be modelled via AmbSIM

		patients with unequivocal vascular emergencies		

WORK IN PROGRESS: To be reviewed and finalised at T&F group, move to appendix

5. DELIVER - Implementation Plan

Treatment: How will it be implemented?

Implementation Strategy

1. **Stakeholder Engagement**: Engage with key stakeholders, including healthcare providers, patients, and policymakers, to gather input and build consensus on the proposed changes.
2. **Current State Assessment**: Conduct a comprehensive assessment of the current state of vascular services to identify gaps, strengths, and areas for improvement.
3. **Developing the TOM**: Design the Target Operating Model by defining the desired future state, including care pathways, resource allocation, technology integration, and governance structures.
4. **Pilot and learn from the SOM whilst transitioning to the TOM**: Implement the SOM to test and refine the TOM before scaling up to a wider implementation across NHS Scotland.
5. **Continuous Improvement**: Establish mechanisms for continuous monitoring, evaluation, and improvement to ensure the TOM remains responsive to evolving needs and challenges.

5.1 Roadmap to implementation

Key milestones and timelines:

WORK IN PROGRESS: Discuss at next T&F group, add additional required detail to conclude once agreed

Phase	Milestone	Timeline	Responsibilities	Status
Planning and Preparation	Establish Governance Structure & agree Governance & Accountability	0-1 month	NHS Scotland Planning and Delivery Board	Complete
	Conduct Baseline Assessment	1-3 months	Vascular Task & Finish Group, Service providers	Complete
	Identify SOM / TOM recommendations / undertake feasibility assessment	3-6 months	Vascular Services Steering Group	SOM recommendations identified and feasibility assessment concluded
	Seek endorsement	1 – 3 months	NHS Scotland Planning and Delivery Board	In progress
SOM Implementation	Standardise Care Pathways	6-12 months	Vascular Service Lead, MDTs	Planned
	Enhance Multidisciplinary Teams (MDTs)	6-12 months	Vascular Service Lead, Regional Network Coordinators	Planned
	Implement Regional NOS Vascular Network	12-18 months	Regional Network Coordinators	Planned
	Stakeholder communication	12-18 months	Vascular Service Lead, GPs, Local Hospitals	Implementation plan under development
TOM Implementation	Community-Based Services	18-24 months	Vascular Service Lead, Community Health Teams	T&F group WIP
	Telemedicine and Digital Health Tools	18-24 months	Vascular Service Lead, IT Department	T&F group WIP
	TOM finalised & endorsed	24-30 months	MDTs, Clinical Governance Committee	T&F group WIP
	Enhance MDT Collaboration with AI and Data Analytics	24-30 months	Vascular Service Lead, National IT, PHS	T&F group WIP
Full Implementation and Optimisation	Infrastructure, resourcing and training funding identified and in place	36-48 months	Vascular Service Lead, Surgical Teams, NHS Scotland Board	To be identified and agreed
	Continuous Quality Improvement	48-60 months	Clinical Governance Committee,?	To be identified and agreed
	Evaluate and adjust	48-60 months	?	To be identified and agreed

5.2 Stakeholder Engagement

The fourteenth Citizens' Panel survey was published at the time of writing this case for change and citizens were specifically asked questions around NHS reform which was helpful given the specialist nature of some vascular procedures and helped inform our approach.

Key Findings from Citizens' Panel Survey:

- **Travel for Specialist Services**: 84% of respondents are willing to travel further for specialist services if it results in better outcomes.
- **Travel Preferences**: Respondents are willing to travel regionally for routine inpatient care (55%) and outpatient services (62%). For specialized services, 43% would travel regionally, 33% nationally, and 24% locally.
- **Workforce Shortages**: 90% of respondents prioritize expanding the range of NHS health and care professionals, ensuring they have appropriate training and support. This is followed by providing services in the same locations but for reduced hours (60%) and reducing the number of service locations.

WORK IN PROGRESS – Undertake next stage in process – add detail post meeting with Derek Blues

5.3 Training and Support

Plans for training healthcare professionals and providing ongoing support.

WORK IN PROGRESS-Summarise training work already underway and additional requirements to support move to TOM. Discuss and finalise at next T&F group

6. DELIVER - Monitoring and Evaluation

6.1 Performance Metrics

Key Performance Indicators (KPIs) for the Target Operating Model (TOM) are essential for monitoring performance, ensuring quality, and driving continuous improvement.

WORK IN PROGRESS- Discuss and finalise at next T&F group

1. Clinical Outcomes

- **Reduction in Disease Incidence**: Measure the decrease in the incidence of vascular diseases such as peripheral artery disease, stroke, and aneurysms.
- **Mortality Rates**: Track changes in mortality rates associated with vascular conditions.
- **Complication Rates**: Monitor the rates of complications following vascular procedures.

2. Service Efficiency

- **Waiting Times**: Measure the average waiting times for vascular consultations, diagnostics, and treatments.
- **Length of Stay**: Track the average length of hospital stays for vascular patients.
- **Readmission Rates**: Monitor the rates of readmission within 30 days of discharge for vascular conditions.

3. Patient Experience

- **Patient Satisfaction**: Use surveys to gauge patient satisfaction with vascular services.
- **Quality of Life**: Assess improvements in patients' quality of life post-treatment using standardised tools.

4. Access to Care

- **Equity of Access**: Measure access to vascular services across different demographic and geographic groups to ensure equity.
- **Utilisation Rates**: Track the utilization rates of vascular services to identify any barriers to access.

5. Preventive Measures

- **Screening Uptake**: Monitor the uptake rates of vascular screening programs.
- **Lifestyle Modification Programs**: Measure participation and success rates in programs aimed at reducing risk factors (e.g., smoking cessation, hypertension management).

6. Resource Utilization

- **Staffing Levels**: Ensure appropriate staffing levels and monitor staff-to-patient ratios.
- **Facility Utilisation**: Track the utilisation rates of facilities providing vascular services to optimize resource allocation.

7. Financial Performance

- **Cost per Patient**: Measure the average cost of providing vascular care per patient.
- **Budget Adherence**: Monitor adherence to budget allocations for vascular services.

8. Innovation and Improvement

- **Implementation of Best Practices**: Track the adoption of clinical guidelines and best practices in vascular care.
- **Research and Development**: Measure the involvement in and outcomes of research and development activities related to vascular health.

9. Health Outcomes

- **Reduction in Risk Factors**: Measure changes in the prevalence of risk factors such as smoking, hypertension, and diabetes in the population.
- **Long-term Outcomes**: Track long-term health outcomes for patients who have received vascular treatments.

By regularly monitoring these KPIs, NHS Scotland can ensure that the Target Operating Model for vascular services is effective, efficient, and continuously improving.

Furthermore, the five key performance indicators (KPIs) for a vascular service of timely care will be collected alongside compliance with entry to the vascular registry.

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

WORK IN PROGRESS: To be reviewed and finalised at T&F group

7. Conclusion and Recommendations

7.1 Conclusion

Recap of key findings and the proposed target operating model.

WORK IN PROGRESS-To be completed post final T&F group

Vascular services in the UK have been transformed since the creation of a separate vascular surgery speciality in 2013 through the introduction of the following:

- Vascular networks
- Arterial centres
- Shared pathways of care
- Multidisciplinary team working.

Whilst progress in Scotland has been paid further work is required to implement a target operating model that resolves the identified challenges around service sustainability, lack of resource and inequitable access.

Volume and outcome relationships

There is a published body of evidence that patient outcomes from major vascular surgery are related to caseload. Analysis (2012) of UK AAA repair in quartiles from the low volume units (mean 10 cases per year) through to the high-volume units (mean 150 cases per year) showed a consistent reduction in mortality across the quartiles from 4.4% to 1.9%.

Whilst it is recognised that reconfiguring to the TOM will be challenging with remote and rural impacted the most, the sustainability issues across vascular services alongside the evidence indicates only in the most geographically remote regions do the risks outweigh the benefits centralisation brings to patients.

The case for networks

Centralising resources and expertise at the arterial centres offer several benefits, including increased surgeon availability, enabling seven-day vascular surgery. Pooled budgets can be used to invest in facilities like CT scanners, hybrid theatres, and better-equipped vascular wards, allowing both endovascular and open surgery to be performed without delays. This setup provides patients and clinicians with more choices regarding procedures.

Arterial centres with higher patient volumes facilitate greater collaboration with other medical disciplines, such as cardiology, radiology, and elderly care, promoting a multidisciplinary approach with standard protocols for referral and post-operative care. This ensures that relevant support from other departments is available when surgery is provided seven days a week.

The hub and spoke network model, proposed by the Vascular Society over ten years ago and reflected in the NHS national service specification, has shown significant positive impacts where well-implemented. However, variations in implementation have led to differences in throughput, wait times, and outcomes between hubs and spokes. Despite excellent work by consultants and teams in non-network providers, advanced hub and spoke models with well-established referral processes demonstrate better outcomes.

WORK IN PROGRESS: To be finalised

7.2 Recommendations

WORK IN PROGRESS- to be completed post final T&F group, timeline and responsibilities to be added

The core recommendation is to accelerate the implementation of the proposed NOS network model. Although there are cultural, financial, and logistical barriers, the network model remains the most practical and achievable way to deliver a vascular surgery service with the capacity and flexibility to provide urgent care for all patients.

Recommendation	Associated Actions	Timeline
Ensure all units operate within the network model (arterial centres (HUB); non-arterial (Spoke)	Hubs must perform a minimum of 40 carotid endarterectomy and 60 AAA procedures per year, staffed by at least six vascular surgeons and six vascular interventional radiologists. Aim for higher volumes where possible.	
Pool budgets for investment in facilities	Invest in CT scanners, hybrid theatres, and better-equipped vascular wards.	

Recommendation	Associated Actions	Timeline
Adopt a multidisciplinary approach	Facilitate overlap with other medical disciplines, promoting standard protocols and processes for referral and post-operative care.	
Accelerate implementation of the NOS network model	Emulate well-developed hub and spoke networks to treat all patients as urgent.	Immediate
Address cultural, financial, and logistical barriers	Overcome barriers within established networks to ensure effective implementation.	
Monitor outcomes and referral processes	Ensure TOM implementation with well-established referral processes to achieve significant positive impacts on patient outcomes.	
Promote the National AAA Screening Programme (NAAASP)	Continue efforts to ensure early identification and treatment before emergencies occur.	
Increase early availability of revascularisation surgery	Enhance access to revascularisation surgery to reduce amputation rates.	
Identify funding to meet workforce and infrastructure needs for vascular surgery and interventional radiology	Evaluate and increase workforce to support sustainable delivery of TOM.	
Improve prehabilitation for AAA, PVD, and CEA	Enhance perioperative medical input for better prehabilitation.	
Ensure case ascertainment to the National Vascular Registry >85%	Achieve and maintain high case ascertainment rates.	
Improve quality of routine data entry and collection	Enhance data entry and collection processes.	
Improve coding for complex aneurysms and emergency vascular surgical activity	Enhance coding accuracy for complex cases.	
Improve insight into patient experience	Gather and utilise patient experience data to support clinical improvements.	
Improve procurement of devices and consumables	Enhance procurement through transparency, aggregation, consolidation, and best practice sharing.	

Addressing data quality issues

Alongside these core recommendations to improve care, development of the SOM and TOM has also highlighted the need to improve data collection related to vascular surgery. Development of real-time ‘dashboards’ to monitor activity, with vascular services developing action plans for improvement when standards are not being met alongside a mandatory requirement to report to the vascular registry is recommended. Investment in data analysts to support is recommended. One particular gap in the data around vascular surgery relates to patient experience. Ultimately a cultural shift is needed; one that places increased value on the importance of record keeping. It is

recommended that responsibilities around data collection to make the NVR and HES more valuable resources for commissioners and clinicians are clarified.

Workforce planning
Setting standard parameters for consultants' workload helps with workforce planning at Board level. However, Boards can only recruit from the available vascular surgery workforce and concerns about whether or not this is sufficient have been long documented. Demand is rising and it is known that many vascular surgeons are expected to retire in the next decade. There is therefore a need to plan ahead and develop a workforce strategy – not just for surgeons but for all members of the vascular team. In particular, to ensure the workforce is sustainable, the numbers of vascular specialists in training will need to increase.

Retain vascular nurse specialist posts, losing any of these vital members of the vascular team will have a detrimental effect on the network. A specialist nurse presence in the non-arterial vascular hospitals is the glue that holds the network together. Amongst other things, they ensure timely review of internal requests for vascular opinions, that relevant investigations are performed and available and the smooth transfer of patients to and from the arterial centre

Referral Protocols

Standardise referral protocols into the arterial centre, together with the investigations and the capacity of the non-invasive imaging that is available in the non-arterial network hospitals. Inevitably there will be differences, but as far as possible try to get consistency for the sake of smooth, rapid transfer of patients.

Repatriation protocols
Agree repatriation 'rules' this can make or break the capacity of an arterial centre to deliver good, timely care and so again, needs early agreement. This needs to be at executive level because of the implications it has on the wider functioning of all hospitals concerned

WORK IN PROGRESS: To be finalised

8. Appendices

8.1 Literature Review-Lessons Learned

Lessons learned from two previous service reconfigurations were considered by the task and finish Group and are outlined below.

The first involved the reconfiguration of vascular services in Northern Ireland , presented by Paul Blair and the second concerned the formation of the South West Scotland Vascular network, presented by Tam Siddiqui.

Paul Blair was appointed External Clinical Advisor for Scottish vascular service reconfiguration, he is a past President and chair of Professional Standards for VSGBI. He was closely involved in the reconfiguration of Northern Ireland vascular services and for 9 years was Clinical Director of the regional unit in Belfast, one of the largest vascular centres in the UK. He has personal experience of overseeing several UK regional vascular service reconfigurations.

Tam Siddiqui is a Consultant Vascular and Endovascular Surgeon at University Hospital Hairmyres. He was Clinical Lead during centralisation and played a pivotal leadership role in the formation of the South West Scotland Vascular Network. He has a number of management and training roles including Deputy Clinical Director for Surgery and Associated Specialties, Training Programme Director for Vascular Surgery in Scotland and Vascular Specialty Advisor to the Chief Medical Officer.

Northern Ireland Network

In 1995 Northern Ireland had eight hospitals performing vascular surgery, by 2015 reconfiguration had resulted in one singular vascular centre in Belfast serving a population of 1.9 million.

Barriers to change that were encountered are listed below

- Geographical concerns with additional travel times for patients
- Clinicians apprehensive about change
- Split site working logistics
- Loss of local vascular services for interdependent specialties
- Perception of winners and losers
- Team and hospital loyalty of clinicians, MDs and CEOs
- Perception of large complacent arterial “hub” v hard working and enthusiastic “spoke”
- Capacity issues at arterial hub, delayed repatriation to “spoke”

Lessons learned:

- Patient safety and best outcome must be the priority
- Elective and urgent index arterial cases were relatively low volume and easy to manage

- Patients with Critical Limb Ischaemia and Diabetic foot problems more difficult to manage as high volume
- Diabetic foot service now improved enhanced podiatry team
- Vast majority of vascular emergencies will tolerate and benefit from transfer to hub
- Despite significant concerns, Vascular emergencies occurring in spoke hospitals were extremely rare and could be managed locally with subsequent transfer of patient.
- Vascular presence at spoke hospitals required hub surgeons to travel and was dependent on vascular consultant numbers
- Support for vascular interdependent specialties at spoke centres important
- Avoid prolonged transition arrangements if possible
- Identification of strong clinical and managerial leaders essential
- Resources must follow patients
- Communication with staff and patients important

The service reconfiguration in Northern Ireland was an evolving model with a gradual reduction in the number of arterial centres. Some of the changes occurred without adequate time for planning. It was under resourced and as a result several Key Performance Indicators slipped, particularly assessment and intervention for patients with critical limb ischaemia. Diabetic foot services have improved due to additional funding for a regional Podiatry led initiative but maintaining some services at spoke hospitals has proved difficult as consultant vascular surgeon numbers have reduced due to retirement and staff relocation. Delayed discharge and repatriation combined with a lack of adequate inpatient beds at the arterial hub remains an ongoing problem.

South West Scotland Vascular Network

In August 2022 the vascular services of NHS Lanarkshire, NHS Ayrshire and Arran and NHS Dumfries & Galloway formally centralised, with the formation of the South West Scotland Vascular network with the hub based at University Hospital Hairmyres. This was the cumulation of an extremely complex, sensitive but necessary process involving a huge variety of stake holders, both clinical and managerial. Nonetheless, this was planned and delivered in a structured and efficient manner with “buy in” from all involved parties including executive and board level at all 3 health boards.

Some key points

- The planning and implementation were delivered via regular high level Programme Board meeting, chaired by the Director of Acute Services with senior representatives from all sites including clinical services, chief of nursing, director of finance, director of modernisation and planning and service managers from all involved specialties and disciplines.
- Attendance was compulsory with specific workstreams (capital & procurement, clinical pathways, medical staffing, AHP workforce, Repatriation, A&C staffing, finance, nursing and radiology)
- Nominated leads with described and mandated outcomes and outputs

- Deliverables included within next reporting period, progress against key deliverables and a risk register.
- The net result was an extremely well organised, efficient and productive process befitting a complex service reconfiguration across a wide geographical area and population of 1.2 million.
- There was significant capital investment from all 3 Health Boards with the construction of a highly sophisticated hybrid operating theatre, refurbished interventional radiology suite, vascular laboratory and funding of additional staff including vascular nurse specialists, vascular scientists and additional middle grade vascular surgeons.

Challenges and Lessons Learned

- Consultant staffing has become challenging as the previously fully staffed hub at University Hospital Hairmyres has inherited the consultant staffing vacancies of the other sites.
- Communication and outreach between the hub, spoke sites and with other specialties is of paramount importance.
- The formation of formal clinical pathways to support the “hub and spoke” model was very helpful
- Recruitment of the non-medical workforce is of pivotal importance with vascular nurse specialists and podiatrists of huge value.
- The patient volume was under predicted, with a knock on effect of a shortage of inpatient and critical care beds.
- Rehabilitation and repatriation pathways are complex across a wide geographical area with ongoing refinement and optimisation to improve patient flow.
- There was no significant reluctance or resistance from consultant colleagues to change their working pattern and location of clinical activity, as the benefits to patients and the service clearly outweighed any perceived inconvenience.

The formation of the South West Scotland Vascular network was a success four years in the making. The enthusiasm, passion and diligence demonstrated by the entire multidisciplinary team across the full spectrum of specialties and disciplines, both clinical and managerial led by senior figures within the organisation allowed the process to reach its goal, while accepting the lessons learned for the future.

The experience from these two service reconfigurations are helpful when considering a proposed model. In order to agree an appropriate sustainable operating model the following were considered by the task and finish Group:

- Report of Scottish Vascular Steering Group 2011
- Stonebridge Report November 2023
- SAS Preliminary modelling of transfer of Highland patients April 2024
- Arterial site visits NSS + ECA (June/July 2024)
- T+F group meetings (number ?)

- Data submissions from each arterial centre outlining capacity issues and current kep performance indicators
- Further NSS engagement at individual sites
- ECA discussions with individual lead clinicians
- ECA meeting with Trainees
- Impact of change on local vascular codependent specialties

8.2 Supporting Data

Additional data and analysis that support the findings and recommendations.

WORK IN PROGRESS: Add in all other supporting data/summary of literature review/information provided from service providers and site visit details

Main findings from previous patient surveys

Patient Satisfaction

1. **Overall Satisfaction**: The Health and Care Experience Survey indicates that a majority of patients report positive experiences with vascular surgical services. High satisfaction levels are noted in areas such as the professionalism of staff and the quality of care received 1.
2. **Communication**: Patients appreciate clear and effective communication from healthcare providers, which is crucial for understanding treatment options and managing expectations2.
3. **Waiting Times**: While many patients are satisfied with the care they receive, some express concerns about waiting times for appointments and procedures2.

Quality of Life

1. **Post-Treatment Improvement**: Many patients report significant improvements in their quality of life following vascular treatments. This includes reduced pain, increased mobility, and better overall health3.
2. **Ongoing Support**: Patient's value ongoing support and follow-up care, which helps them manage their conditions more effectively and maintain a higher quality of life3.

Health and Care Experience Survey - gov.scot

8.3 Glossary

Definitions of key terms and acronyms used in the report.

WORK IN PROGRESS: Appendix to be added

8.5 References

WORK IN PROGRESS-add in reference appendix and ensure all links work

List of references and sources used in the report.

1	Diabetes | NHS Research Scotland | NHS Research Scotland
2	Scotland's Population 2023 - The Registrar General's Annual Review of Demographic Trends - National Records of Scotland (NRS)
3	Vascular Services Quality Improvement Programme (VSQIP) 2024 State of the Nation Report
4	Population projections – ScotPHO
5	Scottish Burden of Disease Forecasting Briefing
6	Scottish Burden of Disease Study - Public Health Scotland
7	2024 NVR State of the Nation Report - HTML - VSQIP - Vascular Services
8	Scotland's Census 2022 - Rounded population estimates
9	Public Health Scotland Surgical Procedures Dashboard

WORK IN PROGRESS: Review and add in all supporting appendices including EQIA