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Vascular Surgery

A model of care for Ireland

2023

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Vascular Surgery
A model of care for Ireland 2023

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FOREWORD

The National Clinical Programme in Surgery (NCPS), has published Models of Care defining the generic standards of care that should apply for acute (unscheduled) (NCPS, 2013) and elective (scheduled) (NCPS, 2011) surgical care in Irish hospitals. These services are delivered by multidisciplinary teams with a wide range of expertise. The development of specialty Models of Care was the next step in defining best practice, with both Urology and Otolaryngology Head and Neck Surgery being published in 2019. These specialty Models of Care allow a deeper understanding of the range of activity delivered by specialist services as well as areas where there are unmet needs.

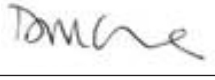
Improvement of surgical services will require specialties to define how the multidisciplinary surgical workforce can best deliver the care required by Irish patients and consider new ways of working, such as one-stop clinics, delivery of services by other healthcare professionals where appropriate, and migration of some inpatient procedures towards ambulatory care. New technology has the potential to change, not only the diagnostic and therapeutic procedures that can be performed, but also the way that surgeons communicate with patients, interdisciplinary team members, colleagues in the community and their fellow surgeons. The starting point for the development of specialty Models of Care must remain the needs of our patients and our responsibility to ensure that these services are accessible, safe, equitable, and of high quality. Recommendations should also be delivered in a sustainable way.

Developments in the understanding of disease, diagnostic capability and therapeutic interventions mean an ever-changing landscape for almost all specialties. This is most evident for surgical specialties due to operative technological developments. In vascular surgery, these changes, combined with recent specialty designation, make it a rapidly evolving specialty. Vascular surgeons provide an important service to the Irish healthcare system, with their capacity to treat a wide range of disease processes that affect both the venous and arterial systems. Vascular surgery services broaden the complexity and diversity of services that a healthcare system can offer, both in the inpatient and outpatient settings.

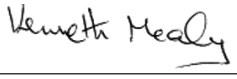
This Model of Care will briefly outline recent changes in the specialty, the nature of vascular surgery, how the service is currently provided and finally, will set out the recommended changes required to enable the optimum delivery of the service in the next 5–10 years. The Model of Care aims to align with the Sláintecare objective of delivering a patient centred service across community and hospital services and as close to the patients' homes as possible.

The data used to generate this report was 2019 HIPE data which should reflect the status of vascular surgery prior to the COVID-19 pandemic. The Model of Care will challenge those who deliver the service and stakeholders who resource the changes in infrastructure required, to deliver the proposed changes.

Dr Martin Feely, Clinical Advisor for Vascular Surgery, National Clinical Programme in Surgery (NCPS), RCSI



Professor Deborah McNamara



Mr Ken Mealy

Co-Leads for National Clinical Programme in Surgery

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VASCULAR SURGERY
MODEL OF CARE FOR IRELAND 2023

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1.0 WORKING AND ADVISORY GROUP

A multidisciplinary working and clinical advisory group was established to develop the Model of Care for Vascular Surgery in Ireland to align with current HSE and Sláintecare principles. The participants and their roles are detailed in Table 1.

Table 1. Working and Advisory Group Members (Present and Past)

Name	Representation
Mr Martin Feeley	Chair and NCPS Clinical Advisor for Vascular Surgery
Ciara Hughes	Programme Manager – NCPS
Professor Deborah McNamara	Co-Lead of the NCPS
Mr Ken Mealy	Co-Lead of the NCPS
Jamie Logan	Nurse Lead for National Clinical Programme in Surgery
Gerry Kelliher	Business Intelligence for Acute Hospitals
Padraig Kelly	Associate Director, Surgical Affairs, RCSI
Kieran Ryan	Managing Director, Surgical Affairs, RCSI
Professor Paul Ridgway	NCPS Clinical Advisor for General Surgery
Professor Michael Walsh	NCPS Clinical Advisor for ENT
Mr Padraic Regan	NCPS Clinical Advisor for Plastic Surgery
Mr Dermot Pierse	NCPS Clinical Advisor for OMFS
Professor Eamonn Rogers	NCPS Clinical Advisor for Urology
Laura Hammond	Data Analyst, NCPS
Dr Síle O'Connor	Project Manager, NCPS
Sharon Casey	Administration Officer, NCPS
Mr Tony Moloney	Consultant Vascular Surgeon, Secretary of Irish Vascular Society
Ms Mary Barry	Consultant Vascular Surgeon, Chair of Irish Vascular Society
Ms Zenia Martin	Consultant Vascular Surgeon
Professor Eamon Kavanagh	Vascular Surgery Training Coordinator, RCSI
Mr Keith Synott	National Lead for Trauma
The late Professor Sean Tierney	Representative for Diabetic Foot
Dr Caitriona Canning	Representative for Vascular Medicine
Professor Michael Lee	Representative for Radiology
Dr Mike O'Connor	National Clinical Advisor and Group Lead for Acute Hospitals
Dr Roisin Morris	National Doctors Training Programme
Tom Pierse	National Doctors Training Programme
Professor George Mellotte	National Renal Office

2.0 KEY RECOMMENDATIONS

Table 2. Summary of Key Recommendations

Configuration of Vascular Services

Area	No.	Details
Configuration of Vascular Services	1	Create a hub and spoke Model of Care for vascular surgery services. The HSE should designate and resource the hub and spoke centres to align with the Health Regions as per guidelines described in this Model of Care.
	2	Establish dedicated vascular wards with appropriately trained staff in the vascular hub, with ring-fenced beds.
	3	Designated vascular hubs should accept referral on a no-refusal basis from designated hospitals with an agreed repatriation arrangement.
	4	The regular scheduled presence of a consultant vascular surgeon onsite in the spoke is critical to facilitate urgent inpatient assessments; consultant vascular opinion should be available within 48 hours and preferably within 24 hours during the working week.
	5	Vascular surgery services should work with the National Office for Trauma Services and the National Ambulance Service to establish transfer protocols for vascular emergencies and also for transfer of care of trauma patients when acute management has been completed.
	6	Designate National Centre/s for high complexity, low volume procedures e.g. thoracoabdominal aneurysms.
	7	Establish a vascular laboratory in every hub and spoke site.
	8	Vascular laboratories should be integrated into the NIMIS diagnostic imaging platform.
	9	Each vascular hub should be equipped with a hybrid theatre. Theatres should be risk-assessed to ensure minimum radiation exposure for staff and patients.
	10	The decision to operate on children in the treatment of vascular disease should be carefully considered by a multidisciplinary team and carried out in a dedicated centre.

Referrals

Area	No.	Details
e-Referrals	11	Establish an electronic e-referral system for all patients requiring a vascular surgery consultation including recommended criteria for referral. This should include the varicose vein pathway developed as part of this model of care.

Population Health and Wellbeing

Area	No.	Details
Health and Wellbeing	12	Work with the agencies within the HSE/DoH to promote a healthy lifestyle awareness to include smoking cessation, diet, exercise and alcohol consumption.

Clinical Care

Area	No.	Details
Limb Saving	13	Establish Diabetic foot teams, as per the Diabetic Foot Model of Care, to ensure a seamless care pathway between community and hospital services to prevent, recognise and treat diabetic foot disease.
	14	Patients with severe critical limb ischaemia or sudden onset acute limb ischaemia should be immediately referred to vascular surgery, as emergency intervention may be required to prevent loss of limb.
	15	Surgery for incapacitating but non-limb threatening disease of the leg arteries should only be considered once lifestyle changes such as exercise and smoking cessation have been adopted.
	16	Enhance collaboration with local specialist prosthetic rehabilitation services/teams to promote integrated care pathways and best functional outcomes for patients undergoing amputations.
Leg Ulceration	17	Establish outreach leg ulcer clinics, run by advanced nurse practitioners or clinical nurse specialists, so that leg ulcer care can be delivered as close to the patients home as possible.
Abdominal Aortic Aneurysm (AAA)	18	Any patient with a ruptured AAA deemed appropriate for surgery, should be immediately transferred to a vascular hub centre.
	19	Establish a national AAA screening programme with agreement from HIQA and the National Screening Programme.
	20	To ensure best practice, a minimum number of 40 AAA procedures should be performed in a vascular hub per annum (elective and emergency). At least 10 elective EVAR procedures should be performed in a vascular hub per annum (averaged over three years).
Stroke Prevention/ Transient Ischaemic Attack (TIA)	21	Establish nationwide rapid access clinics for patients with a Transient Ischaemic Attack (TIA) (ideally assessed within 24 hours). These clinics should have staff and resources to investigate TIA patients in one hospital visit, i.e., a one-stop-shop with immediate access to carotid ultrasound and CT scanning.
	22	Patients for carotid endarterectomy **must** have immediate access to vascular surgery inpatient beds, with daily access to theatre. Surgery should be carried out as soon as possible but no more than 14 days after TIA symptom onset.
	23	To ensure best practice, a minimum number of 35 carotid surgeries should be performed in a vascular hub per annum (elective and emergency and averaged over three years).

Area	No.	Details
Renal Replacement/ Vascular Access	24	All patients with established and deteriorating renal failure who will require haemodialysis should have timely access to A-V fistula surgery, ideally 4 months prior to dialysis.
	25	Each vascular unit should establish a fistula care team co-ordinated by a Clinical Nurse Specialist or Advanced Nurse Practitioner.
	26	Enhance collaboration with the National Renal Office (NRO) to develop a Fistula-First programme for the optimum provision of haemodialysis nationally.
	27	Provide theatre access for A-V fistula surgery.
	28	Ensure vascular laboratory support is available for pre-op assessment and fistula maintenance.
Varicose Veins	29	Varicose vein treatment should be carried out in an ambulatory care setting, ideally as a see and treat service.
Gerontology	30	Comprehensive Geriatric Assessments should become routine for patients >65 years of age undergoing arterial surgery. Gerontology resources should be expanded to facilitate this co-management.
Workforce and Training	31	The RCSI and NDTP should work closely with the Irish Vascular Society to ensure the availability of adequately trained consultants to meet the needs of the population.
	32	Each Hospital Group (HG) / Health Region (HR) should undertake a workforce analysis to identify deficiencies, especially in specialist nursing.
	33	Vascular surgeons using radiation should undertake an accredited Radiation Protection training course and adhere to European Society for Vascular Surgery (ESVS) published Clinical Practice Guidelines on Radiation Safety.
	34	Assess the need for a Physician Associate role in vascular surgery.
Quality Assurance, Audit and Patient Safety	35	Establish a National Vascular Registry to record vascular surgery activity and implant details.
Technology and Innovation	36	Vascular surgeons should utilise virtual health where appropriate but particularly for follow-up/review appointments.

3.0 RATIONALE FOR THE MODEL OF CARE

A Model of Care defines the way health services are delivered and describes best practice in care and services for a person, patient cohort or population.

The National Clinical Programme in Surgery has published four Models of Care to date defining the generic standards of care that should apply for acute (unscheduled) (NCPS, 2013) and elective (scheduled) (NCPS, 2011) surgical care in Irish hospitals. These services are delivered by multidisciplinary teams in a broad range of specialties. These were followed by Models of Care for Urology and Otolaryngology Head and Neck Surgery. These specialty Models of Care demonstrate the next step in defining best practice and allow a deeper understanding of the range of activity delivered by specialist services. In addition to examining areas where there are unmet needs, they also provide an opportunity for each specialty in surgery to define how the multidisciplinary surgical workforce can best deliver the care required by Irish patients.

Improvement of surgical services will require specialties to consider new ways of working. One-stop-shop clinics and delivery of services by Nursing and Health and Social Care Professionals, including Physician Associates where appropriate, and migration of some inpatient procedures towards ambulatory care, all need to be taken into consideration.

The COVID-19 pandemic has demonstrated that new technology has the potential to change not only the diagnostic and therapeutic procedures available, but also the way that surgeons communicate with patients, interdisciplinary team members, colleagues in the community and fellow surgeons.

The starting point for the development of specialty Models of Care must remain our patients' needs and our responsibility to ensure that these services are accessible, safe, equitable, and of high quality. The services must also be delivered in a sustainable way. Developments in the understanding of disease, diagnostic capability and therapeutic interventions mean an ever-changing landscape for almost all specialties. This is most evident for surgical specialties due to operative technological developments. In Vascular Surgery, these changes, combined with recent specialty designation, make it a rapidly evolving specialty and, as such, the time is opportune to produce a Model of Care for the Vascular Surgery service in Ireland.

4.0 AIMS AND OBJECTIVES

The aims of the vascular surgery model of care are to:

(a) Describe the vascular surgery needs of the population now and for the foreseeable future

(b) Describe the resources, including workforce, required to service those needs

(c) Describe the best deployment of those resources to deliver the service

The objectives of the model of care will be to:

- Describe the spectrum of conditions which require vascular surgery specialty intervention, including prevention, early disease identification and management to prevent disease progression and complications
- Describe the most effective and efficient system to deliver vascular surgery services using a hub and spoke model
- Outline the training programme and consultant workforce planning needed to ensure the provision of a vascular surgery service of international standard
- Support workforce planning, particularly in the area of Clinical Nurse Specialists, Advanced Nurse Practitioners and other healthcare professionals in vascular surgery

5.0 SCOPE

This Model of Care covers all patients in both acute and chronic healthcare settings.

6.0 OVERVIEW OF VASCULAR SURGERY IN IRELAND

Vascular Surgery has traditionally been a sub-specialty of General Surgery, with the vast majority of surgeons having General Surgery as their primary interest. In the 1990s, surgeons with a special interest in Vascular Surgery formed the Irish Vascular Society (IVS), and in March 1998 produced the document: 'The Provision of Vascular Surgery Service in the Republic of Ireland'. This document outlined the evolution of Vascular Surgery as a specialty and the need for provision of a specialty service. In 2000, Comhairle na n-Ospidéal produced a report of the Joint Committee of Vascular Surgery Services which largely adopted the recommendations of the IVS 1998 report.

In 2014, fourteen years after the Comhairle na n-Ospidéal document on Vascular Surgery provision, Vascular Surgery became the fifty-sixth standalone specialty recognised by the Irish Medical Council. There are currently 33 Vascular Surgeons registered in Ireland.

7.0 DEFINITION AND SCOPE OF VASCULAR SURGERY

The specialty of vascular surgery deals with diseases of the arteries, veins and lymphatics. The management of arterial disease constitutes the core essential element of the service. The exceptions are the intra-cranial arterial system and the intra-cardiac and peri-cardiac arterial systems, which are the remit of Neurosurgeons, Interventional Radiologists, Cardiologists and Cardiac Surgeons.

The Core Elements of Vascular Surgery are:

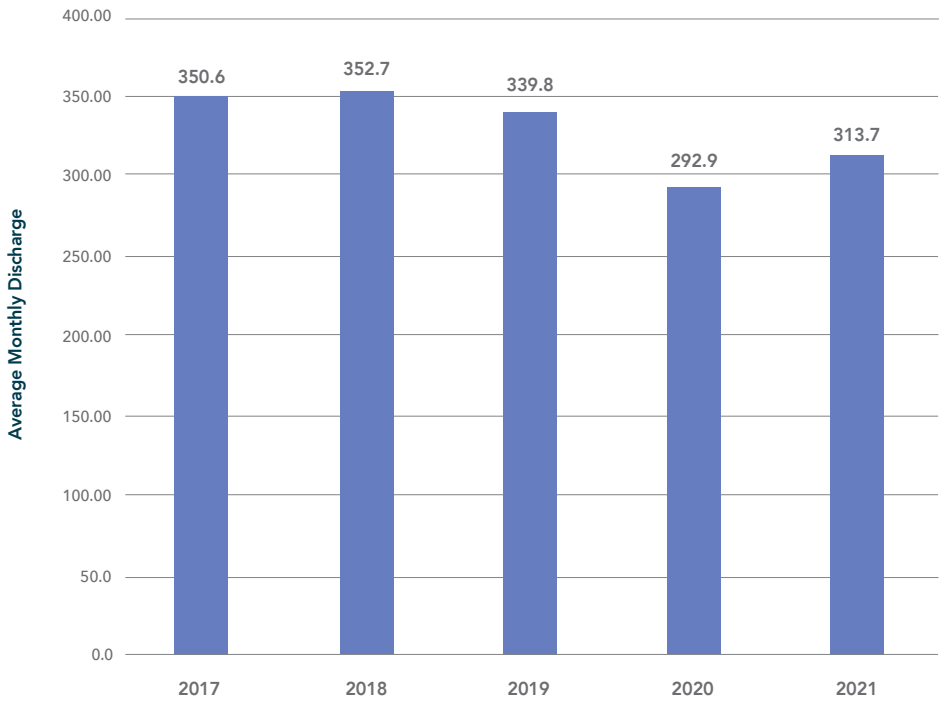
- Preserve limb function and prevent limb loss
- Abdominal Aortic Aneurysm Surgery
- Stroke prevention surgery: Carotid Endarterectomy
- Vascular Access for Dialysis Patients
- Venous Disease
- Other Arterial Conditions requiring vascular care
- Provide assistance to colleagues in other specialties:
  - Management of Vascular Complications in Diabetes, Renal disease, etc. e.g. MDTs with neurology, renal and endocrine services
  - Operative assistance to other surgical specialties, e.g. Cancer Surgery
- Paediatric Vascular Surgery
- Other conditions managed by vascular surgeons, Lymphoedema, Thoracic Outlet Syndrome (TOS) and Hyperhidrosis

8.0 VASCULAR SURGERY ACTIVITY IN IRELAND

8.1 THE IMPACT OF THE COVID-19 PANDEMIC

The COVID-19 pandemic that began in March 2020 caused significant disruption to all surgical activity. Pre-pandemic HIPE data has been used to demonstrate vascular activity and workload. The impact on vascular surgery inpatient activity of the pandemic is demonstrated in Figure 1.

Figure 1. Vascular Surgery Inpatient Activity (Jan'17 – Dec '21)



NQAIS Clinical uses HIPE data supplied by HPO and coded by 31st Oct' 22. Excludes state funded activity in private facilities and non-acute hospital group data.

8.2 VASCULAR SURGERY ACTIVITY

In 2019, there were 9,921 discharges from Vascular Surgery, accounting for 2.1% of all surgical discharges. The top 7 procedures for patients discharged by Vascular Surgeons in Ireland are outlined in Table 3. Vascular Surgery had the 8th highest number of discharges across all surgical specialties (HIPE Data, 2019). These figures do not include those patients discharged by other specialties who had vascular operative procedures.

Table 3. Top Seven Vascular Surgical Interventions for Patients in 2019 in Ireland (HIPE)

Ranking	Procedure	National No. of Discharges*
1	Varicose Veins	3,720
2	Percutaneous Balloon Angioplasty	1,008*
3	Partial Foot Amputations	788
4	Open Arterial Surgery of the Limbs	594
5	Repair of Abdominal Aortic Aneurysm	436
6	Arteriovenous Anastomosis of Upper Limb	358
7	Carotid Endarterectomy/Resection	347
	Other	2,670
	Total	**9,921**

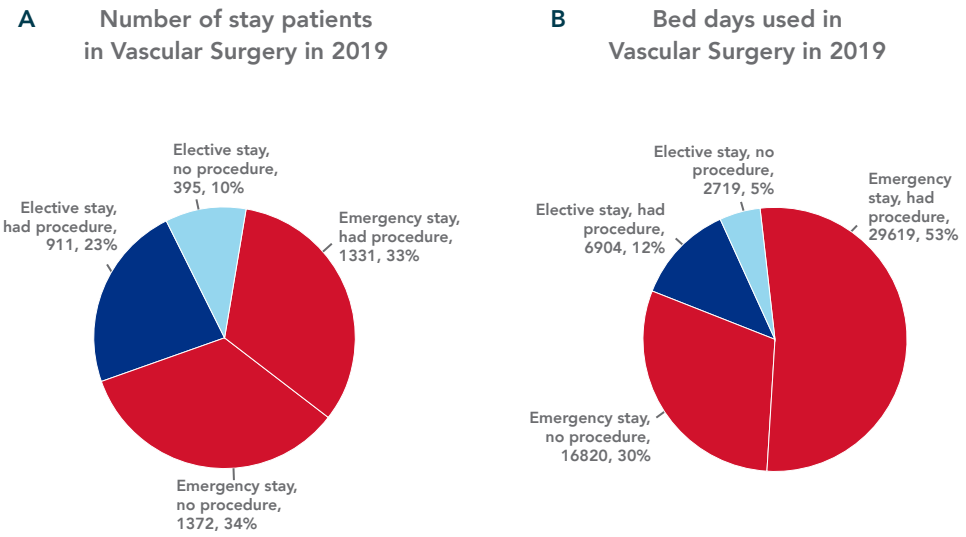
*In some centres, a proportion of the percutaneous balloon angioplasty procedures are carried out by Interventional Radiologists

8.3 THE URGENT NATURE OF VASCULAR SURGERY

The primary function of vascular surgery is to treat complications caused by diseases of arteries by removing disease material or a clot, bypassing blockages or replacing diseased artery segments. A minority of surgical interventions are emergency in nature; necessary within one to two hours to protect life or limb. As outlined in the GIRFT (Get It Right First Time) UK report (2018) (1), the use of the elective/emergency classification, as used for other surgical specialties, has limitations for vascular surgery as there are few absolute emergency (immediate) and few elective (can wait) arterial surgery procedures. The vast majority of surgical interventions are of an urgent nature. Interventions for the four core specialty elements (limb saving, abdominal aortic aneurysm, stroke prevention surgery and creation of arterio-venous fistula) when deemed necessary, need to be carried out within days or weeks.

On average, two-thirds of vascular surgery inpatients are admitted as emergencies (NQAIS, 2019). As shown in Figure 2a, in 2019, 67% of vascular surgery inpatients were admitted from the Emergency Department. Of all inpatient vascular surgery interventions, 60% were on patients admitted as emergencies (NQAIS 2019). Bed occupancy by vascular surgery patients for emergency admissions was 83% of the total bed days for vascular surgery which is illustrated in Figure 2b.

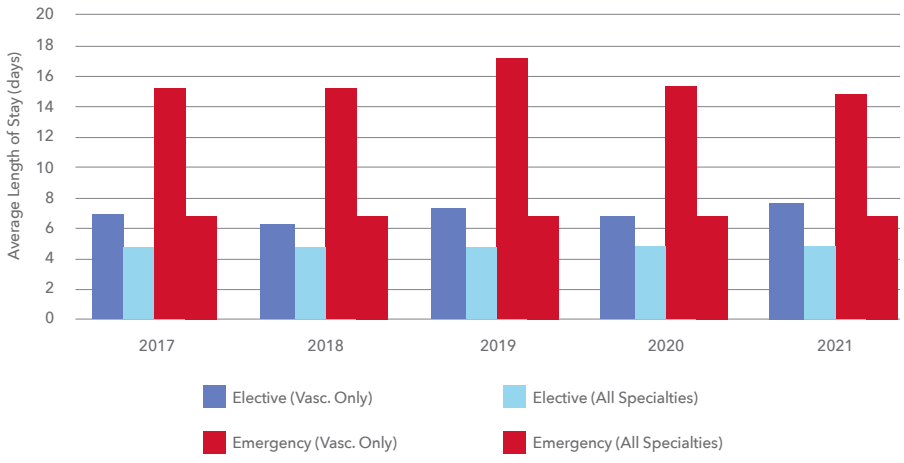
Figure 2. Vascular Surgery Inpatients (A) and Bed Days used (B) in 2019, broken down into Elective and Emergency



*The data was obtained from NQAIS Clinical, which utilises HIPE data and includes patients who were not discharged by Vascular Surgery. 'Had procedure' includes records of activity where the patient underwent a vascular surgical procedure. 'No procedure' includes patients who had non-operative treatment.

In 2019, the average length of stay (AVLOS) for emergency vascular surgery patients (17.18 days) is more than twice the length of stay for other emergency surgical specialties (6.97 days). For elective patients the AVLOS was 7.34 days vs. 4.74 days for other elective surgical patients. This reflects the complex nature and multiple co-morbidities of these patients. This has remained consistent both pre, during and post-pandemic (Figure 3).

Figure 3. Average length of stay (days) for Vascular Surgery Patients (Elective Vs Emergency) compared to all Surgical Specialties (2017 – 2021)



The activity data presented does not reflect the entire workload of the vascular service. Due to the interdependence of vascular surgery with many other specialties, many patients requiring vascular surgery intervention remain under the care of, and are discharged by other specialties. This is demonstrated in Table 4.

Table 4. Number of procedures by Vascular Surgeons on patients discharged by other specialties, 2019.

Discharge Specialty	2019
General Surgery	621
Nephrology	233
Orthopaedics	59
Geriatric Medicine	81
Other	392

This data was obtained from NQAIS Clinical, which utilises HIPE data supplied by the HPO, 2019.

8.4 VASCULAR SURGERY WAITING LISTS

The urgent nature of surgery for arterial disease does not allow significant waiting lists for either OPD or inpatient services. There are exceptions, such as intervention for severe but non-limb threatening disease of the leg arteries which restricts walking, and also surgery for asymptomatic carotid artery disease (less than 15% of carotid surgery). Similarly, the creation of arteriovenous fistulas to facilitate haemodialysis for patients with renal failure, once deemed necessary should be carried out within four months (2, 3).

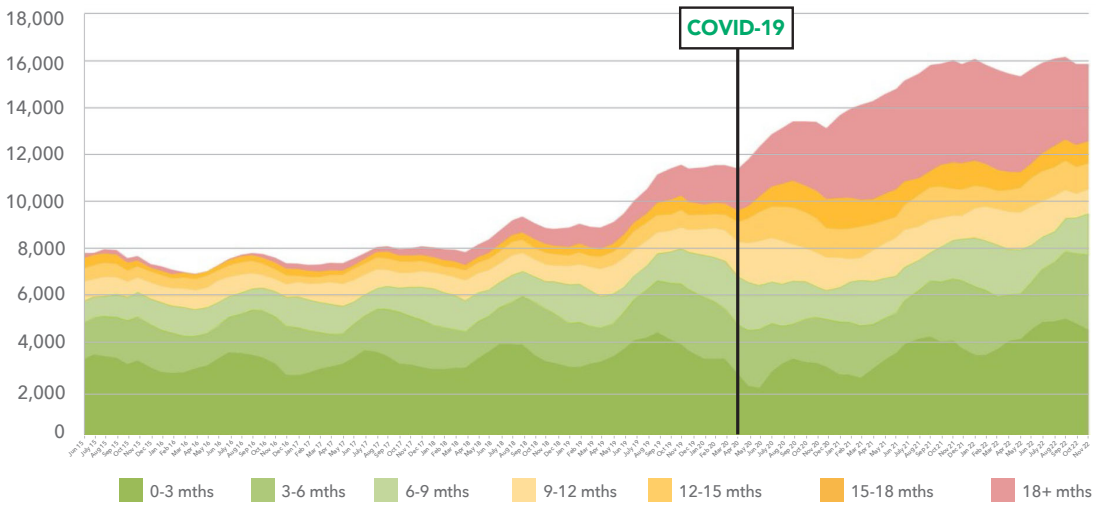
The non-arterial component of Vascular Surgery is almost exclusively the treatment of varicose veins. Varicose veins comprise the majority of General Practitioner referrals to the vascular OPD. This is a non-life or limb threatening condition and as there is rarely urgency for review or intervention, this can explain the significant waiting lists for OPD review and intervention.

8.4.1 Outpatient Appointments Waiting List

The OPD waiting list has increased steadily over the last seven years to over 15,500 patients waiting for consultation (Figure 4). The cause for a referral is not recorded, but as all arterial conditions are triaged and seen urgently, as are leg ulcer referrals, it is estimated that >90% of waiters are for varicose vein symptoms.

Since March 2020, the COVID-19 pandemic has had a negative impact on outpatient appointments waiting lists including those for vascular services. The trend from June 2015 to November 2022 is outlined below in Figure 4 (NTPF) and demonstrated in Table 5. It is of note that the number of patients waiting over 9 months since 2019 has increased by 78% (3,567 to 6,359), with an overall increase for all waiters of 36.9% from 2019 to 2022. The data indicates a decrease in the number of patients who have been on the waiting list for 0-3 months from 2019 to 2020 (3,950 to 3,154). This may be explained, not by an increase in service provision, but by a reduction in the number of patients attending General Practitioners during the pandemic and, therefore, not subsequently being referred and added to the OPD waiting list.

Figure 4. Vascular surgery outpatient waiting list trend from June 2015 – November 2022 (by month)



Waiting list data supplied by NTPF

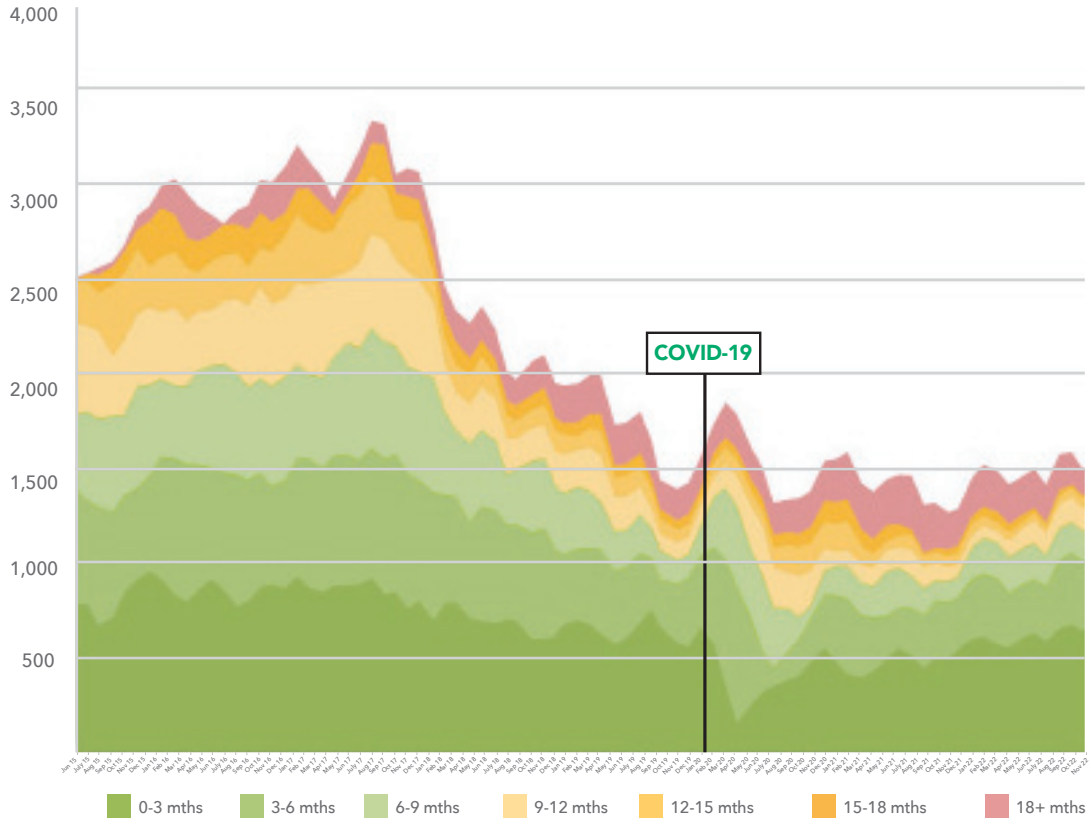
Table 5. Total for Vascular Surgery outpatient waiting list November 2015 – November 2022

Outpatient Waiting List	0-3 months	3-6 Months	6-9 Months	9-12 Months	12-15th Months	15-18 Months	18+ Months	TOTAL
30/11/2022	4,563	3,156	1,764	1,028	1,102	937	3,292	**15,842**
30/11/2021	4,114	2,588	1,644	1,050	1,132	1,125	4,345	**15,998**
26/11/2020	3,154	1,919	1,325	1432	1,458	1,182	2,924	**13,394**
28/11/2019	3,950	2,545	1,509	889	734	614	1,330	**11,571**
29/11/2018	3,223	2,211	1,161	730	483	381	685	**8,874**
30/11/2017	3,075	2,044	1,233	604	472	266	315	**8,009**
30/11/2016	3,124	1,969	1,082	523	409	288	217	**7,612**
26/11/2015	3,255	1,832	1,056	615	469	258	201	**7,686**

8.4.2 Inpatient/Day Case Waiting Lists

As mentioned previously, the nature of arterial surgery does not allow for significant waiting lists for inpatient services or procedures. In contrast to the OPD waiting list, it is encouraging to see in Figure 5 that the inpatient and day case surgery waiting list has decreased since 2018. There was a small increase at the beginning of the pandemic which then decreased again towards the end of 2020. This, however, may reflect a reduction in referrals of patients with varicose veins and reduction of OPD clinics, thereby limiting patients being added to the surgical waiting list since the onset of COVID-19. This is illustrated in Figure 5, showing a sharp drop in the number of patients waiting 0-6 months from March 2020.

Figure 5. Vascular Surgery IP/DC waiting list month-end trend June 2015 - November 2022



Waiting list data supplied by NTPF

9.0 THE CORE ELEMENTS OF VASCULAR SURGERY

The following section briefly outlines the principle conditions within the remit of vascular surgery, describes the principles of best practice and makes recommendations regarding changes required in order to deliver optimum care.

9.1 PRESERVE LIMB FUNCTION AND PREVENT LIMB LOSS

RECOMMENDATION 14

Patients with severe critical limb ischaemia or sudden onset acute limb ischaemia should be immediately referred to vascular surgery, as emergency intervention may be required to prevent loss of limb.

Peripheral Arterial Disease (PAD) results from atheromatous disease which narrows the leg arteries, thus limiting blood supply. Upper limbs arteries are rarely affected by PAD. The limited blood supply causes pain when walking, limiting walking ability. The condition is common and affects approximately 1% of 40-49 year olds, 3-5% of 60 year olds and 15-20% at 70 years of age (4, 5). While limited walking ability impacts significantly on life quality, the major concern is that this condition can progress to leg gangrene. As peripheral artery disease progresses, the blood flow is reduced to levels barely adequate to maintain tissue viability, resulting in intractable foot pain and leg ulceration, known as Critical Limb Ischaemia (CLI). CLI is the painful precursor of imminent foot/leg gangrene and limb loss.

Acute Limb Ischaemia (ALI) occurs if there is a sudden compromise in blood supply to the leg or arm, usually as a result of a blood clot originating in the heart. It can also occur as a result of trauma or thrombosis of a diseased artery. In complete arterial obstruction, irreversible changes occur to the nerves in 4–6 h, to the muscles in 6–8 h, and to the skin in 8–12 h (4). ALI is the most common vascular emergency. Approximately 120 surgical procedures are performed annually, of which about 20% are to prevent arm loss (HIPE). Traumatic arterial injury is infrequent but surgery is extremely time dependent to control haemorrhage and restore blood supply.

Acute limb ischaemia (ALI) is differentiated from chronic limb ischaemia (CLI) by the duration of symptoms being <2 weeks (6).

In March 2019, the Vascular Society (of Great Britain and Ireland) published a best practice clinical care pathway for PAD (4). They recommend that patients with severe critical limb ischaemia, foot sepsis or sudden onset acute limb ischaemia require an immediate referral to vascular surgery, as emergency intervention may be required to prevent limb amputation (7). This recommendation is adopted in this model of care.

RECOMMENDATION 15

Surgery for incapacitating but non-limb threatening disease of the leg arteries should only be considered once lifestyle changes such as exercise and smoking cessation have been adopted.

There is considerable evidence published which supports the impact of smoking cessation on PAD. This is outlined in Section 15 under health and wellbeing. Surgery for incapacitating but non-limb threatening disease of the leg arteries should only be considered once lifestyle changes such as exercise and smoking cessation have been adopted.

9.1.1 Diabetic Foot Disease (The Diabetic Foot)

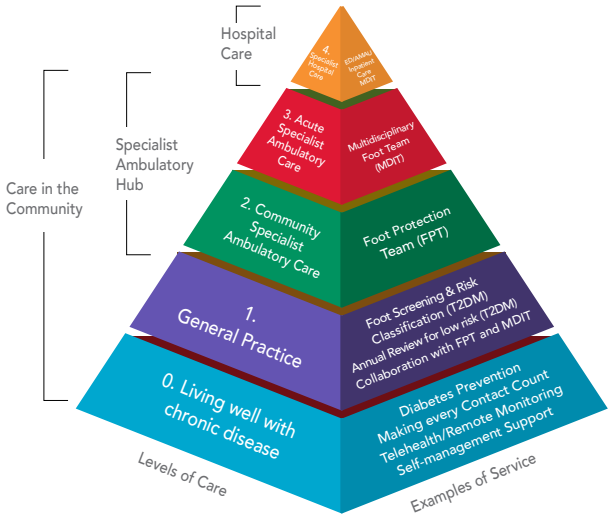
Diabetes is now the major risk factor for PAD and CLI with care of the 'Diabetic Foot' being the single greatest challenge for vascular surgeons. Over 50% of interventions for PAD to preserve limbs are in patients with diabetes, with the risk of major amputation in diabetic patients up to 15 fold to that in non-diabetics (8). Patients who present with diabetic foot ulceration (DFU) or diabetic foot infection (DFI) are at significant risk of limb loss. Approximately 80% of diabetes-related major amputations are preceded by DFU (8).

Of note is that there was a 20% increase in in toe and partial foot amputations in 2019 when compared to 2017 in Ireland (NQAIS).

For many patients, the wound following toe amputation heals without leg revascularisation intervention and has quite a good prognosis (9). However, for a significant number of patients, revascularisation is necessary to enable amputation site healing. Despite best efforts, revascularisation may not be successful and then it is necessary to progress to major limb amputation which is associated with a prolonged hospital stay and reduced life expectancy, partly due to co-morbidity.

One key feature of diabetic foot disease is the rapidity of disease progression, particularly infection, where what looks like a relatively harmless condition can progress to a limb and life-threatening situation in a matter of hours. Prompt and appropriate care of infection, neuropathy, ulceration, deformity and ischaemia with good glycaemic control requires multidisciplinary input. The incidence and seriousness of diabetic foot complications is such that the National Clinical Programme for Diabetes has produced a "Model of Care for the Diabetic Foot" (11). This has been drafted by the National Clinical Programme for Diabetes Working Group including Diabetologists, Podiatrists, Vascular Surgeons and many Nursing, Community and Rehabilitation specialists. This Model of Care outlines the goal of delivering the right foot care, at the right time, by the right team and in the right place. It sets out a comprehensive and detailed guideline for foot care in those with diabetes and addresses patient preventative measures through to expert care required to treat complex neurological, infection and blood supply complications due to diabetes (11). For descriptive purposes, this continuum of care is broken into five levels, as illustrated in Figure 6.

Figure 6. The Diabetic Foot Model of Care (Reproduced)



- **Level 0 - Living Well with Chronic Disease:** All Health Care Professionals involved in the management of the diabetic foot will support people to have an awareness of, understand and manage their risk status or active foot disease effectively. They will use their routine consultations to empower them to make healthier choices to achieve positive long-term health outcomes in an effort to prevent the onset, slow the progression or reduce the complications associated with diabetes and diabetic foot disease.
- **Level 1 - General Practice:** The GP and Practice Nurse are key to the implementation of the diabetic foot model of care. They are responsible for initial foot screening within general practice of people with newly diagnosed type 2 diabetes; annual foot screening of people with type 2 diabetes who are classified as being at low risk of diabetic foot ulcer (DFU); and close working and communication with the Foot Protection Team and Multidisciplinary Foot team as required.
- **Level 2 - Community Specialist Ambulatory Care:** Foot Protection Teams (FPT's) are specialist teams, primarily based in the specialist ambulatory care hub in the community, led by the podiatrist and are responsible for care of the person with the 'at-risk foot' i.e. those classified as being moderate or high-risk of DFU including those in remission.
- **Level 3 - Acute Specialist Ambulatory Care:** Multidisciplinary Foot Teams (MDFT's) are primarily based in the acute hospital led by the podiatrist and are responsible for care of the person with active foot disease and provide shared care with the FPT for those who are in remission. This care will include an integrated clinical care and management plan. MDFT clinics may be delivered from the specialist ambulatory care hub in the community as well as the acute OPD setting.
- **Level 4 - Specialist Hospital Care:** MDFT's are also involved in the care of inpatients in hospital with active foot disease.

RECOMMENDATION 13

Establish Diabetic foot teams, as per the Diabetic Foot Model of Care, to ensure a seamless care pathway between community and hospital services to prevent, recognise and treat diabetic foot disease.

With the onset of complications, the vascular surgeon is involved in the care as part of the Foot Protection Team (FPT) and Multidisciplinary Foot Team (MDFT). The role and composition of these teams are outlined in the Diabetic Foot Model of Care (11).

9.1.2 Vascular Surgery Role in the Clinical Management of the Diabetic Foot

Frequently, the vascular surgeon first sees the diabetic patient when asked to assess the circulation/blood supply to the patient's foot. Assessment can be difficult in the diabetic foot in the absence of palpable foot pulses. Regular pressure measurements are unreliable due to the high prevalence of vascular calcification in those with neuropathy and/or ulceration. Vascular laboratory diagnostics such as toe blood pressures and tissue oxygenation (TcPO2) measurements may be required to predict the likelihood of ulcer healing or infection clearance without the need for surgery to restore/improve the blood supply. With the vascular laboratory information and clinical assessment, the vascular surgeon will be able to decide whether to proceed with non-operative measures or if revascularisation is necessary (12).

In the presence of significant infection, prompt surgical debridement of all infected and dead tissue in addition to appropriate antimicrobial therapy is essential. Antibiotic therapy alone may be appropriate for soft tissue infection and should be guided by local microbiological expertise. Prolonged antibiotic therapy for isolated chronic osteomyelitis may also be appropriate (2).

Where blood supply is inadequate to heal the foot, intervention is needed to improve the circulation. This can only proceed after adequate imaging of the arteries, to demonstrate those blocked and those still patent. Imaging modalities include ultrasound CT and MRI and may require injection of dye into the artery (digital subtraction angiography (DSA)) (2). In many cases, it is possible while carrying out DSA to proceed with the restoration of a channel through a blocked artery using balloon angioplasty (keyhole or endovascular surgery). In some centres, these procedures are carried out by Interventional Radiologists. At other times, an open bypass operation is required and, on occasion, circulation restoration may require a combination of keyhole and open surgery, known as a hybrid procedure. This supports the need for a hybrid theatre in a vascular surgery centre, which is discussed later.

This Model of Care fully supports the introduction and development of multidisciplinary care teams in the hub and spoke hospitals. The development of vascular surgery centres (hubs) will allow sub-specialisation in the management of the diabetic foot and limb salvage arterial surgery, which would lead to a reduction in major lower limb amputation.

Due to the rapidly progressive nature of diabetic foot infection, patients who require limb saving surgery should be prioritised for hospital admission and theatre access.

The incidence of diabetes is increasing and, in 2015, The Irish LongituDinal Study on Aging (TILDA) showed that 10% of adults over 50 years of age had Type 2 diabetes (13). It is anticipated that the incidence will increase, as has occurred in the US. In 2018, among the US population overall, crude estimates suggest that 34.2 million people of all ages or 10.5% of the US population had diabetes. The percentage of adults with diabetes increased with age, reaching 26.8% among those aged 65 years or older (14). This will lead to a significant increase in diabetic foot disease. This needs to be carefully monitored in order to ensure there are adequate community and hospital resources available and it is, therefore, imperative to implement the recommendations as agreed by this Model of Care and the recently published Diabetic Foot Model of Care.

9.2 ABDOMINAL AORTIC ANEURYSMS

An aneurysm occurs due to the weakening of an artery wall resulting in stretching and ballooning. This is most common in the abdominal aorta, the main artery carrying the blood supply to the abdominal organs and lower limbs, and is called an Abdominal Aortic Aneurysm (AAA). An AAA is generally defined as an enlargement of the abdominal aorta to 3.0 cm or more in diameter (15). They are generally silent and those with an AAA are not aware of their presence unless they rupture which is a catastrophic event with approximately one third of patients dying before they reach hospital (16). Total mortality from ruptured aortic aneurysms is estimated at approximately 81% (16, 17).

Importantly, not all AAAs are at risk of rupture, which is directly related to the maximum diameter of the AAA. As with most conditions, treatment and intervention is based on the risk benefit analysis. For example, with AAA diameters less than 5.5 cms for men and 5 cms in women, there is a 1% rupture rate. In these scenarios, treatment is not justified, as the mortality risk associated with best surgical care is 1-2% (15).

9.2.1 Treatment of AAA

The only treatment for AAA is surgical intervention. Traditionally, this consisted of major open abdominal surgery to replace the diseased aorta with a synthetic graft. This high-risk surgery is curative, with excellent long-term safety, but does have a mortality rate for open surgery of approximately 4% for elective surgery (15). For many years, the mortality rate for emergency surgery was 50% or higher (18). However, more recently, reports from multicentre studies, registries and RCTs have noted a decreasing trend in mortality figures to between 25 – 40.6% (15).

Endovascular Aneurysm Repair (EVAR) is a form of keyhole surgery, which is used to repair abdominal aortic aneurysms from within the blood vessel without the need for open surgery. It was first introduced about 25 years ago and has now become the preferred treatment for suitable AAAs (19). In 2019, 69% of aneurysm repairs in Ireland were by EVAR.

Recently, there has been significant disquiet caused within the NHS as a result of a NICE (National Institute for Health and Care Excellence) 2018 report which suggested that the optimum treatment of AAAs is by open surgery (15). Most specialists and centres in North America and Europe, including those in the NHS and the Vascular Society of Great Britain and Ireland, are not in agreement with NICE in this regard. The consensus is that the NICE opinion is based on results of early studies when the technology and devices were not well developed and, more importantly, where EVAR was used in AAAs which were not suitable for EVAR repair as per device manufacturer guidelines, with consequent poor outcomes. This illustrates the need for a national registry, to track implanted devices and monitor outcomes of vascular surgery interventions which is currently absent in Ireland. This should be part of quality assurance and the patient safety strategy.

The European Society of Vascular Surgery published Clinical Guidelines in January 2019 where they accepted that there is a role for open surgery in young patients with long life expectancy (17). An analysis of the difference between the ESVS 2019 and NICE 2020 Guidelines for Abdominal Aortic Aneurysm was subsequently published in July 2020 (19). Here it was outlined that to revert to open repair of aneurysms would have significant resource implications; open surgical repair (elective) needs 1–3 days in Intensive Care and 7-10 days of inpatient care whereas EVAR rarely requires intensive care stay and an inpatient stay of 3 days (19).

9.3 THORACIC ENDOVASCULAR REPAIR

Aneurysmal disease also affects the aorta in the thorax. Thoracic aortic aneurysms (TAA) may grow asymptomatically until they rupture, with a mortality rate over 90%. The true incidence and prevalence of this condition is uncertain and epidemiologic data is scarce. A recent systematic review and meta-analysis of population-based studies indicated that the pooled incidence of TAAs was 5.3 per 100,000 individuals and the pooled incidence of ruptured aneurysms was 1.6 per 100,000 individuals/year (20).

As with AAA, this condition was only amenable to complex open surgery, carried out by Cardiothoracic/Heart Surgeons. Approximately 40% of thoracic aneurysms occur in the descending aorta and are amenable to keyhole/endovascular techniques similar to those used in EVAR (21). The development of thoracic endovascular aortic repair (TEVAR) has allowed a minimally invasive approach for management of thoracic aortic aneurysms, and is now used as an alternative to open surgery for a variety of disease pathologies due to the lower morbidity of this approach (22). In recent years, because of their developed expertise, vascular surgeons now work with thoracic surgeons in the three cardiothoracic units to provide this Thoracic Endovascular Repair (TEVAR).

9.4 RUPTURED ABDOMINAL AORTIC ANEURYSM

RECOMMENDATION 18

Any patient with a ruptured AAA deemed appropriate for surgery, should be immediately transferred to a vascular hub centre.

The mortality rate from a ruptured abdominal aortic aneurysm is high, with an overall mortality rate of approximately 80% and with 33% dying before reaching hospital (16) (17). Mortality in those undergoing surgery is 30-50% depending on turn-down rate (23). This contrasts greatly with the outcome of elective repair where mortalities should be in the order of 2-4% (15). Prior to rupture, an AAA rarely causes symptoms or ill effects. Almost all electively operated aneurysms are detected by chance as an incidental finding during routine examination or investigation for unrelated symptoms. For a ruptured AAA, the timeframe from 'door to intervention' should be 90 minutes and the surgery should only be carried out in designated hub centres that are doing sufficient numbers to optimise patient safety (15). The outcome for open surgical repair is better in centres with a higher number of this procedure (15, 24).

A recent publication in the European Journal of Vascular Surgery (25) which looked at the regulation of Aortic Aneurysm surgery recommended 40 procedures per vascular centre, and this figure has been adopted by this Model of Care. This includes both open and endovascular surgery.

RECOMMENDATION 20

To ensure best practice, a minimum number of 40 AAA procedures should be performed in a vascular hub per annum (elective and emergency). At least 10 elective EVAR procedures should be performed in a vascular hub per annum (averaged over three years).

The Society for Vascular Surgery (SVS) recommends that elective EVAR be limited to hospitals with a documented mortality rate and conversion rate to open surgical repair of 2% or less and that perform at least 10 EVAR cases each year. It further suggests that elective open aneurysm repair be limited to hub centres with a documented mortality rate of 5% or less and that perform at least 10 open aortic operations of any type each year (15). These figures are averages over three years.

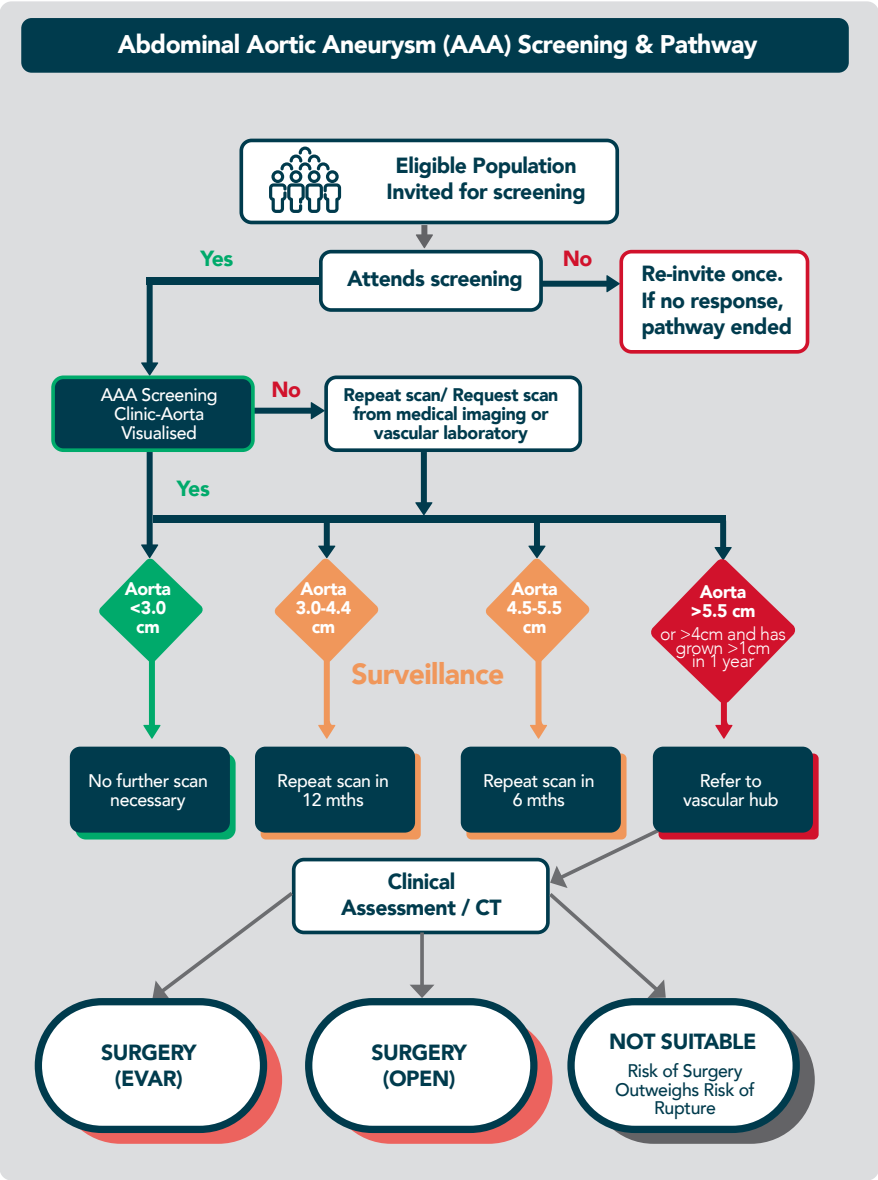
9.5 ABDOMINAL AORTIC ANEURYSM (AAA) SCREENING

Health screening is used for specific cohorts of asymptomatic people who are known to be at higher risk of having or developing a disease. Screening is commonly associated with cancer detection but is also important in the detection of potentially dangerous non-malignant conditions such as diabetic retinopathy, many childhood illnesses and AAA.

The ideal management of AAA is early detection and then an operation as a planned elective procedure. This can only be achieved by checking individuals for the presence of AAA and as with all screening programmes, this is not practical for every individual and screening should be focused on the at-risk population.

Not all detected AAAs need surgery. There is general agreement that small aneurysms, <4.0 cm in maximum diameter, are at low risk of rupture whereas an aneurysm >5.4 cm in diameter should be repaired in an otherwise healthy person (15, 26). This is supported by two randomised controlled trials (27) (28), as well as a follow-up study of patients detected in the UK (29). These studies demonstrated that a policy of surveillance until aneurysm diameter exceeds 5.5 cm is safe and associated with a rupture rate of 1% per year. Various jurisdictions have issued guidelines on AAA screening, surveillance and treatment pathways - see section 9.5.3. The following pathway has been developed for use in Ireland (Figure 7).

Figure 7. AAA screening, surveillance and treatment pathway



9.5.1 Prevalence of AAAs

Screening studies offer the best evidence regarding the contemporary prevalence of AAA. The current prevalence in 65 year old men is 1.5% in the Swedish Screening Programme (31) with an additional 0.5% with an already known AAA. It is 1.3% in the UK National Screening Programme and 3.3% in a Danish screening programme which target men aged 65 years. In contrast, a programme in the USA which only offers screening to smokers reports a prevalence of over 5% (17). The prevalence of AAAs is approximately four times lower in women (32). A pilot screening program in Dublin identified undiagnosed AAA in 4.2% of men aged 65 to 75 years (33), which is in line with data from national screening programmes in the UK and other western world nations.

Screening for AAA fulfils all 10 criteria for health screening laid down by the World Health Organisation (WHO) in 1968 (34):

1. The condition should be an important health problem.
2. There should be a treatment for the condition.
3. Facilities for diagnosis and treatment should be available.
4. There should be a latent stage of the disease.
5. There should be a test or examination for the condition.
6. The test should be acceptable to the population.
7. The natural history of the disease should be adequately understood.
8. There should be an agreed policy on whom to treat.
9. The total cost of finding a case should be economically balanced in relation to medical expenditure as a whole.
10. Case-finding should be a continuous process, not just a "once and for all" project.

9.5.2 Screening Method

Ultrasonography is used to screen for AAA because of its high sensitivity (94%-100%) and specificity (98%-100%) (35). It is also non-invasive, simple to perform and does not expose people to radiation.

9.5.3 International Screening Programmes

The importance of routine screening for AAA has been well proven in many jurisdictions. In 2008, the Department of Health in England announced that it would fund a national NHS Abdominal Aortic Aneurysm Screening Programme (NAAASP) to be introduced over five years. Screening for AAA is not routinely offered to women, men under 65 years old or those who have already been treated for an AAA, due to the lower risk in these groups (30). A review of this service after five years was published, indicating that the programme was effective in detecting and treating men with AAA (36). Such population screening for AAA has been shown to reduce disease specific mortality by about 60% in a meta-analysis of the late results of the existing randomised trials (37).

The American Preventative Services Task Force recommends ultrasound screening for AAA in men aged 65-74 years who have ever smoked (38). Canadian studies have shown that screening is also economically advantageous. Screening converts many emergency procedures to elective; the average hospital cost for treatment of a ruptured/urgent case is about double that of an elective procedure (39). Despite the initial cost of establishing

screening in Ontario, screening resulted in savings by avoidance of emergency operations, decreased operative complications and reduced number of unnecessary deaths in males aged 65 to 74 years (39). Numerous other studies have shown that screening has been found to be cost-effective and increase life years saved (40-42).

The UK National Institute for Health and Clinical Excellence guidelines recently concluded that AAA screening is cost effective provided that AAA prevalence in the screened population is over 0.35% (43). Data from large randomised trials demonstrate that AAA screening of men aged 65 to 75 years with a one-off ultrasound reduces AAA rupture and AAA-related death. No such benefit has been demonstrated in women, most likely due to the lower incidence of AAA in females (44). High-risk population screening is in place in many centres internationally but in Ireland it is ad hoc and needs to be formalised.

9.5.4 Who to Screen

There are minor variations in population cohorts screened in different countries. Most screening programmes offer screening to males when they reach their 65th birthday. A recent publication in February 2022 has reviewed and revised this population in the UK (45). The UK National Screening Committee (UK NSC) now recommends ultrasound screening for:

- Men registered with a GP during the year they turn 65.

However they also suggest that:

- Men over 65 who have not previously been screened can self-refer.
- Any women, or men under 65 who think they are at higher risk (for example, due to family history of the condition) can talk to their GP about the possibility of having a scan outside the screening programme (45).

Determining the population and criteria is key to determining the resources required to run an AAA screening programme. Significantly, in terms of capacity, once screening has determined there is no aneurysm present, no further screening is necessary.

From a purely clinical perspective, there are three areas to be considered when looking at capacity needs:

1. Capacity to perform Aortic Ultrasound Screening on all men reaching the designated age
2. Capacity to see, preoperatively assess and operate on all significant aneurysms detected (usually >5.5 cm or 4 cm with growth of more than 1 cm in a year). NICE recommends that people with an AAA that is 5.5 cm or larger are referred to a regional vascular service and should be seen within 2 weeks of diagnosis (43)
3. Capacity to see and scan at designated intervals, anyone in whom an aneurysm is detected between 3 and 5.5 cm The two most comprehensive programmes, UK and Sweden, reported a ten-year lag before demonstrating a reduction in AAA rupture. This is partly due to the time taken to roll out the programme but also, arguably, due to not initially screening the higher risk population. Any comprehensive analysis would have to take into account Quality Adjusted Life Years (QALY).

LONG-TERM BENEFITS

Sufficient participation will be essential for obtaining the desired effect of a screening program. Studies from the United Kingdom and Sweden report that it takes 10 years to obtain the maximum effect of AAA screening programs for avoided deaths (46), with an expectation that the number of emergency EVAR procedures for AAA would decrease, whilst the number of elective AAA procedures would increase.

Sweden's AAA screening programme reported that, with a total population of 9.5 million, the national AAA screening program was predicted to annually prevent 90 premature deaths from AAA and to gain 577 quality-adjusted life-years. The incremental cost-efficiency ratio was estimated to be €7,770 per quality-adjusted life-years (31).

RECOMMENDATION 19

Establish a national AAA screening programme with agreement from HIQA and the National Screening Programme.

To determine the most effective implementation of an AAA screening programme, the NCPS and the Irish Vascular Society will collaborate with the National Screening Programme and HIQA to implement the service.

9.6 STROKE PREVENTION SURGERY: CAROTID ENDARTERECTOMY (CEA)

Stroke remains the third leading cause of death in Ireland and Western Europe, and is the leading cause of severe, adult-onset physical disability (47). The Irish National Audit of Stroke (INAS) has been incorporated into the National Office of Clinical Audit (NOCA) and the most recent annual report showed that the majority of stroke cases in 2020 were due to occlusion of arteries to the brain (85%, n=4379) with the average age of patients being 72 years, and one-quarter (n=1333) being under 65 years (47).

RECOMMENDATION 21

Establish nationwide rapid access clinics for patients with a Transient Ischaemic Attack (TIA) (ideally assessed within 24 hours). These clinics should have staff and resources to investigate TIA patients in one hospital visit, i.e., a one-stop-shop with immediate access to carotid ultrasound and CT scanning.

A severely debilitating or fatal stroke is frequently preceded by a recent mini stroke, known as a Transient Ischemic Attack (TIA). A TIA is therefore ominous and should be considered a 'Brain Attack' and treated with the same urgency as a Heart Attack. As the highest risk of a major stroke is in the weeks immediately following a TIA, the recognition of TIA symptoms and immediate referral for assessment is crucial to prevent stroke (NICE, 2109). It is for this reason that one of the first actions of The National Stroke Programme, which was set up to reorganise and develop acute stroke services, was the establishment of a public education programme for TIA recognition, known as FAST (Face, Arm, Speech, Time).

The next step in stroke prevention is the establishment of nationwide rapid access clinics to facilitate patients with a TIA. These clinics should have the staff and resources to investigate TIA patients in one visit, with immediate access to carotid ultrasound and CT scanning. Ideally, patients should be assessed within 24 hours of first TIA symptom.

RECOMMENDATION 22

Patients for carotid endarterectomy must have immediate access to vascular surgery inpatient beds, with daily access to theatre. Surgery should be carried out as soon as possible but no more than 14 days after TIA symptom onset.

Those suitable for surgery should have carotid surgery (endarterectomy) as soon as possible (48). A recent review of the literature suggested surgery as soon as possible but no more than 14 days following TIA symptom onset (49).

For those with non-debilitating stroke, surgery should also be carried out within 14 days of symptom onset (50, 51). Overall life expectancy and preoperative functional status, rather than age, should be the major determinants in the decision to operate (52).

Patients who meet the criteria for carotid intervention but who are **unsuitable** for open surgery (e.g. inaccessible carotid bifurcation, restenosis following endarterectomy, radiotherapy-associated carotid stenosis) should be considered for carotid angioplasty and stenting (CAS) in centres with appropriate expertise (53). The above timeline guidelines are international standards and represent optimum care.

The resources required to deliver this service include:

(a) Rapid access clinics for TIA and non-debilitating stroke
(b) Immediate access to a vascular surgery inpatient bed; no waiting, no cancellation
(c) Daily access to theatre with no cancellations

The Irish National Audit of Stroke recently published its "Organisational Audit Report 2021" which showed that only a small minority of Irish hospitals have an operational Rapid Access TIA Clinic. The Irish Vascular Society fully support the Stroke Programme's 'National Stroke Strategy 2021-2026', a major aim of which is to establish these rapid access clinics to support hospitals caring for stroke patients. The report also showed that ten of the 24 stroke centres provide a carotid endarterectomy service in their hospital. 8 out of the remaining 14 hospitals have a formal arrangement in place with a vascular surgery unit for urgent patient transfer.

RECOMMENDATION 23

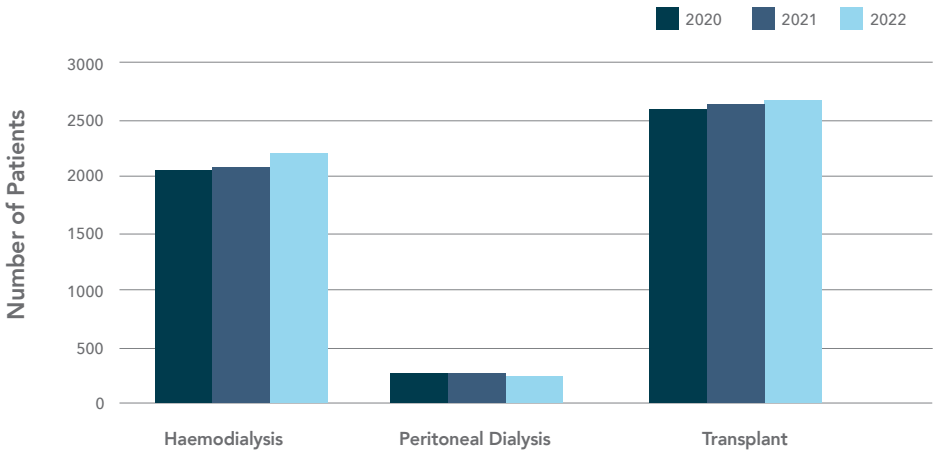
To ensure best practice, a minimum number of 35 carotid surgeries should be performed in a vascular hub per annum (elective and emergency and averaged over three years).

Asymptomatic patients with severe carotid stenosis should be assessed and referred for carotid endarterectomy (CAE). In order to be of benefit to patients, the operative death and stroke rate must be less than 3% (54-56). Surgeons and vascular units with a large operative experience can best achieve this. To ensure best practice, a minimum number of 35 carotid surgeries should be performed in a vascular hub per annum (elective and emergency and averaged over three years) (49).

9.7 VASCULAR ACCESS FOR DIALYSIS PATIENTS

Kidney disease resulting in kidney failure, known as End Stage Renal Failure (ESRF) is a fatal condition in the absence of kidney replacement. Management is in the the form of kidney transplantation or functional replacement by dialysis. In Ireland, the number of patients needing dialysis has increased by 36% (1,475 – 1,977) over a 10 year period (2010 - 2020) (NRO Office, 2021). It is anticipated that for patients who commence dialysis each year, 80-90% will be on haemodialysis with the remainder on peritoneal dialysis. At the end of 2022, there were over 2,211 patients reported to be on haemodialysis. Figure 8 shows the increasing pattern of patients with kidney failure living with on-going dialysis or living with a functioning renal transplant from 2020 - 2022 (NRO, 2022).

Figure 8. Number of people in Ireland who are undergoing dialysis or have had a renal transplant



(https://www.hse.ie/eng/about/who/cspd/ncps/renal/resources/nro-statistics-end-of-year-2022.pdf)

Haemodialysis requires ready access to high blood flow (300 millilitres/minute) for 3-4 hours 2-3 times per week. This can be provided by a permanent large catheter running through the skin to a large vein or by an arterio-venous fistula (a surgically created connection between an artery and vein situated under the skin, usually on the arm). A fistula is the optimum access, as it is associated with significantly fewer complications, the most significant being infection/ sepsis. The consequences of infection or poor quality dialysis can be devastating for an individual. For all patients requiring long-term haemodialysis, vascular access is their lifeline.

Improvements in A-V fistula rates for haemodialysis patients in Ireland is another challenge facing the Vascular Surgery service. International guidelines such as the Fistula First programme in the US strongly recommend A-V fistula formation as the preferred access mode for dialysis (57). Data provided by the Irish Nephrology Society shows that the proportion of patients on A-V dialysis has remained unchanged at 43% for the past 10 years while, internationally, it is believed the target should be as high as 70%. In 2019, 358 such fistulas were created in Ireland (HIPE).

Ideally, the fistula should be functioning and usable when the patient first needs dialysis, the difficulty being that it takes up to four months for a created fistula to mature adequately to be used. One of the difficult factors to determine is the timing of the A-V fistula surgery. Even when the patient is being monitored by a Nephrologist, the rate of progression from Chronic Kidney Disease (CKD) to End Stage Renal Disease (ESRD) may not be constant, and the need for haemodialysis may be precipitated by random, unexpected clinical events leading to a sudden drop in renal function. Moreover, the relationship between measures of renal function and the development of clinical symptoms requiring haemodialysis varies between patients (2).

RECOMMENDATION 24

All patients with established and deteriorating renal failure who will require haemodialysis should have timely access to A-V fistula surgery, ideally 4 months prior to dialysis.

A study published in 2004 looked at a large cohort of patients with early creation (at least 4 months prior to needing dialysis), just prior (1-4 months) and late creations (within 1 month of dialysis start). They found that A-V fistula creation at least four months before starting dialysis was associated with the lowest risk of sepsis and death (3). Furthermore, evidence has shown that patients who commence haemodialysis without a mature, ready-to-use fistula have higher morbidity and mortality rates (58) (NRO Position Statement 2021).

All patients with established and deteriorating renal failure who will require haemodialysis should have timely access to this surgery, ideally at approximately four months prior to dialysis. Some units already have dedicated vascular access lists. These should be established in all units (hub and/or spoke models).

RECOMMENDATION 27

Provide theatre access for A-V fistula surgery.

While A-V fistula creation is not possible in all patients, the rates of fistula dialysis vary widely due to multiple influences, one of which is access to a vascular surgery service. A European-wide study concluded that suboptimal access to surgical resources, lack of dedicated training of clinicians, limited routine use of pre-operative diagnostic imaging and patient characteristics primarily emerged as potential barriers to adopting a Fistula First policy in Europe (59). Emphasis needs to be placed on appropriate patient identification, early vein protection and timely surgical intervention with earlier access to vascular surgery consultation with the aim of increasing the A-V dialysis rate in the Irish population.

The procedure of A-V creation is technically demanding but does not require special technology or equipment. The majority can be performed under local anaesthesia with overnight accommodation not usually necessary. These procedures could be performed in most hospitals with dialysis units which have vascular surgery on site or as a visiting service.

Fistula monitoring and maintenance is critical to avoid unnecessary primary or secondary fistula failure. There are hospital sites in Ireland that have established successful Fistula First programmes and these need to be established nationally.

RECOMMENDATION 25

Each vascular unit should establish a fistula care team co-ordinated by a Clinical Nurse Specialist or Advanced Nurse Practitioner.

RECOMMENDATION 26

Enhance collaboration with the National Renal Office (NRO) to develop a Fistula-First programme for the optimum provision of haemodialysis nationally.

RECOMMENDATION 28

Ensure vascular laboratory support is available for pre-op assessment and fistula maintenance.

RECOMMENDATION 11

Establish an electronic e-referral system for all patients requiring a vascular surgery consultation including recommended criteria for referral. This should include the varicose vein pathway developed as part of this model of care.

There is a need to enhance the collaboration between vascular surgery and National Renal Office to develop the Fistula First programme in Ireland. A successful Fistula First programme, including monitoring and maintenance, relies on establishing a multidisciplinary team including nephrology, vascular surgery, anaesthesiology, interventional radiology and a nursing vascular access coordinator. Vascular access CNS training and supporting dialysis nurses to monitor constantly and to educate patients will support the success of the fistula maintenance.

The services of the vascular laboratory for the initial patient assessment and ongoing monitoring of the A-V fistula is essential for a successful Fistula First programme.

9.8 VENOUS DISEASE

9.8.1 Varicose Veins

Varicose veins are a common condition, affecting up to 3 in 10 adults. Women are more likely to develop them than men (60). Venous disease is the most common reason for referral to vascular surgery clinics and is the principle elective non-urgent consultation and intervention within the vascular specialty. At the end of 2019, there were over 12,000 patients waiting for a vascular surgery OPD appointment. According to the NTPF (National Treatment Purchase Fund), in October 2019 there were over 1,000 patients on varicose vein surgery waiting lists.

Patients may be asymptomatic or they can present with symptoms or complications of chronic venous hypertension such as venous eczema, lipodermatosclerosis, superficial thrombophlebitis or venous ulceration. Management options for patients who present with varicose veins include reassurance only, compression hosiery and intervention. Reassurance may be acceptable for patients who present with thread veins or with asymptomatic, uncomplicated varicose veins. Patients with uncomplicated varicose veins will be seen routinely and offered venous intervention if they have truncal incompetence.

The NICE 2014 guidelines recommend intervention in the order of endothermal ablation, foam or open surgery, for patients who present with confirmed varicose veins and truncal reflux (61). Compression hosiery is only recommended if intervention is unsuitable. Intervention prior to the development of skin complications should also reduce the burden of venous leg ulcers. The NCPS in collaboration with the Irish Vascular Society have developed a referral and treatment pathway which is outlined in Figure 9. It is recommended that this would be supported by a primary care varicose vein referral form which could be piloted prior to national roll-out (Appendix 1).

Endovenous treatment and foam sclerotherapy for varicose veins, which have evolved significantly over recent years, facilitates the treatment of the vast majority of patients with varicose veins in an ambulatory setting and without the need for major theatre facilities. Facilities for treating varicose veins can and should be easily accommodated in Model 2 and 3 hospitals. Treatment of varicose veins in a single visit in a 'see and treat' setting is being used in a number of international centres and needs to be considered. This could function by ensuring patients are provided with appropriate information including the risks, benefits and details of the consent process in advance.

RECOMMENDATION 29

Varicose vein treatment should be carried out in an ambulatory care setting, ideally as a see and treat service.

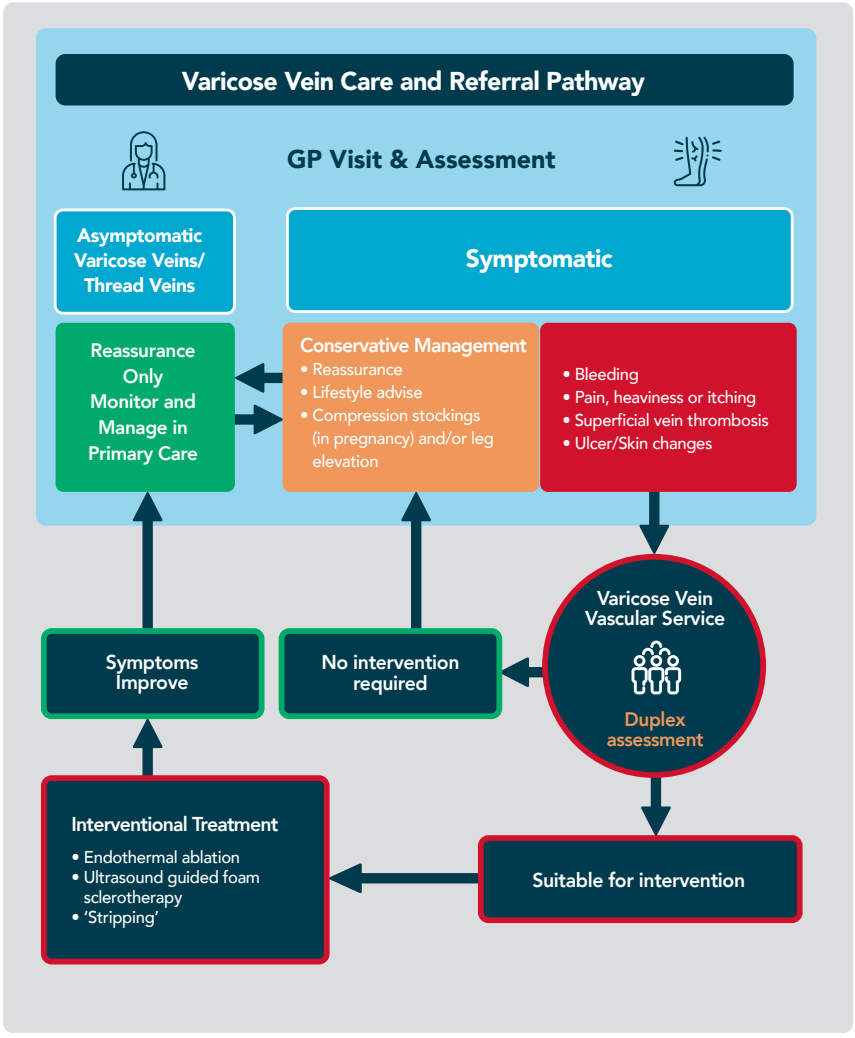
This would support reducing the number of visits and a more streamlined patient experience.

The 'see and treat' service team would offer venous duplex assessment and, if appropriate, treatment could be provided in the same visit. Endovenous techniques have the advantage that they can be carried out under local anaesthetic and rarely require overnight stay. Most patients will be able to walk immediately afterwards and can resume normal activities in 1 to 2 days.

The See and Treat facility needs to be resourced with:

- Staff: Consultant Vascular Surgeon, Vascular CNS/ANP, Vascular Physiologist, Vascular Tissue Viability Nurse ANP
- Facility: Outpatient setting to minor operations facility and patient bed
- Equipment: Vascular Laboratory with ABI/Toe Pressure and Duplex Ultrasound capabilities, Sclerotherapy, Laser equipment/Radiofrequency equipment

Figure 9. Varicose Vein Care and Referral Pathway



9.8.2 Chronic Deep Venous Disease

Chronic deep venous disease is a significant but, until recently, an underappreciated cause of lower limb problems. Most, but not all, are secondary to deep venous thrombosis. Management strategies have been clearly outlined in guidance from the European Society for Vascular Surgery and the Society for Vascular Surgery (62). The management of deep venous pathology should always be conducted in the tertiary care environment by highly trained staff.

Endovenous intervention forms the predominant modality of intervention for deep venous pathology. It requires adequate fixed imaging systems, specialist endovenous equipment, anaesthetic support and specialist imaging to deliver the international standard of care. These interventions should be centralised to ensure adequate expertise and to permit reasonable volume to optimise outcomes. It is important to note that in the vast majority of cases, asymptomatic patients should not undergo deep venous invasive intervention regardless of findings on imaging.

9.8.3 Acute Lower Limb Deep Venous Thrombosis

While the majority of presentations for deep venous thrombosis (DVT) may be managed with anticoagulation and compression therapy, endovenous intervention may be utilised to limit the significantly deleterious effects of post-thrombotic syndrome in moderate - severe presentations.

Again, these interventions should be conducted within the Model 4 environment supported by the expertise, physical resources, and the multi-disciplinary input.

RECOMMENDATION 17

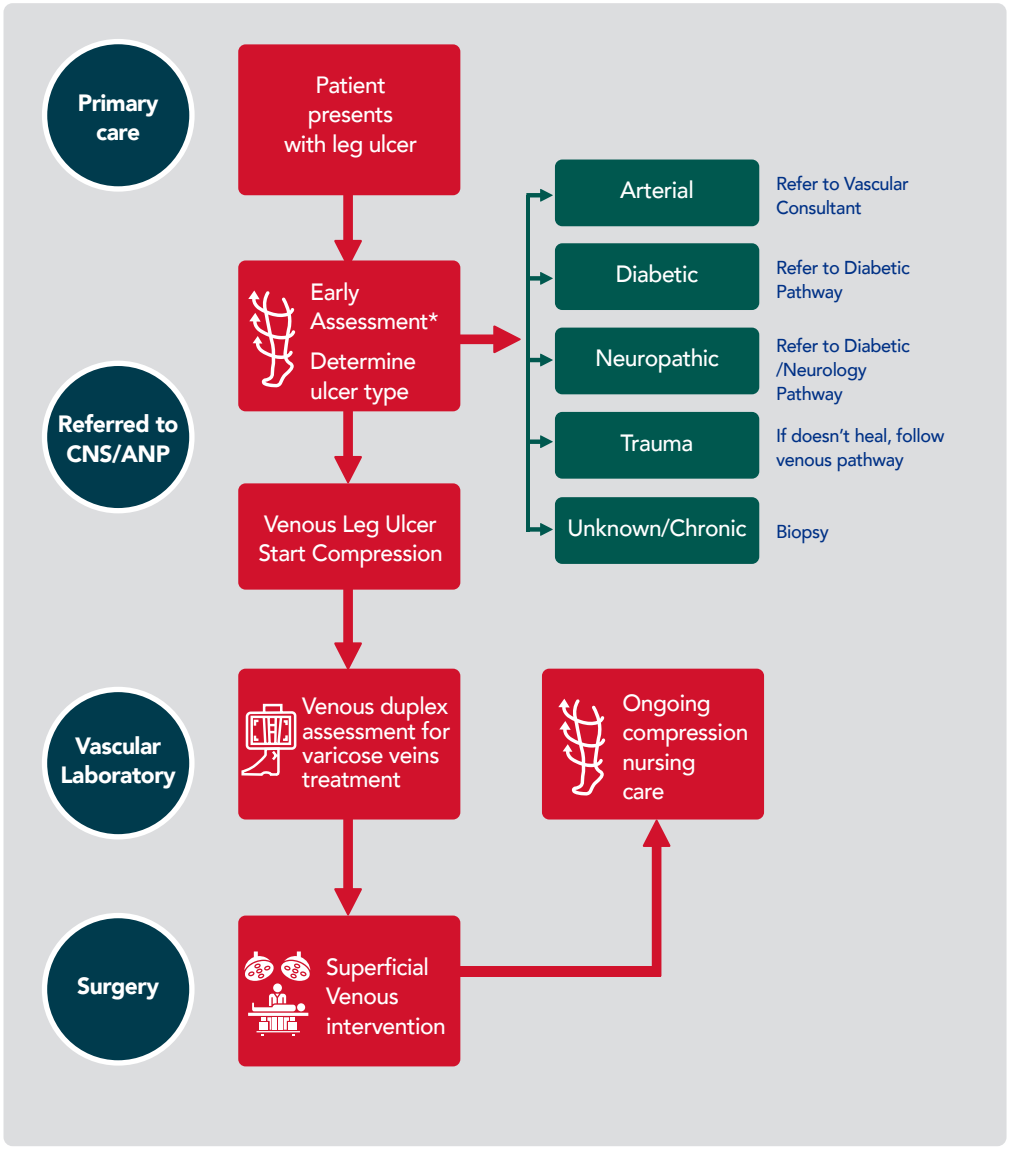
Establish outreach leg ulcer clinics, run by advanced nurse practitioners or clinical nurse specialists, so that leg ulcer care can be delivered as close to the patients home as possible.

9.8.4 Venous Leg Ulceration

Venous leg ulcers affect around 1 in 500 people in Ireland. They become more common with age and are extremely debilitating with a significant negative impact on quality of life. It is estimated that around 1 in 50 people over the age of 80 years (>3,500 over 80's) are affected (63). The management of this condition requires considerable time and resources in both the community and hospital settings. In the UK, more than 1% of the annual NHS budget is spent on the management of venous leg ulcers with the cost per patient per annum around £8,000 (64).

The mainstay of venous leg ulcer treatment is compression bandaging. This is carried out in the community with OPD supervision (Figure 10). The EVRA Trial has shown early endovenous ablation of varicose veins resulted in faster healing of venous leg ulcers and more time free from ulcers than deferred endovenous ablation (65). Many patients with venous leg ulcers have chronic venous hypertension from varicose veins. Patients with swelling, skin damage or ulcers should be referred and seen promptly for assessment and intervention, if appropriate, as outlined in the pathway in Figure 10.

Figure 10. Care Pathway for the Management of Venous Leg Ulceration



* Check Ankle Brachial Pressure index if pedal pulses are not palpable

9.9 OTHER ARTERIAL CONDITIONS REQUIRING VASCULAR CARE

Surgical intervention is occasionally required for arteries that supply the kidneys and intestines. Aneurysmal disease of arteries other than aorta/iliac and popliteal is also rare but can present electively or as an emergency.

9.10 PROVIDE ASSISTANCE TO COLLEAGUES OF OTHER SERVICES

9.10.1 Inpatient Non-Operative Vascular Consultations

As evident from the section on specialty interdependence, vascular disease impacts on patients under the care of many specialists. Therefore, a significant proportion of a vascular surgeon's inpatient workload is in providing expert opinion to other inpatient specialist units including neurology, nephrology, endocrinology and general medicine. This aspect of the vascular surgery workload is largely undocumented and as a result, is often overlooked when undertaking workforce planning and rostering. A proportion of these consultations result in the need for vascular interventions.

9.10.2 Intra-operative Assistance

Vascular surgeons are frequently required to provide assistance to other specialty surgeons in both elective and emergency settings. Vascular surgeons are uniquely qualified to provide assistance to other surgeons, not only in haemorrhage control but also in major arterial and venous reconstructions such as in complex cancer resections and spinal surgery. The majority of these interventions are predictable and can be planned due to the accuracy and precision of modern-day imaging. Preoperative multi-disciplinary team meetings are essential to ensure vascular surgery resources are available and carefully planned.

Vascular surgeons are frequently required to provide assistance in the management of iatrogenic injuries occurring outside the operating theatre, such as in the angiography suite or cardiac catheterisation laboratory. Their availability at short notice is an important resource in helping with the success and safety of many hospital-based surgical and interventional procedures. These interventions are complex and time-consuming, often impacting on a vascular surgeon's own elective workload. It is important that support is given to vascular surgeons in providing such cover by ensuring adequate staffing and resources.

9.11 PAEDIATRIC VASCULAR SURGERY

Vascular disease in children is uncommon and challenges the paediatric surgeon due to the unfamiliarity of the presentation and pathology. Arterial injury or trauma is the most common reason for vascular surgery intervention, with the pulseless hand complicating a supracondylar fracture or the ischaemic leg following iatrogenic femoral artery injury being the most frequent (66). Rare conditions such as congenital vascular diseases, ranging from vascular malformations, complex aneurysmal disease to severe aortic and arterial abnormalities can present in early childhood. Any Thoracic Arterial Disease is treated by Cardiothoracic Surgeons. Awareness and recognition of these disorders is required in order to facilitate a specialist paediatric vascular opinion.

RECOMMENDATION 10

The decision to operate on children in the treatment of vascular disease should be carefully considered by a multidisciplinary team and carried out in a dedicated centre.

Acquired vascular diseases are rare in children, but require clinical awareness and prompt tertiary referral to achieve the best outcomes. A major challenge in paediatric patients is the small calibre of the vessels, particularly in pre-term neonates and infants. Thrombolysis is important in the management of acute occlusive disease.

For the treatment of vascular diseases in children, the decision to operate or the operative procedures should be carefully considered by a multidisciplinary team. For arterial reconstruction, the small size, future growth, abundancy of collateral circulation and availability of suitable vascular conduit need to be considered. Because of the higher development of collateral circulation and regenerative capacity, the prognosis is usually good in cases performed in a dedicated high volume centre (67).

Vascular units outside Dublin manage problems that arise locally for the paediatric cohort. However, emergency care transfer protocols should be established and agreed by the paediatric trauma network and the national ambulance services for certain presentations, e.g. pulseless hand. In Dublin, surgeons from the Mater Misericordiae University Hospital care for Temple Street Children's University Hospital patients. Our Lady's Children's Hospital Crumlin is covered for by St. James's Hospital consultants, and Tallaght University Hospital patients by Tallaght University Hospital consultants.

9.12 OTHER CONDITIONS MANAGED BY VASCULAR SURGEONS

9.12.1 Lymphoedema

The lymphatic system is a system of channels which carry lymph (a protein-rich fluid) and drains it from the tissues into the vascular system. Lymphoedema can be defined as "The progressive swelling of a body part, usually an extremity, following developmental (Primary Lymphoedema) or acquired (Secondary Lymphoedema) disruption of the lymphatic system" (68). In general, lower limb lymphoedema is significantly more common than upper limb lymphoedema (68, 69).

Lymphoedema is common and it is estimated that the prevalence in Ireland is approximately >19,000, with this likely being an underestimation (68). There is no role for arterial or venous surgery in the management of lymphoedema. However, the mainstay of management is similar to that of venous leg ulceration. Vascular surgeons oversee care and collaborate with vascular medicine colleagues as necessary and refer for tumescent assisted liposuction or lymphovenous anastomosis as appropriate.

Lymphoedema responds very well to structured conservative treatment. All patients with a lymphoedema diagnosis should be referred to a specialist lymphoedema service if possible, in their catchment area. A list of current services is available at hse.ie/lymphoedema. The Model of Care has been published and is available at: https://www.hse.ie/eng/services/list/2/primarycare/lymphoedema/lymphoedema-guidelines.pdf

9.12.2 Thoracic Outlet Syndrome (TOS)

Thoracic outlet syndrome (TOS) is a group of potentially disabling disorders that arise due to compression of the nerves and blood vessels as they exit the neck and chest to enter the arm. TOS is classified into three subtypes based on the structure affected; nerve (nTOS), vein (vTOS), or artery (aTOS).

TOS mainly affects a younger population, with 90% of cases being in those under 50 years of age, thus timely treatment may have far-reaching benefits. Vein TOS usually presents as an acute/emergency due to thrombosis of the principle vein draining the arm. Artery TOS, which results in loss of blood supply to the arm, is much less common. While not usually an emergency, Nerve TOS is the commonest variant, usually causing debilitating arm pain.

The diagnosis and treatment of TOS requires a multidisciplinary approach which starts with appropriate referral pathways and includes the vascular surgeon, vascular physiologist, radiologist, pain specialist, and physiotherapist. Surgical decompression is the definitive management of TOS. This involves removing the first rib as well as the muscles attached to it and releasing the scar tissue formed due to the repetitive compressive injury. Patients spend an average of 3 to 5 days in the hospital, with emphasis on early physiotherapy.

9.12.3 Hyperhidrosis

Hyperhidrosis (excessive sweating) can be an extremely debilitating condition, and in its severe form can be treated by surgical intervention to divide the nerves causing the sweating. Expertise with this procedure was developed by vascular surgeons. Other forms of treatment are evolving but surgeons are still called upon to provide the surgical service.

9.13 VASCULAR SURGERY AND THE OLDER PERSON

Many patients presenting with vascular disease are elderly and frail. The degree of frailty predicts longer-term outcomes such as risk of major complications, risk of death and rate of re-admission (70).

Factors such as polypharmacy, poor nutrition and poor mobility are associated with poorer outcomes. However, interventions by specialists with expertise in medicine for the elderly have been shown to be effective in reducing complications, risk of death and need for re-admission to hospital. The concept of Comprehensive Geriatric Assessment (CGA) is a holistic approach which addresses overall health and wellbeing in the older person. Involvement by Gerontology Consultants in the management of both elective and emergency vascular surgical patients has proven beneficial in terms of shorter lengths of stay, fewer complications and less likelihood of discharge to a higher level of dependency (71).

It is a recommendation that a Comprehensive Geriatric Assessment should become routine for patients >65 years of age undergoing arterial surgery. Consideration should also be given to appointing more Gerontology Consultants who could provide shared care to patients hospitalised for vascular surgical disease. This would allow for better quality of medical care and would probably reduce the need for multiple consults to many different medical specialties which can result in fragmented care.

RECOMMENDATION 30

Comprehensive Geriatric Assessments should become routine for patients >65 years of age undergoing arterial surgery. Gerontology resources should be expanded to facilitate this co-management.

9.14 SPECIALTY INTERDEPENDENCE

As with all surgical specialties, vascular surgery is heavily dependent on other specialty and hospital services. The multi-professional vascular service includes Anaesthesia, Critical Care and Pain Management, Interventional Radiology and Laboratory and Diagnostic services as well as the Health and Social Care Professionals (Figure 11). The care of the vascular patient can be further complicated when there is multi-system disease and co-morbidities. The patient's care therefore, requires multispecialty expert care (VS 2018). Most vascular surgery patients are elderly, such that post-operative care and rehabilitation need the expertise of the Geriatric Care Team. The collaborative relationship between other specialties are outlined in Figure 12.

Figure 11. The Multi-Professional Vascular Service

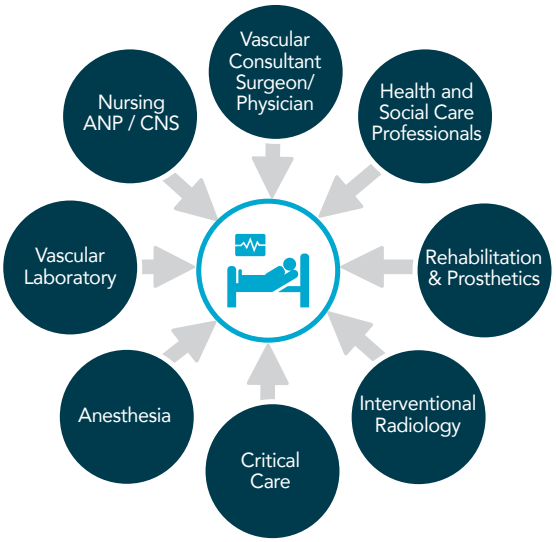


Figure 12. Vascular Surgery collaboration with other Medical and Surgical Specialties

Outlined below is an example of some of the important collaborations with other medical and surgical specialties:

1. The Neurology and Stroke teams rely on the Vascular Service to provide carotid artery scanning and surgery. Decisions regarding surgery require close co-operation and timely MDTs to ensure optimal care for stroke patients and prevention.
2. Diabetes mellitus (DM) is the greatest risk factor for peripheral artery disease; over 50% of patients requiring leg artery surgery have DM. Care of Diabetic Foot Disease is complex and multidisciplinary as discussed in the "Diabetic Foot Disease" section.
3. Renal failure +/- DM is frequent in patients with leg ischaemia and care for these patients requires constant input from a nephrologist. The creation of arterio-venous fistula to enable haemodialysis in end-stage renal failure patients is an important vascular surgeon function.
4. Vascular disease is usually systemic and patients need preoperative cardiology assessment before undergoing what is frequently complex surgery. Patients undergoing cardiac interventions occasionally need vascular surgery assistance.
5. Vascular Medicine Physicians also provide expertise in wound management, venous leg ulcers, leg swelling including lymphoedema, risk reduction for those with or at risk of arterial disease, and management and surveillance for Fibromuscular Dysplasia and other unusual related arterial conditions.
6. The average length of stay for vascular patients is approximately double that for other surgical specialties. This is partly due to the frail and elderly nature of vascular patients with complex health needs who require rehabilitation or have longer-term care needs. The role of gerontology and the rehabilitation services is key to ensure optimal recovery.

9.14.1 Interventional Radiology

Interventional radiology, a subspecialty of diagnostic radiology, first described endovascular intervention in the 1960s. Over the last 40 years there have been enormous advances in interventional radiology techniques, equipment and expertise that have revolutionised the care of patients with vascular disease. As a result, vascular surgery has undergone significant change in the past 25 years with the development of these endovascular surgical techniques. With the exception of carotid surgery, the majority of arterial interventions are now endovascular.

The delivery of the endovascular service varies widely internationally and within countries. In Ireland, vascular surgeons and interventional radiologists have worked to bring these minimally invasive techniques to Irish patients. In some centres, interventional radiologists perform endovascular intervention in patients with intermittent claudication, critical limb ischaemia, diabetic foot disease and A-V fistula malfunction. The treatment is decided at joint MDT meetings with vascular surgery colleagues. Interventional radiologists also perform complex interventions to treat arterio-venous malformations, EVAR endoleaks, and visceral artery aneurysms. In five of ten hospitals, the majority of aortic and lower limb interventions are carried out by vascular surgeons. In the remaining five hospitals, interventional radiology provides some elements of the service, mainly lower limb interventions.

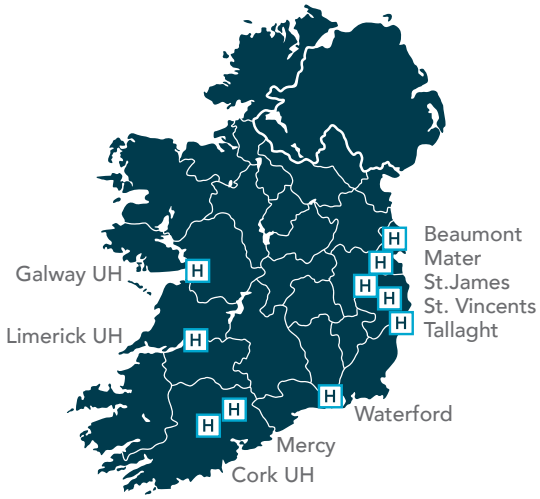
Table 6 details the centres where Interventional Radiologists provide endovascular elements of the vascular surgery service.

10.0 DELIVERY OF VASCULAR SURGICAL SERVICES IN IRELAND

10.1 GEOGRAPHICAL DELIVERY OF SERVICES

Currently, there are ten Vascular Surgery centres in the Republic of Ireland; five of which are in Dublin city, two in Cork city and one each in University Hospital Waterford, University Hospital Limerick and University Hospital Galway (Figure 13). There are 16 Model 3 hospitals with 24/7 Emergency Departments in Ireland which do not have an in-house Vascular Surgery service. Virtually all have open-door access for all patients. There is a minority with ambulance bypass protocols in place for conditions such as major trauma, fractured neck of femur, myocardial infarction (STEMI) and stroke. All Model 3 hospitals have EDs, OPDs and inpatient specialist services for patients with diabetes, renal failure and stroke/TIA, many of whom have a need for vascular opinion and care.

Figure 13. Geographical Delivery of Vascular Services in the Republic of Ireland



With the present Hospital Group configuration, there are three vascular centres in the South/ South West Group, two each in Ireland East and Dublin Midlands Groups and one in each of the other three Groups. Virtually all arterial surgery is carried out in these hospitals. Vascular surgeons from these centres carry out a significant proportion of the varicose vein surgery at their Group Model 2 hospitals (Table 6).

Generally, there are well established care pathways within the Hospital Groups for appropriate referral of patients to the vascular units. Emergency patients with ruptured AAA, and acute and critical limb ischaemia get transferred immediately.

Table 6. Number and Location of Vascular Consultants

Hospital Group Current	Model 2 Hospital Services	Model 3 Hospital Services	Model 4 with Vascular Centres	Interventional Radiology	Population served	No. of Consultants	Ratio
RCSI HG	St Joseph's (OPD & Surgery)	N/A	Beaumont Hospital	Yes	860,000	5	
IE HG	Navan (Surgery) St Michael (OPD and Surgery) St Colmcille's (OPD and Surgery)	N/A	Mater Misericordiae University Hospital St Vincent's University Hospital	Yes	1,100,000	4 3	
DM HG	N/A	Midland Regional Hospital Tullamore (OPD)	St James' Hospital Tallaght University Hospital	Yes	800,000	4 3	
SSW HG	Mallow (Surgery)	Mercy University Hospital Cork	Cork University Hospital University Hospital Waterford	Yes	1,200,000	2 (2 - Mercy) 3	
UL HG	Ennis Hospital (OPD & Surgery) Nenagh Hospital (OPD & Surgery)	N/A	University Hospital Limerick	Yes	370,000	3	
Saolta HG			University Hospital Galway	Yes	710,000	4	
TOTAL					5,040,000	33	

Currently, the ratio of consultant vascular surgeons to population is 1:152,727 in Ireland working in the public sector. The current estimate in the UK is 1:129,000. The recommendation from the Vascular Society is that there should be a ratio of 1:100,000 (62).

In December 2021, the Minister for Health announced the establishment of the "Regional Health Areas Advisory Group" and in 2023, 6 new Health Regions (HRs) were named. This proposal is in line with recommendations made in the Oireachtas Committee on the Future of Healthcare Sláintecare Report (2017), (72) which proposed that each regional body would be responsible for the planning and delivery of integrated health and social care services.

The aim of the Health Regions are to ensure geographical alignment of hospital and community healthcare services at a regional level, based on defined populations and their local needs. While the number of HRs are the same as the number of Hospital Groups, there are significant differences in the Model 4 hospital groupings within the HRs, as illustrated in Table 7. The timeline for the transition from the current structure of Hospital Groups to Health Regions has not as yet been determined, which impacts on the implementation of the recommendations for delivery of services in this Model of Care.

Table 7. Proposed Health Regions

Health Region Area covered	Hospitals (Model 4 hospitals in bold)	Population (Census 2016, rounded)
HSE Dublin and North East North Dublin, Meath, Louth, Cavan**, and Monaghan	**Cappagh National Orthopaedic Hospital** **Louth County Hospital, Dundalk** **Monaghan Hospital** **Our Lady's Hospital Navan** **Cavan General Hospital** **Connolly Hospital Blanchardstown** **Our Lady of Lourdes Hospital Drogheda** **Beaumont Hospital** **Mater Misericordiae University Hospital** **Rotunda Hospital Dublin**	**1,080,000**
HSE Dublin and Midlands Longford, Westmeath, Offaly, Laois, Kildare, and parts of Dublin South and Wicklow*	**St. Luke's Hospital, Rathgar** **Midland Regional Hospital, Mullingar** **Midland Regional Hospital Portlaoise** **Midland Regional Hospital Tullamore** **Naas General Hospital** **Tallaght University Hospital** **St. James's Hospital** **Coombe Women & Infants University Hospital**	**1,000,000**
HSE Dublin and South East Tipperary South, Waterford, Kilkenny, Carlow, Wexford, Wicklow, part of South Dublin	**Orthopaedic Hospital Kilcreene** **Royal Victoria Eye & Ear Hospital** **St. Columcille's Hospital** **St. Luke's Hospital,Kilkenny** **St. Michael's Hospital, Dun Laoghaire** **Wexford General Hospital** **South Tipperary** **St. Vincent's University Hospital** **University Hospital Waterford** **National Maternity Hospital, Holles Street**	**900,000**
HSE South West Kerry and Cork	**Bantry General Hospital** **Mallow General Hospital** **Mercy University Hospital** **South Infirmary-Victoria University Hospital** **University Hospital Kerry** **Cork University Hospital** **Cork University Maternity Hospital**	**690,000**
HSE Mid West Limerick, Tipperary and Clare	**Croom Hospital Limerick Ennis Hospital** **Nenagh Hospital** **St. John's Hospital Limerick** **University Hospital Limerick** **University Maternity Hospital Limerick**	**390,000**
HSE West and North West Donegal, Sligo, Leitrim**, Roscommon, Mayo, and Galway	**Roscommon University Hospital** **Letterkenny University Hospital** **Mayo University Hospital** **Portiuncla University Hospital** **Sligo University Hospital** **Galway University Hospital/Merlin Park**	**710,000**

*West county Wicklow: West county Wicklow continues to be aligned with Kildare for health services
**West county Cavan: A small portion of west county Cavan continues to be aligned with Sligo/Leitrim for health services

11.0 TRAINING AND WORKFORCE PLANNING

Consultant vascular surgeons, whose numbers have increased from 18 in 2000 to 33 in 2022 (83% increase), provide the national vascular surgery service in 10 hospitals. As indicated above, the current ratio in Ireland is 1:152,000: This compares with 1:126,000 in the UK. The Vascular Surgery United Kingdom Workforce Survey (2018) carried out by the Vascular Society of Great Britain and Ireland, recommended a gradual increase in numbers to 1:100,000 over 10 years (73). The projected workforce requirements for the next 10 years are currently under review, but based on the current population of Ireland and advice of the Vascular Society, it is predicted that there should be 57 vascular surgeons to meet the demand to 2038. The recognition of vascular surgery as a specialty necessitated the development of a specialty training programme. In this regard, approximately an average of 1.5 trainees need to complete specialist training each year to replace those retiring. Consideration must also be given to future service developments and changing work practices among both trainees and consultants. The current consultant demographic population indicates that 18.5 consultants are expected to retire by 2038. The split between male and female is 84%:16%. Unlike most other specialties, there are very few consultants working solely in private vascular surgery practice.

11.1 THE VASCULAR TRAINING PROGRAMME

11.1.1 TRAINING FOR VASCULAR SURGEONS

The Vascular Training Programme in Ireland is closely linked to the RCSI's sister colleges in London, Edinburgh and Glasgow via an integrated Intercollegiate Committee structure. The Joint Committee on Surgical Training, (JCST), is an intercollegiate body which oversees the organisation and administration of specialist surgical training in the UK and Ireland. The JCST represents the four surgical Royal Colleges in Great Britain and Ireland, and the relevant specialist associations. The JCST is the advisory body to the RCSI for all matters in relation to surgical training including the recommendation for the award of the Certificate of Completion of Specialist Training (CCST).

Vascular surgery training programmes in Ireland and the UK share common governance, curriculum and assessment methods. The curriculum is defined in the Intercollegiate Surgical Curriculum Programme portal (https://www.iscp.ac.uk/curriculum/surgical/surgical_syllabus_list.aspx). The training programme and examination are robust and both are actively monitored by a number of committees. All trainees are subject to continuous monitoring by their supervisors and the training programme itself. Training units are subject to regular robust and independent inspection and accreditation.

Prior to 2016, vascular surgery was within the general surgery programme and trainees undertook general surgery training. Now, all new vascular surgery trainees are specialist surgeons in vascular surgery and not dual-trained with general surgery.

The main elements of surgical training are:

- Core Surgical Training (CST): A two-year competitive entry programme, usually commencing after the intern year. It comprises an ST1 year in General Surgery and an ST2 year as a specialist year. Trainees are then awarded their certificate of core surgical training (CST Certificate) and are expected to have passed their MRCS examination. Trainees are then eligible to apply for Higher Surgical Training (HST).
- Higher Surgical Training (HST): A six-year competitive entry programme (post-CST). Specialist Registrars (SpR) in Vascular Surgery will spend the first year in General Surgery and the next five years in rotations through vascular units. They must complete six years in HST and then progress on to the Intercollegiate FRCS in Vascular Surgery and obtain their CCST.
- Research & Fellowship: A period of research is strongly recommended for all trainees. Currently, this is undertaken after the second or third SpR years (ST4 or 5) and is mostly self-funded by part-time on-call hospital work. Most trainees post-HST undertake a fellowship abroad to enhance specialist training and their experience. Candidates are unlikely to obtain a consultant post without a competitive CV, which is bolstered by research and/or fellowship.

The average number of consultant posts per annum that become available is 1-1.5. An intake of 4 trainees per year will support the expansion of numbers to meet the demand for the next 10 years.

Trainees successfully progressing through the programme and obtaining their examination will meet the requirements for a consultant post in Ireland. However, these tend to be minimum qualifications and candidates will often have other higher degrees, fellowships and/or subspecialist training.

It was the norm for vascular surgeons to partake in the emergency roster for the provision of general surgery services. With the evolution of vascular surgery, particularly with specialty recognition and its associated specialty training programme, vascular surgeons no longer have the necessary expertise to provide general surgery services, elective or emergency. At present, only a small minority of vascular surgeons partake in the general surgery emergency roster.

For specialist training, it is essential that the trainees get the opportunity to undertake the requisite workload experience and to be part of the emergency service. The specialist rota across all units is 1 in 4, but at present there are insufficient Specialist Registrars to fill this form of rota. The majority of the rotas are covered by non-training programme registrars, fellows and general surgery trainees. These NCHDs, although essential to the service, do not have access to supported structured training which is essential in a rapidly evolving specialty like vascular surgery.

Assuming current training progresses as predicted, it should be possible to achieve a steady stream of accredited consultants. Some flexibility is required to take into account the duration of any research period different trainees undertake and, in addition, the duration of any fellowship training which is usually taken abroad.

As vascular surgery is in a state of development, it may take several years to achieve a sustainable workforce. Research and fellowship commitment of trainees make workforce modelling difficult to predict accurately. The ongoing evolution of endovascular techniques make predictions for future advances in vascular surgery difficult. Hence, all vascular trainees are exposed to the latest endovascular techniques during training and encouraged to seek fellowships in renowned international centres of excellence in North America, Australia and Europe. Currently all endovascular training is performed by vascular surgeons.

In addition, there are an indeterminate number of other non-programme overseas trainees and registrars who have obtained their intercollegiate fellowship and/or the Fellow of the European Board of Vascular Surgeons examination. These surgeons could be eligible for consultant posts in this country if they are admitted to the specialist register of the IMC.

Satisfactory vascular surgery training requires an appropriate number of suitably qualified trainers with time allocated for training in centres that have adequate unit volumes. The Joint Committee on Surgical Training have guidelines on specific certification details (74).

The RCSI and NDTP should work closely with the Irish Vascular Society to ensure the availability of adequately trained consultants to meet the needs of the population.

RECOMMENDATION 31

The RCSI and NDTP should work closely with the Irish Vascular Society to ensure the availability of adequately trained consultants to meet the needs of the population.

11.2 INTERVENTIONAL RADIOLOGY/ ENDOVASCULAR SURGERY TECHNIQUES

Training in endovascular techniques is within the remit of interventional radiology and vascular surgeons. Endovascular training is an integral part of the newly developed training programme. In Ireland, the vast majority of vascular surgery consultants appointed in the last 15 years are trained endovascular surgeons. Vascular surgery and interventional radiology should continue to work collaboratively to provide good quality patient-centred care. Expansion of interventional radiologist numbers will be required to support arterial hub sites as the vascular surgery workload expands.

At present, there is a critical national shortage of radiographers. This has a significant impact on theatre efficiency, as many surgical specialties require intraoperative imaging (such as orthopaedics) and insufficient staffing can result in delays in care. While we remain one of the few countries which mandates the presence of radiographers, there will be an urgent need to increase staffing.

11.3 SPECIALIST AND ADVANCED NURSING WITHIN VASCULAR SURGERY

Ireland has had a dynamic policy to develop advanced practice nursing. In 2019 in Ireland there were about 200 ANPs in various areas of medicine but only 13 were in surgical specialties (75).

The following Tables 8 and 9 indicate the number of nursing roles working within the vascular surgery services. As of July 2019, there were three ANPs in post and a total of 22 Clinical Nurse Specialists in post (75).

Table 8. ANP Nursing Roles working within Vascular Surgical Services

Hospital Group/Name of Hospital	ANP Vascular		ANP TVN		ANP Diabetes	
	Approved	In Post	Approved	In Post	Approved	In Post
Ireland East Hospital Group	1	1			2	2
NATIONWIDE TOTAL	1	1	0	0	2	2

Table 9. CNS Nursing Roles working within Vascular Surgical Services

Hospital Group/Name of Hospital	CNS Vascular		CNS TVN		CNS Diabetes	
	Approved	In Post	Approved	In Post	Approved	In Post
Ireland East Hospital Group	1	1	7.5	7.5		
Dublin Midlands Hospital Group			1	1		
RCSI Hospital Group			3	5		
South/South West Hospital Group	1	0	2.9	2.9	0.8	1.8
University Hospital Limerick	1	1				
SAOLTA Hospital Group			2	1.8		
NATIONWIDE TOTAL	3	2	16.4	18.2	0.8	1.8

The appointment and training of ANPs from Staff Nurse level can take two to three years of structured, on-the-job training with specialty consultant supervision. Clinical Nurse Specialists could attain ANP level in one year. The expanded role of nursing would enable the extension of outpatient clinics for conditions such as claudication, varicose veins and vascular access and diabetic foot care. Table 10 indicates the care level and suggested roles that could support the vascular surgery service.

Table 10. Care Level and Suggested Nursing Roles in Vascular Surgery

Care Level	Position	Suggested Roles
Community Specialist Ambulatory Care	**CNS**	**Leg ulcer care** **Care of patients with PAD** **Lifestyle advice for patients with vascular disease**
	ANP	**Diabetic foot disease management** **Development of an integrated service, e.g. diabetic foot**
Acute Specialist Hospital Care	**CNS**	**Leg ulcer dressing clinics** **PAD patient review** **Patient education/lifestyle advice**
	ANP	**Outpatient clinics** **Ulcer diagnostics and dressing** **Development of an integrated service, e.g. AAA screening**

The development of ANP roles in the spoke hospital is viewed as crucial for the provision of a quality service. It is envisaged that they will play an important role in areas including outpatient clinics, ulcer care, aneurysm screening and management of the diabetic foot (Table 10). The benefits of developing the ANP role include improved care of vascular patients in both the acute and primary care setting. ANPs can improve patients' access to services, reduce waiting lists, facilitate early discharge and avoid unnecessary hospital attendance by keeping patients at home through expanded integrated care pathways. This role should be developed in line with Advanced Practice (Nursing) Standards and Requirements (76) and could include, but not be limited to:

- Tissue Viability Service/Leg Ulcer Care: This includes care of venous leg ulceration, chronic wounds, diabetic foot care and lymphoedema. Development of an integrated service with the community will be a crucial element of this role.
- Input into the community care of patients with Peripheral Arterial Disease, including lifestyle advice.
- Delivery of the AAA screening and EVAR surveillance programmes. Integration with the diabetic foot and lymphedema programmes.

RECOMMENDATION 32

Each Hospital Group (HG) / Health Region (HR) should undertake a workforce analysis to identify deficiencies, especially in specialist nursing.

Each new Health Region should undertake a workforce analysis to identify deficiencies, especially in specialist nursing.

11.4 VASCULAR PHYSIOLOGISTS

Vascular physiologists are primarily involved in the diagnosis of disease of the veins and arteries. Most vascular physiologists work within vascular laboratories as part of a multidisciplinary surgical team. They perform and report on a wide variety of ultrasound examinations and arterial and venous functional studies which provide valuable information to the surgeons or other referring doctors. In Ireland, the route to becoming a vascular physiologist is usually through obtaining a BSc in Clinical Measurement from Technology University, Dublin, or a Certificate in Medical Physics and Physiological Measurement (Dublin Institute of Technology, Kevin Street, Dublin) or equivalent. Collaboration and communication between the vascular surgical specialty and the higher education colleges is necessary to ensure that sufficient candidates are encouraged to apply to courses to fulfil the expected demand.

11.5 PHYSICIAN ASSOCIATES

Physician associates (PAs) are medically trained, generalist healthcare professionals, who work alongside doctors and provide medical care as an integral part of the multidisciplinary team. Physician associates can have a variable degree of independence but always work with a dedicated medical supervisor who provides appropriate support. In other jurisdictions, physician associates work within the community setting, EDs, and support specialist medical and surgical teams in both the acute and elective settings. PAs support doctors and surgeons in the diagnosis and management of patients and are trained to perform several roles, including taking medical histories, performing examinations, making diagnoses, analysing test results and assisting at surgery.

RECOMMENDATION 34

Assess the need for a Physician Associate role in Vascular Surgery.

The role of the physician associate was first developed in the US in the 1960s and, currently, over 200,000 physician associates work in US healthcare. In 2004, the UK's Department of Health commissioned an evaluation of physician associates on healthcare provision and, in 2005, the UK Association of Physician Associates (UKAPA) was established. In the UK in 2006, the Department of Health produced a Competence and Curriculum Framework for the PAs, developed in partnership with the Royal College of Physician and Royal College of General Practitioners.

It is possible that the number of trainees within the vascular surgery specialty could diminish in the coming years due to the separation of vascular surgery from the general surgery training programme. To off-set this, workforce planning needs to consider replacing trainees with other grades to fill the service needs of the vascular surgery patient population. One such grade could potentially be the physician associate.

RCSI commenced a two-year Masters programme in Physician Associate Studies and, currently, graduates work in a pilot capacity in Beaumont Hospital and in the private sector. Currently a decision is awaited from the Department of Health regarding the introduction of this role in the Irish health service. It is important that, with the development of supporting roles of ANPs and physician associates, the training opportunities for surgical trainees are not compromised.

12.0 THE FUTURE OF VASCULAR SURGERY IN IRELAND

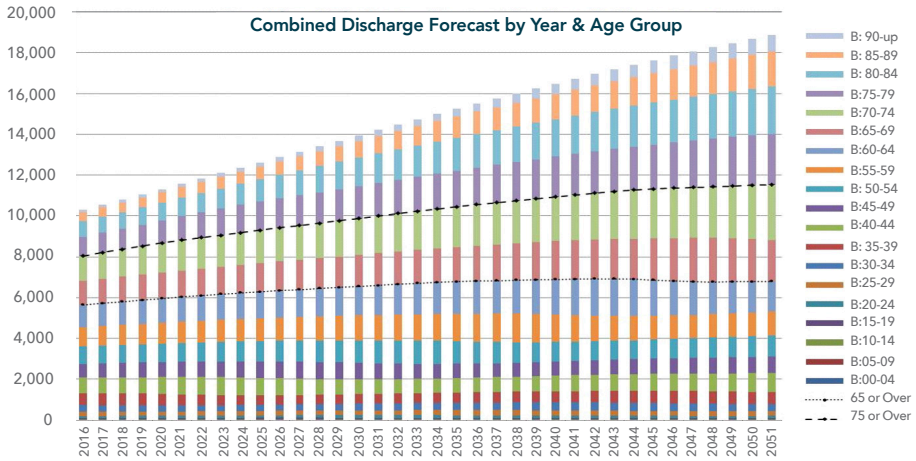
12.1 SERVICE DEMANDS

With demographic changes in Ireland, the elderly population will increase disproportionally (77). Figure 14 illustrates the predicted increase in vascular interventions, day case and inpatient hospital activity to 2051. Assuming no change in disease incidence or disease management, the graph shows an increase of almost 2.5% per year in hospital vascular surgery activity. Resource planning should accommodate a gradual increase in demand for interventions such as carotid surgery.

Of most concern is the inevitable, dramatic increase in the prevalence of diabetes and consequent vascular complications (78). In 1958 in the US, which Ireland demographically tracks, diabetes affected less than 1% of the population and 60 years later this has increased to over 8% (79). The significance of diabetes in lower limb arterial disease and its management has already been discussed. Despite improved glycaemic control, vascular and neuropathic foot complications continue to be responsible for the majority of hospital admissions for patients with diabetes.

In order to address these issues and deliver a quality service with efficient use of resources and supporting an acceptable work-life balance for the workforce, the organisational management of vascular surgery needs to evolve to meet the future needs of the Irish population.

Figure 14. Scheduled and unscheduled vascular patients, day case and inpatient, by age group: 2016 projected forward based on CSO projections, with no improvements in conversion of stay activity to day case



12.2 SERVICE DELIVERY CHANGES

In 2000, Comhairle Na n-Ospidéal produced a report of the Joint Committee of Vascular Surgery Services (80) in which they largely adopted the recommendations of the Irish Vascular Society (IVS) 1998 report.

The key elements of the Comhairle report include:

- Outcomes for vascular surgery procedures were dramatically superior when provided by surgeons with specialist training. Therefore, in order to provide for the population, they recommended the appointment of several consultants with a vascular surgery specialty interest.
- The recommendation for the national reconfiguration of vascular surgery services. In 2000, elements of scheduled vascular surgery were carried out in twelve centres nationally.
- The recommendation of a form of hub and spoke model in which smaller, low-volume centres with one vascular surgeon (such as Cavan General Hospital, Midland Regional Hospital Tullamore and University Hospital Waterford) would be linked to major centres in Beaumont Hospital, St. James's Hospital, Tallaght University Hospital and St. Vincent's Hospital respectively.
- The recommendation that the Vascular Surgery services be centralised by (i) amalgamating services at St James' and Tallaght hospitals to one site and providing a satellite service to Tullamore, (ii) amalgamating the Mercy Hospital and Cork Regional Hospital (now Cork University Hospital) services, (iii) the Mater Hospital and Beaumont have a joint unit working on both sites and providing a satellite service to Cavan Hospital, (iv) the unit in St Vincent's Hospital should have a joint unit with Waterford General Hospital.

Since that time, the only significant reconfiguration has been the discontinuation of vascular surgery at Cavan General Hospital and Midland Regional Hospital, Tullamore.

These recommendations were made prior to creation of the Healthcare Service Executive (HSE), Hospital Groups and more recently, Health Regions. Nevertheless, it is clear that 20 years ago, and 14 years before the recognition of vascular surgery as a specialty, there was a recognition by Comhairle Na n-Ospidéal and the Department of Health for the need to concentrate vascular surgery services in centres of excellence. The principles of the report, which predated a similar report for the NHS by a decade, were incorporated into the Provision of Vascular Surgery (POVS) report published in 2015 by the Vascular Society of Great Britain and Ireland (81) and updated in 2021 (62).

12.3 HUB AND SPOKE MODEL FOR VASCULAR SURGERY

Vascular surgery service planning provision cannot ignore the now confirmed volume/outcome relationship which was the principle which guided the establishment of the "Cancer Centres" in Ireland and elsewhere. The principle is as true for complex vascular procedures as for surgical oncology. Complex vascular surgery is comprised of all arterial interventions except arterio-venous fistula access surgery. In 2015, the Vascular Society of Great Britain and Ireland published "The Provision of Services for Patients with Vascular Disease 2015", with the overarching principle that "High-quality vascular care is best delivered by integrated vascular networks" (81). The executive statement concludes that patients may have to travel to obtain access to more complex diagnostic and interventional facilities. This document was updated in 2021 and also concludes that networks are the best model to safely deliver specialist vascular care (62). A significant number of vascular surgery reconfigurations have taken place in the NHS, including in Northern Ireland, where all complex vascular surgery is centred in the Royal Victoria Hospital. In the NHS reconfiguration, hospitals which did, but no longer, provide complex surgery have been developed as spoke centres.

RECOMMENDATION 1

Create a hub and spoke Model of Care for vascular surgery services. The HSE should designate and resource the hub and spoke centres to align with the Health Regions as per guidelines described in this Model of Care.

The key to success in developing a hub and spoke model is dependent on ensuring:

(a) capacity and staffing in the hub,
(b) adequate modern diagnostic and treatment resources in the hub, and
(c) the development of clear patient care pathways for the hub and spoke centres.

RECOMMENDATION 6

Designate National Centre/s for high complexity, low volume procedures e.g. thoracoabdominal aneurysms

The major and very important difference between this hub and spoke model compared to previous Irish iterations of networks is that complex interventions are not provided at the spoke centre. Another important feature of centralisation is that it allows a sustainable on-call rota which is no more onerous than one in six and allows for an acceptable work-life balance. The presence of six or more surgeons in a centre also allows sub-specialisation, if so desired, within the unit. As discussed in the section on training, large units are ideal for training purposes as they allow for greater trainee exposure and experience with complex procedures interventions. Centralisation also avoids the duplication of expensive technology and, as for all surgery, promotes a solution to sustainable staff recruitment and retention. The Irish Vascular Society recommends a minimum number of 40 AAA repairs (open surgery and EVAR) should be carried out in a hub centre, of which 10 should be open AAA repairs (25). There should also be 35 or more carotid procedures (elective and emergency) performed per unit per year. These are all averaged over three years. A population of 800,000 is usually considered ideal to generate this workload (81). National Centre/s should be designated for high complexity, low volume procedures, e.g. thoracoabdominal aneurysms.

The vascular service that is currently delivered in ten centres should be reconfigured around a maximum of six hub centres to reflect the current structure of the Hospital Groups. This principle equally applies to the Health Region configuration approved by the Government in April 2022.

12.3.1 A TRAUMA SYSTEM FOR IRELAND

In 2015, the Minister for Health established a Steering Group to develop a trauma policy for Ireland which culminated in the publication: *A Trauma System for Ireland* in February 2018 (82). The report recommends the establishment of an inclusive trauma system, where a network of facilities and services co-ordinate in the care of injured patients along standardised pathways.

The service specification for the Major Trauma Centres includes a Trauma Team on site 24 hours every day who will provide specialist services in Neurosurgery, Spinal and Spinal Cord Surgery, Vascular Surgery, Cardiothoracic Surgery, Plastic Surgery, Maxillofacial Surgery, Ear Nose and Throat Surgery, Diagnostic Radiology, Interventional Radiology (50).

It is axiomatic that the two National Trauma Centres and the Trauma Unit with Specialist services in Galway must provide complex vascular surgery services.

RECOMMENDATION 5

Vascular Surgery services should work with the National Office for Trauma Services and the National Ambulance Service to establish transfer protocols for vascular emergencies and also for transfer of care of trauma patients when acute management has been completed.

Ambulance Service

As outlined in the Trauma System for Ireland document, the concept of dynamic connectivity between Trauma Units and Major Trauma Centres is a cornerstone of any Trauma System. Key to this connectivity is the National Ambulance Service (NAS). Other essential components for delivering on this connectivity will be robust referral and acceptance procedures, a national communication system and a critical care bed information system. A severely injured patient may be too far from a Major Trauma Centre to be brought there safely and may need to be taken to the nearest Trauma Unit for stabilisation. Alternatively, a patient who is initially assessed as requiring a Trauma Unit may deteriorate and need to be brought to a Major Trauma Centre for more specialised treatment. Repatriation of patients from Major Trauma Centres to Trauma Units or other healthcare facilities, once their initial phase of care is complete, will be a necessary part of Trauma Networks. This is equally true for patients brought by ambulance who require emergency vascular surgery. For example, those patients with a suspected ruptured AAA should be brought only to a hub centre. The presence of trauma related vascular injuries may necessitate transfer of patients to the hub centre even with on-site availability of a Vascular Surgeon in the spoke hospital. As the trauma network and role of NAS evolves along with the designation of the hub and spoke models for vascular surgery, protocols should be developed in collaboration with NAS to ensure patients are brought to the most appropriate setting for whatever treatment they require.

12.4 VASCULAR HUB

The following sections describe the essential requirements for a Vascular Hub.

12.4.1 The Vascular Ward

The optimum care of vascular surgery patients can only be provided in a dedicated vascular ward with ring-fenced bedstock. This ring-fenced ward will ensure high quality care is delivered by appropriately educated and trained nurses who are working within their competence and scope of practice.

RECOMMENDATION 2

Establish dedicated vascular wards with appropriately trained staff in the vascular hub, with ring-fenced beds.

At present, only one third of inpatients are elective admissions and these should follow the Model of Care for Elective Surgery (2013) guidelines for admission. These include:

- Prior to admission, scheduled patients should be pre-assessed in an appropriate setting by an appropriately trained member of staff, in line with the Pre-admission Model of Care (2017). This could take place in an ANP-led pre-admission clinic.
- Day of Surgery Admission (DOSA) following pre-admission assessment should be the norm.

Based on current experience from the United Kingdom, a population of 800,000 will require approximately 20-25 beds on a dedicated vascular ward, not including rehabilitation, day care or intensive care unit/high dependency unit beds (62). The experience in Ireland would also be reflective of this.

12.4.2 Vascular Nursing

Specialist nursing care is required for optimal vascular patient outcomes. This requires an appropriate skill mix of nurses who have been specially trained in the care of vascular patients. The nursing care of vascular inpatients requires specialist skills, as well as combining aspects of general surgical nursing, critical care, wound care, rehabilitation, diabetes care, as well as care of the patient with a physical disability and care of the older person. For staffing ratios, please follow the framework for safe staffing and skill mix phase 1 report (83).

12.4.3 Health and Social Care Professionals

The input of the health and social care professionals (HSCP) such as physiotherapists, occupational therapists, podiatrists and social workers are central to the successful discharge of frail and disabled patients. This process is best managed in the context of regular multidisciplinary discharge planning meetings. A HSCP team should form part of the rehabilitation teams in the Major Trauma Centres and Trauma Units with Specialist Services (TUSS) which are vascular hubs.

12.4.4 Specialist Rehabilitation Services

Despite best efforts to restore limb circulation, it may still be necessary to proceed to amputation to manage symptoms, restore health and result in an improved functional outcome. Amputation surgery should be viewed as not solely a treatment to remove a diseased limb but with a focus on providing a residuum which would be optimal for rehabilitation.

Amputation results in changes to body structures and function that are permanent and have significant consequences for the person living with an amputation. Thus, to ensure optimal outcomes for patients requiring amputation, it is essential that consistent high standards of rehabilitation care are provided to ensure their needs are met at all stages. Life expectancy of a vascular amputee is short, and in the elderly is associated with considerable morbidity and decreased function. Rehabilitation can successfully restore function, decrease dependency, and improve quality of life. Referral for rehabilitation should be offered to all patients, not only for consideration for prosthetic rehabilitation but also to allow thorough assessment and expert advice regarding alternative methods of achieving mobility and independence. Relationships need to be further developed with local specialist prosthetic rehabilitation services/teams to establish integrated care pathways and best functional outcomes for patients.

Between hub and spoke models for vascular services, there should be a bidirectional 'no refusal policy'; when it is necessary to escalate care to the hub centre and, likewise, return to the spoke centre once the patient is suitable for rehabilitation or step-down facility following completion of care for the acute condition. The National Trauma Office have developed a Model of Care for the transfer of care of trauma patients when acute management has been completed that could be adapted for vascular surgery networks (82).

RECOMMENDATION 3

Designated vascular hubs should accept referral on a no-refusal basis from designated hospitals with an agreed repatriation arrangement.

12.4.4.1 Pre-amputation

In patients for whom a major amputation is the considered treatment option, or is likely to be required, it is recommended that the patient be referred to a consultant in rehabilitation medicine specialising in the management of amputees for a pre-amputation consultation. This may not always be possible due to the need for time critical amputations to be carried out. Ideally the pre-amputation consultation would involve various members of an inter-disciplinary team and provides discussion of realistic rehabilitation goals, prosthetic options, projected outcomes, and advice to guide the choice of surgical procedure.

12.4.4.2 Post-amputation

Early engagement in post-operative rehabilitation is essential. All amputees should have access to specialist rehabilitation nursing and adequate therapy services; physiotherapy, occupational therapy and be offered psychological and social support. The treating staff should be adequately experienced in amputee management and rehabilitation and have access to appropriate equipment and facilities to optimise their input. Where a pre-amputation consultation is not possible, all patients with major amputations should be referred to the specialist inter-disciplinary rehabilitation service shortly after amputation surgery to assess for rehabilitation with a prosthetic limb. Even where a prosthesis is not going to be beneficial, the specialist rehabilitation service can recommend, guide, or provide a rehabilitation programme via integrated rehabilitation pathways with local or community-based rehabilitation services. Specialist inter-disciplinary rehabilitation services provide the best outcomes for patients who have an amputation and should be offered to all patients.

RECOMMENDATION 16

Enhance collaboration with local specialist prosthetic rehabilitation services/teams to promote integrated care pathways and best functional outcomes for patients undergoing amputations.

In 2018, the National Clinical Programme in Rehabilitation Medicine published their Model of Care (84) which advocates for the completion of a Rehabilitation Needs Assessment/ Prescription and subsequent referral via a rehabilitation co-ordinator into a Managed Clinical Rehabilitation Network (MCRN). Patients will receive care at an appropriate centre based on complexity (tertiary, secondary, local). The MCRN model is also endorsed by the National Clinical Programme for Neurology, the Trauma System for Ireland Report and the National Neuro-Rehabilitation Strategy. In the absence of an established MCRN, patients should be referred for assessment to a Rehabilitation Medicine consultant and their inter-disciplinary team to establish what pathway of care is most appropriate.

12.4.5 Day Ward

A hub vascular centre requires access to day care facilities. The level of need will be dictated by the extent to which day care services such as varicose veins, vascular access procedures and endovascular procedures are carried out in the spoke centre(s).

12.4.6 Operating Theatres and Hybrid Interventional Theatres

RECOMMENDATION 9

Each vascular hub should be equipped with a hybrid theatre. Theatres should be risk-assessed to ensure minimum radiation exposure for staff and patients.

The hub should be equipped with a hybrid theatre, as many modern procedures are a combination of endovascular and open procedures. As many vascular procedures are time consuming and need prolonged operating time, vascular surgeons should have all-day theatre lists. Each vascular surgeon should have at least one full operating day per week at the hub. In general, consultant vascular surgeons require two full day theatre lists per week to fulfil their contractual commitments and maintain their clinical and technical skills. Many vascular procedures are unscheduled and there should be easy access to additional urgent theatre time as required. The major trauma centres will have hybrid theatres and enhanced access to emergency theatres.

Arterial surgery and endovascular procedures are complex, and theatre personnel need to be specially trained. Theatre staff need to be capable of operating cell-salvage devices for blood conservation. The hub needs stocks of the required devices, especially grafts, stents, and guidewires, as they may be necessary as a matter of urgency. Each hub centre should perform an assessment of what equipment and devices are required for emergency surgery and ensure that they are in stock and readily available if needed at short notice.

Hybrid theatres should be risk-assessed and resourced to ensure radiation exposure is kept to a minimum for staff safety.

RECOMMENDATION 33

Vascular surgeons using radiation should undertake an accredited Radiation Protection training course and adhere to European Society for Vascular Surgery (ESVS) published Clinical Practice Guidelines on Radiation Safety.

12.4.6.1 Radiation Safety for Vascular Surgery

There has been an exponential rise in the number of X-ray guided minimally invasive procedures in vascular surgery (85). These have been shown to be the preferred treatment modality based on lower morbidity, mortality, and reduced length of hospital stay compared with the open surgical alternatives. As the technical expertise and imaging improve, vascular surgeons are utilising increasingly complex endovascular solutions that are associated with prolonged fluoroscopy times, with a consequent rise in radiation exposure to both the patient and the endovascular operating team (86) (87).

In 2023, the European Society for Vascular Surgery (ESVS) published Clinical Practice Guidelines on Radiation Safety which outline 46 recommendations promoting the protection of the patient and all healthcare staff (87). It is recommended that centres providing vascular surgery review and adhere to these guidelines.

12.4.7 Vascular Outpatient Clinics

The Vascular outpatient clinic needs to be appropriately staffed by a multidisciplinary team. There also needs to be an appropriate skill mix among nurses, including expertise in ulcer and wound dressings. Sufficient examination rooms and staff must be available to prevent delays while wounds are being redressed after consultation. The vascular team need access to hand held doppler ultrasound machines. The sclerotherapy unit should be sited close to the vascular laboratory if possible, in order to facilitate a 'one-stop-shop' style of management. Triaging of referrals to allow same day pre-booked vascular investigations will reduce the need for unnecessary visits.

Much of the varicose vein treatments, such as endovenous and sclerotherapy techniques, can be provided in an ambulatory setting and also in an elective hospital setting. This would be the ideal setting for an 'see and treat' facility for varicose veins.

The implementation of a comprehensive ambulatory varicose vein service has the potential to release existing theatre resources for other uses.

12.4.8 Vascular Laboratory

The vascular laboratory provides both physiological and anatomical data to aid decision making on vascular patients as well as providing a safe and radiation-free method of patient follow-up. It forms an integral part of any vascular unit. It provides a wide range of non-invasive testing, including:

Physiological tests (blood supply)

- Foot blood flow measurements (ABIs) and exercise ABIs - Intermittent claudication
- Toe pressures – Critical ischaemia, ulceration, diabetic feet
- Finger pressures – Raynauds and vasculitis
- Tissue oxygen levels (TcPO2) – Ulcer healing and amputation level

Anatomic tests (Scanning/Imaging)

- Carotid – TIA, stroke, risk assessment, pre-op cardiac surgery assessment
- Transcranial Doppler – TIA, stroke, pre-op monitoring
- Aorta – Aneurysmal screening and surveillance, post-EVAR surgery surveillance
- Mesenteric and renal arteries - Abdominal angina, hypertension
- Peripheral arteries – Intermittent claudication, critical ischaemia, ulceration, aneurysmal disease vasculitis and diabetic foot disease
- Venous – Deep vein thrombosis, superficial thrombophlebitis, varicose veins and pre-operative mapping
- A-V fistula – Pre and post operative assessment
- Vascular grafts - Post-operative surveillance

A population of 800,000 generates in excess of 5000 (62) tests per annum and thus a minimum of five full-time vascular clinical scientists are required to provide the service. At present, the number of vascular clinical scientists graduating each year is insufficient to meet demands and it is important to engage with the educational institutes to ensure an adequate number of graduates in the future. Clerical support is also essential.

Essential equipment includes high resolution ultrasound machines as well as Flo-labs and a treadmill. All machines should be connected to a PACS system. Regular maintenance and calibration should be an essential part of the service contract. All examination rooms require controlled lighting, electric couches, and examination stools in addition to air conditioning. Each lab should have a chief technologist who aids in the interpretation of results and ensures quality control in addition to the development of new protocols and the introduction of new studies. Overall, the vascular laboratory is governed by a consultant in vascular surgery.

RECOMMENDATION 8

Vascular laboratories should be integrated into the NIMIS diagnostic imaging platform.

12.4.9 Radiology Diagnostics

The assessment and diagnosis of arterial and venous disease requires imaging using X-ray, CT scans, MRI scans and ultrasound. All CT and MRI imaging is carried out in the radiology department. X-ray imaging is carried out in the radiology department and also in the operating theatre for diagnostic and treatment purposes. Almost all ultrasound imaging and blood flow studies pressure measurement is carried out in a dedicated vascular laboratory by specialty vascular technologists who are largely under the governance of the vascular surgeons. The details of the vascular laboratory are outlined in Section 12.4.8.
All vascular laboratories, whether under the governance of Radiology or Vascular Surgery, should be integrated fully onto the NIMIS platform. For non-NIMIS public sites, and all private sites to whom public work is outsourced, image transfer functionality is essential so that imaging studies acquired at such locations can be seamlessly reviewed at NIMIS locations.

12.4.10 Intensive Care Unit (ICU)/High Dependency Unit (HDU) and Post Anaesthetic Care Unit (PACU)

A critical care facility is essential for the care of vascular patients, particularly for post-ruptured aneurysm repair. Many patients will need management post-operatively within the HDU or PACU rather than ICU. Therefore, ICU and HDU beds must be available in order to prevent cancellation of elective procedures due to lack of facilities. The proposed expansion of ICU capacity in response to the COVID-19 pandemic is welcome and may help to address this issue.

12.4.11 Repatriation and Discharge Planning

Following complex surgery, many patients can be repatriated nearer to home. However, by nature of their surgery, patient discharge and repatriations will require multidisciplinary planning.

Core to facilitating early repatriation and discharge are the following services:

Limb fitting/orthotics service, which is a specialty that currently needs a review of resources and service development in each of the Health Regions.

Discharge planning. A senior nurse at ADON level with responsibility for discharge planning or patient flow is central to the speedy transfer of patients to their own locality.

Multidisciplinary Planning. HSCP support (physio, social work and occupational therapy) are all required to expedite patient discharge and repatriation.

As mentioned previously, the National Trauma Office have developed a Model of Care for the transfer of care of trauma patients when acute management has been completed that could be adapted for vascular surgery networks (82).

12.5 THE SPOKE CENTRE

The designation and resourcing of spoke centres will be influenced by many factors. One of the major factors will be the configuration of the new Health Regions as well as the reconfiguration of emergency services and the establishment of trauma centres and units. The designation of spoke centres should be at the discretion of the new Health Regions when implemented. It will not be possible to provide a comprehensive 24/7 vascular surgery service to each trauma unit and major emergency department, so development of appropriate patient care pathways and transfer mechanisms is critical to ensure equitable access to necessary vascular services. Every hospital should have a pre-defined 24/7 mechanism for access to specialist vascular consultation, investigation and surgery to meet patient needs. Designated vascular hubs should be required to accept referral on a no-refusal basis from designated hospitals within its Health Region. Spoke hospitals must also be willing to accept repatriation.

This Model of Care recommends a comprehensive vascular service at the spoke centres. In some situations, it will mean a greatly enhanced service to Model 3 hospitals. The importance of the spoke hospital in the provision of services cannot be overstated. The retention and development of vascular surgery services at present centres to be converted to spoke centres is of paramount importance to maintain the current level of service delivery. At the outset, the designation of one hub and one spoke per Hospital Group/Health Region seems a practical and achievable objective. The vascular service at spoke centres will consist of a significant, almost daily, presence with all the elements of service provided with the exception of complex intervention; it is not just an outreach service with a 'visiting consultant' presence. Spoke hospitals should, therefore, have vascular outpatient clinics, diagnostics, consultation including multi-disciplinary teams, e.g. diabetic foot care, vascular access, and have day care theatre list for varicose veins, A-V fistula formation and amputations. The provision of this spoke hospital service is, therefore, dependent on the following essential resources:

- Consultant vascular surgeon presence
- Vascular Outpatients Clinic
- Vascular Laboratory – It is recognised that it may not be possible to have full time Vascular Laboratory staffing but, optimally, a rotation between hub and spoke could be facilitated to ensure services can be maintained at the spoke hospital
- Day Case and Short Stay Facilities
- Ambulance Service
- Diagnostic Services
- Repatriation Facility

12.5.1 Vascular Consultant Presence

It is necessary to have prompt access to a consultant vascular surgeon opinion in the spoke hospital. The deployment of vascular surgeons between the hub and spoke sites should ensure that the spoke hospital has the regular scheduled presence of a consultant vascular surgeon with scheduled outpatient and theatre sessions.

The presence of a consultant vascular surgeon is critical to facilitate urgent inpatient assessments; availability of consultant vascular opinion should be available within 48 hours,

RECOMMENDATION 4

The regular scheduled presence of a consultant vascular surgeon onsite in the spoke is critical to facilitate urgent inpatient assessments; consultant vascular opinion should be available within 48 hours and preferably within 24 hours during the working week.

RECOMMENDATION 7

Establish a vascular laboratory in every hub and spoke site.

and preferably within 24 hours during the working week. It also facilitates availability for non-vascular procedures that require the presence of a vascular surgeon. With modern day imaging, the involvement of major vasculature in disease processes is usually identified prior to surgery so that the need for vascular expertise can be identified and planned for.

For training purposes, trainees should attend both the hub and spoke sites with their supervising consultant to ensure continuity of training and service.

12.5.2 Vascular Outpatient Clinics

Clinics at the spoke centre need to be staffed and equipped as for the hub centre.

12.5.3 Vascular Laboratory

The spoke centre should have a vascular laboratory to support both inpatient and outpatient requirements. The laboratory should be close to the outpatient department to facilitate "one-stop-shop" service provision and varicose vein treatments. Staffing and equipping will depend on workload demands. The service needs to be staffed during outpatient department times and to service inpatient requirements adequately. All vascular scientists should be based at the hub centre and rotate as appropriate.

12.5.4 Day Case and Short Stay Facilities

As outlined above, the provision of comprehensive day care service is an essential part of the hub and spoke principles in keeping with the Sláintecare philosophy. Ideally, provision of vascular access for haemodialysis should be available in renal dialysis centres; however, patients from some centres may have to travel to the Parent Renal Centre for the service.

Varicose vein procedures will represent the most frequently provided surgical intervention in the spoke centres. Modern varicose vein treatments do not necessarily need theatre access and can be provided in an outpatient setting. This will need a number of rooms with duplex scanning facilities.

As detailed in the Diabetic Foot Model of Care, much of the care of diabetic foot can be carried out in the spoke centre with the exception of complex endovascular or bypass procedures, which will need transfer to the hub centre.

12.5.5 Diagnostic Services

Diagnostic Services at the spoke centre should include the availability of CT and MR angiography/venography.

12.6 HUB AND SPOKE SUMMARY

Centralisation of vascular services will improve patient care and promote efficient use of workforce and hospital resources. However, these benefits are only possible if patients have timely access to the service and treatment they need. Vascular surgery cannot be centralised or rationalised in isolation without consideration of the impact and need of other services, given the degree of interdependence between vascular surgery and other specialties. Currently, no vascular surgery unit is resourced to undertake the role of a vascular hub. The requirements for the hub are:

- Dedicated ring-fenced specialised vascular inpatient ward with an appropriate number of beds
- Adequate intensive care unit/high dependency unit capacity
- Adequate theatre capacity including hybrid theatre and access to emergency theatre
- Adequate Diagnostic and Interventional Radiology Services e.g. CT/MR angiography
- Fully equipped and staffed vascular lab
- Onsite adequate Nursing and Allied Health Professional services such as; Physiotherapy, Occupational Therapy, Social Work, Orthotics, Podiatry, Rehabilitation
- Outpatient clinics with capacity for wound management and duplex scanning
- Consensus on bypass and transfer protocols with the National Ambulance Service (in conjunction with the Trauma Report)

13.0 QUALITY ASSURANCE, AUDIT & PATIENT SAFETY

Critical to evaluating quality of patient care and safety is the development of a system of audit and key performance indicators. Clinical audit is a quality assurance tool and needs to be completed at hospital, both at regional and national level. A structured audit system can provide useful information on both the process and outcomes of care, enabling comparison with national and international standards, and can help drive quality improvement, service development and improve care and patient safety.

Current information that is available through the HIPE system can provide data on number of discharges, emergency or elective admission, type of procedure(s), length of hospital stay and discharge destination. However, the available data gives us little or no information on the quality of healthcare interventions and in order to measure this essential aspect, it is necessary to use other metrics such as Key Performance Indicators (KPIs).

KPIs are, by definition, performance indicators and as such are an essential tool for measuring quality of a service or intervention and are the keystone of quality improvement initiatives. They present visual and easy-to-digest means of analysing all elements of healthcare services, e.g. number of patients seen, timeframe, waiting lists, average length of stay, readmission rates and crucially, morbidity and mortality outcomes.

This Model of Care supports the KPIs that have been already identified in the Diabetic Foot Model of Care (11). Table 11 shows areas of additional good current clinical practice consistent with international best practice that could be utilised to establish key performance indicators.

Table 11. Key Performance Indicators for Vascular Surgery

Area	Key Performance Indicator	Achievable Standard	Minimum Standard	Data Source
Carotid Surgery	Patients with a TIA should be seen/assessed within 24 hours in a Rapid Access Centre	100%	75%	National Vascular Registry
	Surgery if indicated following a TIA or non-debilitating stroke, should be carried out within **14 days** of symptom onset.	100%	75%	National Vascular Registry
Dialysis	Percentage of patients on haemodialysis with an A-V fistula	70%	>50%	National Renal Office
	Percentage of patients who have A-V fistula creation 4 months prior to dialysis commencement	100%	75%	National Renal Office
Hub Workload targets (averaged over 3 years)	AAA procedures in a Vascular hub per year (elective and emergency)	N/A	40	National Vascular Registry
	Elective EVARs performed in a Vascular hub per year	N/A	10	National Vascular Registry
	Elective open aortic operations of any type in a vascular hub per year	N/A	13 Mortality rate of 5% or less	National Vascular Registry
	Carotid Endarterectomies per year	N/A	35	National Vascular Registry

The NHS Improvement Programme, Getting It Right First Time (GIRFT) began in 2012 and uses existing NHS and wider healthcare data in a new and innovative way. Data from multiple NHS sources is consolidated and analysed to provide a detailed national picture of a particular area of practice. This process highlights variations in care decisions, patient outcomes, costs and other factors across the NHS. The Getting it Right First Time (GIRFT) programme published a National Specialty Report on vascular surgery in 2018 which brings into sharp focus the need to improve the quality of data we collect about vascular patients and surgical activity, and the need to record data covering a greater proportion of vascular procedures. The GIRFT report showed that the number of vascular procedures recorded each year in the National Vascular Registry (NVR) was different from the number recorded in Hospital Episode Statistics (HES). Whilst the available data proved vital to the GIRFT programme and to producing their report, they acknowledged that increasing the quality of the data would enable clearer insight and thus potentially lead to further opportunities for improvement being identified.

Similarly in Ireland, whilst the Hospital Inpatient Enquiry (HIPE) system collects useful healthcare data on procedures, average length of stay data etc., it does not collect information regarding patient or procedure outcomes such as graft patency, limb salvage or median number of days from diagnosis of symptom to surgery for CEA. This data is essential to establish whether services provided compare favourably with international standards and can identify opportunities for improvement in the quality of care.

The GIRFT document demonstrates the benefits that having a vascular register could have, not only on patient mortality and morbidity, but also the financial savings opportunity of between £7.6 million and £16 million (GIRFT 2018). The Vascular Society, in its recent publication, also outlines a detailed key performance indicator section (62).

Currently, without a National Vascular Registry, there is no formal method of collecting or monitoring vascular surgery key performance indicators and without establishing a vascular register in Ireland, it will not be possible to report on these outcomes to the level of detail outlined in both the GIRFT and Vascular Society reports.

RECOMMENDATION 35

Establish a National Vascular Registry to record vascular surgery activity and implant details.

13.1 THE DEVELOPMENT OF A VASCULAR REGISTRY

To date, the majority of Irish vascular centres retain detailed records of workloads, much of which is stored on dedicated databases. However, there is no system to nationally record and store the vascular surgery data necessary to monitor KPIs such as those mentioned above. Internationally, most jurisdictions have Vascular Registries, which are independent of the National Data Collection Systems. In the United States, following the implementation of the "Patients Safety Organization in 2008" (as part of the Patient Safety and Quality Act, 2005), the Society for Vascular Surgery Patient Safety Organization was approved in 2011. Its stated mission is "to improve patient safety and the quality of vascular health care delivery by providing web-based collection, aggregation, and analysis of clinical data submitted in registry format for patients undergoing vascular treatments".

In the UK, the national vascular registry was first launched in 2013 to provide NHS units with information on their performance. In 2020, the vascular registry was expanded to record details of medical devices implanted in patients during abdominal aortic aneurysm repair, as well as long-term patient outcomes. This move is seen as a patient safety initiative, as it enables quick identification of device failures and should reduce the need for additional 'revision' surgery (88).

England and Wales NHS Trusts are contractually obliged to submit complete, accurate, index-procedure data to form the National Vascular Registry. The submission of data is not mandatory for the Scottish and Northern Ireland trusts, although they are strongly encouraged to provide this data.

The 2021 POVS document by the Vascular Society of Great Britain and Ireland (62) in their overview state that:

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

This document also recognises the lack of a registry in Ireland and strongly recommends the establishment of an equivalent national registry to the NVR for vascular procedures performed in Ireland (47).

Options of determining the best route to establish either a bespoke register or to adopt an already established international register should be explored in collaboration with the National Office of Clinical Audit (NOCA). In order for a vascular register to have credibility, it is recommended by the National Clinical Programme in Surgery (NCPS) that input of all vascular surgery patient activity and outcomes should be mandatory, subject to validation and clinical audit, and that the hospital site data management function is resourced both by staff and IT infrastructure.

14.0 TECHNOLOGY AND INNOVATION

The eHealth Strategy for Ireland was published in late 2013. The strategy creates a vision for Ireland and has been recognised internationally as a vision for a health system supported by a digital infrastructure.

14.1 E-REFERRALS

In January 2011, a National Electronic General GP Referral Pilot Project was established to achieve an electronic referral pathway between GPs and seven pilot hospitals.

The objective of the project was to put in place an electronic general referral solution that is accessible, transparent, measurable, robust, scalable and ensures its own sustainability. Using the e-referral solution, a GP can submit a referral electronically directly from their practice management system to the hospital in question using the HIQA-approved referral form and immediately receive an acknowledgement confirming receipt of same.

RECOMMENDATION 11

Establish an electronic e-referral system for all patients requiring a vascular surgery consultation including recommended criteria for referral. This should include the varicose vein pathway developed as part of this model of care.

A programme to make it possible for all acute hospitals to accept (general) referrals electronically was initiated in Q1 2015 and, as of May 2016, all hospitals are live. The service is provided by the Primary Care Directorate of the HSE and is managed by eHealth Ireland and supported by the ICGP and the Irish Pharmacy Union (HSE 2021).

Specialty specific care pathways with defined criteria for an e-referral system would enable rapid access to appropriate subspecialty clinics (e.g. leg ulcer, hyperhidrosis). The development of an e-referral form for varicose vein referrals would be beneficial for both primary care physicians and patients.

A referral form has been designed that can be used both in a paper format to pilot but developed into an e-referral once proven in principle. The form has been designed as a one-page referral form but also incorporates the appropriate referral criteria and the referral pathway. The plan will be to pilot this form and convert to e-referral with any additional amendments necessary upon completion of pilot (Appendix 1).

14.2 INNOVATION AND COMMUNICATION

Healthmail is a secure clinical email service that allows healthcare providers to send and receive clinical patient information in a secure manner. The initial implementation of Healthmail was for general practitioners (GPs) and their support staff; however, it is also now available to Community Pharmacies, Nursing Homes and Optometrists. Using Healthmail, patient identifiable clinical information can be shared with colleagues in the HSE, Voluntary Hospitals plus a number of other healthcare agencies nationally. Healthmail is configured to be easy to use and improves electronic communication for the benefit of patients and clinicians. It is recommended that this method is used for the exchange of information for vascular surgery patients.

14.3 VIRTUAL HEALTH

RECOMMENDATION 36

Vascular surgeons should utilise virtual health where appropriate but particularly for follow-up/review appointments

The COVID-19 pandemic presented a significant challenge for the delivery of health services, both in terms of the continuity of ongoing care and patient access to services. Given the emphasis placed on ensuring social distancing where possible and as part of efforts to reduce the transmission of the coronavirus to healthcare workers, solutions were developed to allow clinical consultations to take place remotely using virtual health platforms. The procedure for the management of Virtual Clinics was developed by Acute Operations in response to changes in work practices associated with the impact of COVID-19 and issued to Hospital Groups in March 2020. A National COVID-19 Telehealth Steering Committee developed operational governance guidance for implementing telehealth. They also approved various solutions and made them available during the pandemic, to support communication and collaboration across the health service. These included:

- Attend Anywhere - A web-based platform for virtual clinics offering a secure, private online waiting area for patients. It provides video and audio conferencing, screen sharing and messaging during clinical consultations.
- Microsoft Teams - Microsoft Teams offers a platform for video and audio conferencing. It allows document sharing and storage, screen sharing and messaging.

During 2020, over 657,415 virtual attendances are recorded for all specialties. For surgery specifically, 54,985 attendances were recorded with an average rate of 5% for 'did not attends'. Of the 54,985 virtual appointments, 8,493 were new patients and 46,492 were return patients.

Vascular surgeons should assess and utilise, when appropriate, virtual health consultations for patients such as for review and follow-up appointments.

15.0 HEALTH AND WELLBEING

Many patients referred to a vascular specialist do not require surgical or radiological intervention, but rather reassurance and lifestyle advice (lose weight, take regular exercise) coupled with measures to reduce their future risk of heart disease and stroke (antiplatelet and lipid-lowering therapy, blood pressure control and stopping smoking).

There are many actions that the population can take to improve their vascular health. These are outlined in Figure 15 (From Vascular Society for Great Britain and Ireland):

Figure 15. Factors to Support Vascular Health

1. Smoking Cessation
2. Exercise
3. Diet
4. Weight Control
5. Screening - high blood pressure, raised cholesterol, diabetes - these should be well controlled and are influenced by lifestyle
6. Alcohol Consumption - the recommended weekly limits should not be exceeded

15.1 SMOKING

15.1.1 Smoking and Aneurysms

According to the classification of risk factors for AAA, smoking is the most important risk factor leading to aneurysm-related hospitalisation and death (89). Substantial research has shown that both active smoking and passive smoking may lead to the occurrence of aortic aneurysms and increase the risk of death, with women being more sensitive than men (89). The occurrence of abdominal aortic aneurysms after stopping smoking is also strongly linked to a previous smoking history, but the risk of developing abdominal aortic aneurysms decreases faster in women than in men after quitting smoking (90) (91).

15.1.2 Clinical Evidence of Smoking-Associated PAD

A systematic review showed that half of peripheral artery disease (PAD) cases are due to smoking (92, 93) and compared with non-smokers, people who have ever smoked are still at higher risk of developing PAD (93). Meanwhile, passive smoking also increases the risk of vascular damage or the diagnosis of PAD (94). Smoking is one of the most important preventable factors causing PAD.

15.1.3 Smoking and Atherosclerosis

Smoking has been widely regarded as the leading risk factor for clinical cardiovascular disease that directly affects atherosclerosis (89). Active smoking and passive smoking directly correlate with the occurrence of atherosclerosis (95, 96). Strict smoking bans have reduced the number of active smokers worldwide, but non-smokers may still be exposed to environmental smoke in their homes or workplaces through passive smoke inhalation.

15.2 PHYSICAL EXERCISE, DIET AND WEIGHT CONTROL

Physical exercise and diet are important in reducing the risk for metabolic and cardiovascular diseases. A large body of evidence underlines the importance of proper diet and physical exercise in preventing oxidative stress and endothelial dysfunction, which are risk factors for cardiovascular diseases (97) (98). Sedentary behaviour and physical inactivity are among the leading modifiable risk factors worldwide for cardiovascular disease and all-cause mortality. The promotion of physical activity and exercise training leading to improved levels of cardiorespiratory fitness is needed in all age groups, race, ethnicities and sexes to prevent many chronic diseases, especially cardiovascular disease (98).

15.3 ALCOHOL AND VASCULAR DISEASE

There is much debate over the relationship between alcohol and vascular disease. Observational studies have consistently proposed cardiovascular benefits associated with light alcohol consumption (99) (100), while recent genetic analyses have suggested a possible causal link between alcohol intake and increased risk of cardiovascular disease. Genetic analyses suggest causal associations between alcohol intake and cardiovascular disease but with unequal and exponential increases in risk at greater levels of intake, which should be accounted for in health recommendations around the habitual consumption of alcohol (69) (101).

15.4 HEALTHY IRELAND FRAMEWORK 2013-2025

The Healthy Ireland Framework 2013-2025 supports the Government's response to Ireland's changing health and wellbeing profile. A healthy population is a major asset for society, and improving the health and wellbeing of the nation is a priority for the Government. Healthy Ireland is a collective response to the risks that threaten Ireland's future health and wellbeing. This new framework calls for action to improve the health and wellbeing of the population of Ireland over the coming generation.

The framework draws on existing policies but also proposes new arrangements to ensure effective cooperation and collaboration to implement evidence-based policies at Government, sectoral, community and local levels. It is about each individual sector helping to improve health and wellbeing for all.

Figure 16. The Four Goals for Healthy Ireland

RECOMMENDATION 12

Work with the agencies within the HSE/DoH to promote a healthy lifestyle awareness to include smoking cessation, diet, exercise and alcohol consumption.

This framework also outlines clear routes and strategies to achieve these goals, in which all people and all parts of society can participate.

The link to the Healthy Ireland website can be found at: **https://www.hse.ie/eng/about/who/healthwellbeing/healthy-ireland**

The vascular surgery specialty should work with agencies within in the HSE/DoH to promote a healthy lifestyle awareness around smoking cessation, diet, exercise and alcohol consumption.

16

IMPLEMENTING THE MODEL OF CARE

This Model of Care is just the starting point for enhancing the delivery of high-quality vascular surgical care. To achieve its full potential, an integrated approach to implementation will be required that is aligned with the fundamental principles laid out in Sláintecare (Figure 17). A structured implementation phase will allow us to tackle the most pressing challenges in our health systems, and improve outcomes and experiences for the greatest number of patients in the most effective manner. In addition to defining targeted areas for resourcing, the implementation phase must include engagement with patients and staff, define appropriate leadership and governance, and be supported by the use of improvement methodology underpinned by robust measurement (HSE, 2018).

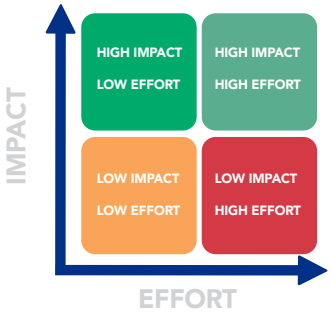
Figure 17. The Principles of Sláintecare

16.1. IMPLEMENTATION PRIORITISATON

This Model of Care outlines 36 recommendations. Using a prioritisation matrix, these recommendations have been classified and grouped into the following categories:

1. Start planning (High Impact/High Effort)
2. Do now (High Impact/Low Effort)
3. Do when possible (Low Impact/Low Effort)
4. Consider the value (Low Impact/High Effort)

Figure 18. Prioritisation Matrix



Implementation Priority

1. Start planning (High Impact/High Effort)

a. Creation of hub and spoke model

b. Scheduled presence of consultant vascular surgeon in spoke

c. Establish outreach leg ulcer clinics run by ANPs or CNSs

d. Designate National Centre's for the treatment of complex thoracic and thoraco-abdominal aneurysm disease

e. Introduction of a national AAA screening programme

f. Ensure safe practice by ensuring adequate numbers of procedures are carried out in centres, e.g. 40 AAA procedures in hub, 10 elective EVARS, 10 open aortic procedures, 35 carotid surgeries per annum averaged over three years

g. The RCSI and NDTP should work closely with the Irish Irish Vascular Society to ensure the availability of adequately trained consultants to meet the needs of the population and to provide a high quality, i.e., effective, timely and safe, service

h. Each HG/HR should undertake a workforce analysis to identify deficiencies, especially in specialist nursing. New posts need to be created and appropriate training instigated as a matter of urgency in order to provide optimum patient care as set out in this Model of Care

i. Comprehensive Geriatric Assessments should become routine for patients >65 years undergoing arterial surgery, to promote shorter lengths of stay, fewer complications and less likelihood of discharge to a higher level of dependency. Gerontology resources should be expanded to facilitate this co-management

j. Each vascular hub should be equipped with a hybrid theatre. Theatres should be risk assessed to ensure minimum radiation exposure for staff

k. A National Vascular Registry should be established

l. Enhance collaboration with local specialist prosthetic rehabilitation services/teams to establish integrated care pathways and best functional outcomes for patients undergoing amputations

m. Vascular services should work with the National Office for Trauma Services and the National Ambulance Service to establish transfer protocols for vascular emergencies and also for transfer of care of trauma patients when acute management has been completed

2. Do now (High Impact/Low Effort)

a. Establish dedicated vascular wards with appropriately trained staff in the vascular hub, with ring-fenced beds

b. Vascular surgeons using radiation should undertake an accredited Radiation Protection training course

c. Establish no-refusal referral and repatriation between hub and spokes

d. Establish vascular laboratory in both hub and spoke

e. Integrate vascular laboratories into NIMIS

f. Establish electronic referral system for vascular patients - Pilot and roll out Varicose Vein referral form

g. Establish Diabetic Foot Teams

h. Ensure patients with acute limb ischaemia are immediately referred

i. Patients with ruptured AAA deemed suitable for surgery need immediate transfer to a hub centre

j. Establish nationwide rapid access clinics for patients with a Transient Ischaemic Attack (TIA) (ideally assessed within 24 hours). These clinics should have staff and resources to investigate TIA patients in one hospital visit, i.e., a one-stop-shop with immediate access to carotid ultrasound and CT scanning

k. Via the rapid access pathway, the patient **must** have immediate access to a vascular surgery inpatient bed, with daily access to theatre and no cancellations tolerated

l. Patients for carotid endarterectomy **must** have immediate access to vascular surgery inpatient beds, with daily access to theatre, in order to comply with international guidelines, e.g. surgery for TIA within 14 days of a non-debilitating stroke

m. Develop a Fistula-First programme for the optimum provision of haemodialysis, with fistula care team, ideally within four months of dialysis, coordinated by CNS or ANP. This should be supported by vascular access lists

n. Varicose vein treatment should be carried out in an ambulatory care setting. Ideally, a see and treat service should be provided

o. Vascular surgeons should utilise virtual health where appropriate, but particularly for follow-up/review appointments

3. Do when possible (Low Impact/Low Effort)

a. Assess the need for a Physician Associate Role in Vascular Surgery

4. Consider the Value (Low Impact/High Effort)

a. Work with agencies within HSE/DoH to promote a healthy lifestyle to prevent vascular disease

GLOSSARY OF TERMS

Term	Definition
AAA	Abdominal Aortic Aneurysm
AA	Aortic Aneurysm
ABI	Ankle Brachial Index
AHP	Allied Health Professionals
ALI	Acute Limb Ischaemia
ANPs	Advanced Nurse Practitioners
A-V	Arterio-venous
AVLOS	Average Length of Stay
BSIR	British Society of Interventional Radiology
CAS	Carotid Angioplasty and Stenting
CSO	Central Statistics Office
CLI	Critical limb Ischaemia
CNSs	Clinical Nurse Specialists
CPR (for Feet)	Check, Protect, Refer (for Feet)
CRP	C-reactive protein
CST	Core Surgical Training
DFI	Diabetic Foot Infection
DFU	Diabetic Foot Ulceration
DNS	Diabetes Nurse Specialist
DOSA	Day of Surgery Admission
DSA	Digital Subtraction Angiography
DVT	Deep Vein Thrombosis
ED	Emergency Department
ESR	Erythrocyte Sedimentation Rate
ESRD	End Stage Renal Disease
EVAR	Endovascular repair of AAA
FAST	Face, Arms, Speech, Time
FEBVS	Fellowship of European Board of Vascular Surgery
FPT	Foot Protection Team
GIRFT	Getting it Right First Time
GPs	General Practitioners
HIPE	Hospital In-Patient Enquiry
HSE	Health Service Executive
HST	Higher Surgical Training
ICU	Intensive Care Unit
IMC	Irish Medical Council
INAS	Irish National Audit of Stroke
IR	Interventional Radiology
IVS	IVS Irish Vascular Society
LOS	length of stay
MDFT	Multi-Disciplinary Foot Team
MRCS	Membership of the Royal College of Surgeons
MRI	Magnetic Resonance Imaging
NCHDs	Non Consultant Hospital Doctors
NHS	National Health Service

Term	Definition
NCP	National Clinical Programme
NCPS	National Clinical Programme in Surgery
NDTP	National Doctors Training Programme
NICE	National Institute for Health and Care Excellence
NOCA	National Office of Clinical Audit
NTPF	National Treatment Purchase Fund
OPD	Out Patient Department
PA's	Physician Associates
PAD	Peripheral Arterial Disease
SpR	Specialist Registrars
SRE	Serious Reportable Event
STEMI	ST-elevation Myocardial Infarction
ST	Specialist Trainee
TAA	Thoracic Aortic Aneurysm
TEVAR	Thoracic Endovascular Repair
TIA	Transient Ischemic Attack
TILDA	The Irish Longitudinal Study on Ageing
TOS	Thoracic Outlet Syndrome
TUSS	Trauma Unit with Specialist Services
TVCNS	Tissue Viability Clinical Nurse Specialist

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APPENDIX 1

Varicose Vein Referral Form

Please see overleaf for referral guidance

Patient

First Name		Gender	
Surname		Mobile No.	
D.O.B		Email	
Address & Postcode			

Referring GP

GP Name		IMC	
GP Surname		Tel	
GP Practice		Email	
Address & Postcode			

Reason for referral to Vascular Service should fall under one of the following categories based on Clinical Judgement	✓
Bleeding Varicose Vein	
Severe pain, aching discomfort, swelling, heaviness or itching	
Lower limb skin changes e.g. pigmentation or eczema	
Superficial vein thrombosis	
A venous leg ulcer below the knee not healed within 2 weeks	
A healed venous leg ulcer	

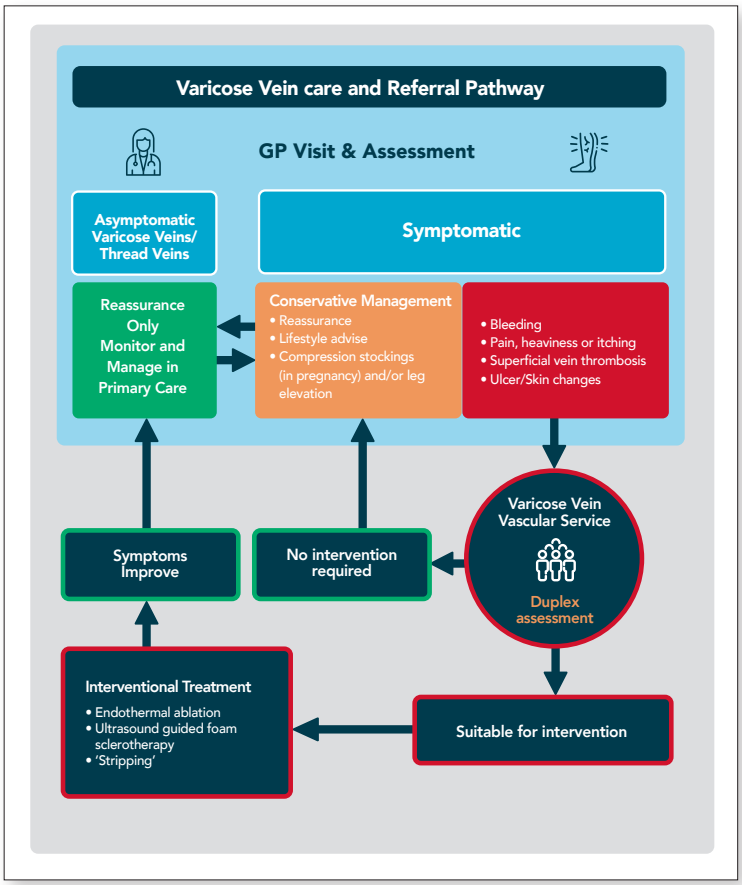
NOTE: This referral must be based on discussion with the patient that they are willing to undergo a surgical procedure should it be offered and that they understand there is no guarantee that a surgical intervention will be required following the consultation with the secondary care specialist

Relevant Medical History / Allergies

Medications

Signed GP:_____ **Referral Date:**_____

DVV 6.12.22



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