



**Comhairle na nDochtúirí Leighis  
Medical Council**

**RECOGNITION OF MEDICAL SPECIALTIES  
UNDER  
THE MEDICAL PRACTITIONERS ACT 2007  
QUESTIONNAIRE  
AND GUIDANCE FOR ASPIRANT  
SPECIALTIES**

**NAME, POSITION AND CONTACT DETAILS  
OF PERSON COMPLETING THE QUESTIONNAIRE**

**Mr Eamon G Kavanagh MD. FRCSI.  
Honorary Secretary Irish Association of Vascular Surgeons,  
Consultant Vascular Surgeon,  
Midwest Regional Hospital,  
Limerick.**

**TITLE OF PROPOSED SPECIALTY**

**Vascular Surgery**

## **EVIDENCE REQUIRED FOR RECOGNITION OF SPECIALTY**

An application for the recognition of a medical specialty will be assessed against the indicators set out in I-IV below. The completed questionnaire should be a maximum of 20 pages long. Please address each subsection individually.

The term "assessor(s)" means any person or group of people, whether Council members or otherwise, mandated by Council to evaluate an application.

### **I: That the proposed specialty is a well-defined, distinct and legitimate area of medical practice with a sustainable base in the medical profession**

**Please describe (using examples) how the proposed specialty:**

**I (a)** is sufficiently distinct from other specialties, based on substantiated and major new concepts in medical science and health care delivery such that it is not feasible to include it within the current specialty structure;

**Vascular surgery in Ireland could be said to have come of age with the publication of the "Report of the Joint Committee on Vascular Surgery Services" in April 2000 by Comhairle na nOspideal and The Department of Health and Children<sup>1</sup>. This report outlined the nature of vascular surgery, and briefly detailed the evidence for superior vascular surgery outcomes when performed by surgeons with specialised training in vascular surgical techniques, thus justifying the need for a national vascular surgery service. Since that report, the last decade has seen major developments in vascular surgery including the successful regionalisation of service delivery. Advancements in minimally invasive techniques including endovascular repair of aortic aneurysms has resulted in significant changes in how vascular patients are managed such that general surgeons without a vascular specialty interest have ceased to perform most vascular operations. Furthermore, the technological developments have dictated that subspecialty training is required at a much earlier stage than was necessary before.**

**A 1998 IAVS discussion document put considerable emphasis on two important changes taking place at that time which would influence the delivery of vascular surgery services; firstly, the evolving concept of a specialist vascular surgeon and, secondly, the changing nature of surgical training. The Comhairle Na nOspideal and Department of Health and Children "Report on The Provision of Vascular Surgery Services" in 2000 was ahead of its time in recognizing the right of every Irish citizen to elective and emergency vascular surgical care and in so doing, in all but name, recognised vascular surgery as a specialty. Furthermore, the Department of Health and Children sanctioned the creation of several new posts for consultant general surgeons with an interest in vascular surgery. Eight years later the Vascular Surgery Society of Great Britain and Ireland, at its 2008 Annual General Meeting in Bournemouth, elected to change vascular surgery from a subspecialty of general surgery to a mono-specialty.**

**I (b)** represents a new well-defined and widely accepted field of medical practice (e.g. as demonstrated by a comprehensive and developing body of international research and scholarly literature to support evidence-based clinical practice; significant representation within academic medicine; number of meetings held annually; the existence of a national and / or international society with a principal interest in the proposed specialty; formal recognition as a medical specialty (or other relevant category) in comparable countries;

Vascular surgery is a well defined specialty in all developed countries with a large number of international societies and meetings, for example European Society of Vascular and Endovascular Surgery, Vascular Society of Great Britain and Ireland, Society for Vascular Surgery, Australian and New Zealand Society of Vascular Surgery. International Society for Vascular Specialists, International Society of Endovascular Specialists, Society for Vascular Medicine and Biology, Society for Vascular Medicine, World Federation of Vascular Societies.

International meetings include the annual scientific meetings of all the above named societies and also Veith Symposium, Charing Cross Symposium, Northwestern Vascular Symposium, American Venous Forum.

Irish vascular surgeons have excellent representation at all of the international meetings and societies, we are represented as counsellors in ESVES and as representatives on UEMS who recognise vascular surgery as a separate specialty. Irish surgeons have been involved in developing the examination leading to the award of Fellow of European Board of Vascular Surgery (FEBVS), this is currently the 'exit' examination used in many European countries to award specialist certification to vascular surgeons.

Irish vascular surgeons have been among the leading academic surgeons for several decades, including: Professor Patrick Fitzgerald (UCD), Professor William Hederman (UCD), Professor Michael Brady (UCC), Professor David Bouchier-Hayes (RCSI), Professor Gregor Shanik (TCD), Professor Cathal Kelly (RCSI), Professor Pierce Grace (UL), Professor Sean Tierney (RCSI).

Peer-reviewed journals include European Journal of Vascular and Endovascular Surgery (ESVES), Journal of Endovascular Therapy, Journal of Vascular Surgery, Annals of Vascular Surgery, Phlebology, Journal of Thoracic and Cardiovascular Surgery, Cardiovascular Surgery.

I (c) has a demonstrable and sustainable base in the medical profession (e.g. as demonstrated by a sufficient number of practitioners with the capacity to meet existing clinical need, who possess the knowledge and skills to practise in the specialty, and who practice predominantly in the specialty);

During the last ten years, vascular services have developed to a large extent along the lines defined in The Report of the Joint Committee on Vascular Surgery Services published in 2000<sup>1</sup>. This report recommended the organisation and further development of six major regional vascular centres each providing for populations in excess of 350,000, with some centres catering for populations of between 700,000 and 900,000.

Some centres are based on two sites. The six regional centres are:-

-Regional Vascular Centre – Beaumont /Mater Hospitals: 6 surgeons (general & vascular)

-Regional Vascular Centre – St. James's/Tallaght Hospitals: 7 surgeons (vascular only, no general surgery)

-Regional Vascular Centre – St. Vincent's/Waterford Regional Hospitals: 6 surgeons (1 vascular only, 5 general & vascular)

-Regional Vascular Centre – Cork University/Mercy University Hospitals: 4 surgeons (general & vascular)

**-Regional Vascular Centre – University College Hospital Galway: 3 surgeons (1 vascular only, 2 general & vascular)**

**-Regional Vascular Centre – Midwestern Regional Hospital, Limerick: 4 surgeons (general & vascular)**

**I (d)** can sustain activities such as vocational training and assessment and continuing professional development.

*Please note: Information regarding current numbers practicing; the rate of increase over the past decade; and projections of the future need for specialist-level skills and knowledge in this area of medicine is required.*

**There are currently 30 vascular surgeons working in full-time public practice in Ireland, this compares to 18 in 2000. It is anticipated that all new vascular surgery appointees will be specialist surgeons. There are two training elements to consider, undergraduate and postgraduate. Each medical school has vascular surgery units attached to it and vascular conditions and their surgery is a central component of the surgical curriculum. It is estimated that the consultant vascular surgeon replacement requirement will be one per year. It is proposed that four of six specialist training years are spent in dedicated vascular surgery units therefore only four vascular higher surgical trainees will be in training at any one time. All consultant vascular surgeons working in Ireland without exception are currently involved in continuing professional development and all attend international courses and meetings on an annual basis. The high involvement of Irish vascular surgeons in British & Irish, European and American societies as well as the fact that most surgeons have spent at least one year training in units in North America, Europe or Australia will ensure that the current high standard of training and professional development will continue into the future.**

**II: That specialisation in this area of medicine is demonstrably contributing to substantial improvements in the quality and safety of healthcare**

**Please describe (using examples):**

**II (a)** Whether the proposed specialty has improved the quality of healthcare in Ireland (by increased effectiveness of health care as defined by improved health outcomes; increased appropriateness of health care as defined by providing care relevant to patients' needs and based on established standards; increased safety of care and / or significant reduction of harm experienced as a result of receiving healthcare);

**Recent IAVS national audits of carotid surgery (2009) and aortic aneurysm repair (2010) carried out following rationalisation of vascular units provide evidence of quality healthcare delivery by specialist units.**

**II (b)** That specialisation is not and will not adversely affect the quality of healthcare in Ireland by promoting the *unnecessary* fragmentation of medical knowledge and skills and / or medical care, including that it should be broadly available nationally; the *unnecessary* deskilling of other medical practitioners (e.g. GPs and other primary health care providers); inequitable access to health care as defined by socioeconomic status, geography or culture;

**Specialisation will have little effect on vascular surgery services, as vascular surgeons in Ireland already uniquely provide a comprehensive elective and emergency service. It will however have significant implications for the provision of general surgical on-call services and to a lesser extent the elective general surgery service. In all but two of the present vascular centres, vascular surgeons provide an elective and emergency general surgery service. RCSI has asked that in the event of vascular surgery separating from general surgery, that vascular surgeons should be involved in finding solutions to the problems posed to general on-call rotas.**

**II (c)** That where the specialist medical services are already provided or could be provided by practitioners in a recognised specialty or a combination of recognised specialty groupings, provision of these services by this new specialty enhances the quality and/or efficiency of healthcare.

**Results in many different countries have been shown to be superior when provided by vascular specialists. Over the last decade vascular rotas have been developed as well as specialty clinics. Improvement in endovascular surgery has resulted in reduced usage of intensive care bed days and shorter overall length of stay.**

**III: That specialisation in this area of medicine is demonstrably contributing to substantial improvements in the standards of medical practice**

**Please describe whether / how:**

**III (a)** There is a professional body that is responsible for setting the requirements and standards for training, assessment and certification in the specialty; that is capable of defining, promoting, maintaining and improving standards of medical practice to ensure high quality health care, and capable of engaging stakeholders, including health consumers, in setting standards; that has guidelines and procedures for determining who will be Fellows/Members of the body; that has appropriate processes for determining the standard of education, training and experience of medical practitioners trained in the discipline overseas;

**The current model of intercollegiate board certification of trainees is likely to end with the impending separation of vascular surgery from general surgery in UK. There is a well established European model of training and certification which Irish vascular surgeons have helped develop through membership and representation on UEMS Council. Under this model, Irish vascular surgical trainees would be certified as Fellows of European Board of Vascular Surgery and awarded a certificate of completion of training. The specialty of Vascular Surgery would remain governed by RCSI and adhere to standards as set out by RCSI and IAVS/ESVS.**

**III (b)** The specific body of knowledge and skills is sufficiently complex or extensive to require a comprehensive and distinct training programme;

**The first endovascular aneurysm repair was performed less than twenty years ago yet the technique has now become widely accepted as standard of care in anatomically suitable patients (level 1 evidence). Such a rapidly developing field of expertise requires ongoing focused and dedicated training. Furthermore the level of skills required to perform endovascular surgery requires earlier exposure to these techniques which can only be provided in a dedicated vascular unit by specialist vascular surgeons as is the model in all the endovascular centres of excellence worldwide.**

**III (c)** There is or will be a programme of education, training and assessment that will enable practitioners to:

- undertake unsupervised, comprehensive, safe and high quality medical practice in the relevant specialty, including in the general roles and competencies that apply to all professional medical practice;

**The 5/6 year SpR programme will provide specialist training in vascular surgery and ensure development of professional standards as outlined by RCSI/Medical council.**

- demonstrate the requisite knowledge, skills and professional attributes through exposure to a broad range of clinical experience and training in the relevant specialty;

**Each trainee will undergo training in general and endovascular techniques including a subspecialty fellowship.**

- contribute to providing high standards of medical education;

**Teaching will be an integral part of vascular training, an outline of the proposed training programme is included in the attached IAVS document.**

- provide leadership in the complex health care environment, working collaboratively with patients and their families and a range of health professionals and administrators;

**An IAVS member and UEMS counsellor, Mr. Paul Burke has led the reconfiguration of surgical services in the Midwestern Region 2009-2011.**

- demonstrate a knowledge and understanding of the issues associated with the delivery of safe, high quality and cost-effective health care within the Irish health system.

**Vascular procedures are among the most audited in all of surgery, IAVS has demonstrated the importance of safety and quality by conducting national audits of carotid endarterectomy and abdominal aneurysm repair.**

**III (d)** There is or will be a programme of continuing professional development that assists participants to maintain and develop knowledge, skills and attitudes essential for meeting the changing needs of patients and the health care delivery system, and for responding to scientific developments in medicine

**IAVS members are active in RCSI and international societies, are involved in research and audit as well as reconfiguration of service delivery in Ireland.**

**III (e)** The professional body can demonstrate experience in all or some of the following:

- health policy development
- health promotion and advocacy
- research activity and facilitation
- the development and dissemination of the discipline's evidence base
- the education of other medical and health professionals
- engagement with health consumers.

**The 'Report of the Joint Committee on Vascular Surgery Services' by Comhairle na nOspideal and the Department of Health in April 2000 drew heavily on a submission in March 1998 by the Irish Association of Vascular Surgeons (IAVS) entitled "The Provision of Vascular Surgery Services in the Republic of Ireland"<sup>2</sup>. In this document, the IAVS detailed the remit of vascular surgery and the requirements for the provision of a nationwide service.**

**There was particular emphasis in the document on the following areas-**

- 1 The spectrum of disease treated by vascular surgery and ongoing changes taking place in vascular surgery requirements due to the ageing population and changing disease patterns**
- 2 The technological advances taking place and their predicted impact on the operative or surgical aspects of the service,**
- 3 Changes taking place in the actual delivery of all aspects of the service consequent upon the emergence of vascular surgery as a specialty**
- 4 The impact on service delivery by radical changes being implemented in surgical training at that time.**

**Many changes foreseen in the 1998 IAVS document have taken place in the past 10 years. Furthermore there are ongoing changes taking place within healthcare delivery and it is anticipated that there will be further rationalization of other elements of hospital health care delivery consequent to the complete reorganisation of surgical oncology services. It is with all these changes in mind that the Irish Association of Vascular Surgeons has drawn up a second discussion document on the provision of vascular surgery services in the Republic of Ireland (see appendix).**

**An example of how IAVS can help shape health policy is the role that they are playing in advocating for a national aneurysm screening programme. There is level 1 international evidence that screening for abdominal aortic aneurysms is cost effective and could save twice as many lives as breast cancer screening. The IAVS recommends the development of a programme similar to the National Abdominal Aortic Screening Programme (NAASP) introduced by the Department of Health in England and Wales in 2008.**

**The RCSI Charter Day Meeting in Feb 2011 includes a mini symposium entitled 'Vascular Surgery's Future in Ireland' which will include four vascular surgery speakers.**

**IV: That recognition of the specialty would be a wise use of resources**

**Please demonstrate:**

**IV (a)** That recognition of the proposed specialty is of significance to health as defined

by a significant burden of disease, incidence, prevalence or impact on the community which is relevant to the proposed specialty;

**Vascular surgeons look after patients with a wide range of problems including aneurysmal disease of the aorta and its branches, peripheral arterial disease, carotid artery disease and stroke, vascular access surgery for haemodialysis, venous disease and leg ulceration, vascular trauma, lymphoedema.**

**IV (b)** That this significance is *coupled with* a demonstrated capacity of members of the proposed specialty to influence it;

**Vascular conditions are referred by general practitioners and other specialists including general surgeons to vascular surgeons at specialist clinics, this pattern of referral has developed over the past 20 years.**

**IV (c)** That there is significant professional and consumer support for the recognition of the medical specialty;

**The 'Report of the Joint Committee on Vascular Surgery Services' published by Comhairle na nOspideal & Department of Health and Children in April 2000 was far-sighted and set out a programme whereby every citizen would have access to specialist vascular surgery treatment, both elective and emergency. More recently the President of the Royal College of Surgeons in Ireland has written a letter of support for this application.**

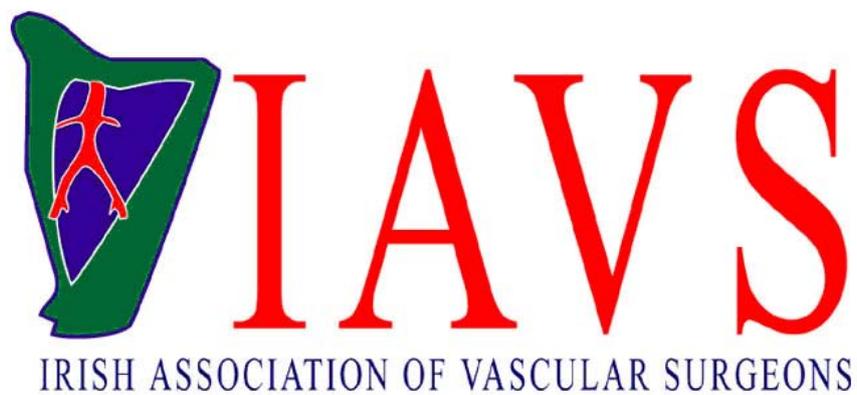
**IV (d)** That the resource implications for health care providers and consumers are justified on the basis of benefit to the community inherent in the recognition of the specialty.

**Patients with vascular conditions are best looked after by vascular specialists who in turn can achieve better results through exclusively looking after vascular conditions. Vascular surgery needs further developments that will ultimately benefit the community, for example the establishment of a national aneurysm screening programme and comparative audit between specialist units in order to improve quality of service and outcomes.**

**A DISCUSSION DOCUMENT ON  
THE PROVISION  
OF  
VASCULAR SURGERY SERVICES  
IN THE REPUBLIC OF IRELAND**

**2010**

**Prepared on behalf of the Irish Association of  
Vascular Surgeons**



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## Introduction

Vascular surgery in Ireland could be said to have come of age with the publication of the “Report of the Joint Committee on Vascular Surgery Services” in April 2000 by Comhairle na nOspideal and The Department of Health and Children<sup>1</sup>. This report outlined the nature of vascular surgery, and briefly detailed the evidence for superior vascular surgery outcomes when performed by surgeons with specialised training in vascular surgical techniques, thus justifying the need for a national vascular surgery service.

The report effectively acknowledged the necessity for every citizen to have access to both elective and emergency vascular surgery services. It then went on to outline the requirements for the implementation of a programme to facilitate the provision of this service. The mainstay of this requirement was the designation of six centres nationally with the appointment of dedicated specialist consultant vascular surgeons to these centres. It has to be said that within a short time the majority of these posts were advertised and filled by specialist vascular consultant surgeons. There were some exceptions and for various unexplained reasons there is still only one consultant vascular surgeon in post in the southeast region at Waterford Regional Hospital.

The report by Comhairle na nOspideal and the Department of Health drew heavily on a submission in March 1998 by the Irish Association of Vascular Surgeons (IAVS) entitled “The Provision of Vascular Surgery Services in the Republic of Ireland”<sup>2</sup>. In this document, the IAVS detailed the remit of vascular surgery and the requirements for the provision of a nationwide service.

There was particular emphasis in the document on the following areas-

- 1 The spectrum of disease treated by vascular surgery and ongoing changes taking place in vascular surgery requirements due to the ageing population and changing disease patterns
- 2 The technological advances taking place and their predicted impact on the operative or surgical aspects of the service,
- 3 Changes taking place in the actual delivery of all aspects of the service consequent upon the emergence of vascular surgery as a specialty
- 4 The impact on service delivery by radical changes being implemented in surgical training at that time.

The IAVS document focused on provision of services to the year 2005. Many changes foreseen in the 1998 IAVS document have taken place in the past 10 years. Furthermore there are ongoing changes taking place within healthcare delivery and it is anticipated that there will be further rationalization of other elements of hospital health care delivery consequent to the complete reorganisation of surgical oncology services under the direction of Professor Tom Keane. It is with all these changes in mind that the Irish Association of Vascular Surgeons has drawn up this second discussion document on the provision of vascular surgery services in the Republic of Ireland.

## **The Role of the Vascular Surgeon**

It is the remit of the Vascular Surgeon to provide holistic care of patients with arterial, venous and lymphatic disease. It can be conveniently broken into the following categories:

1. Aneurysmal Disease of the aorta and its branches
2. Peripheral Arterial Disease
3. Carotid Artery Disease
4. Vascular Access Surgery for haemodialysis
5. Venous Disease and leg ulceration
6. Vascular Trauma
7. Lymphoedema

# 1. Aneurysmal disease of the Aorta

**1.1** An aneurysm is an abnormal dilatation of an artery. It affects the abdominal aorta (AAA) most commonly and is relatively asymptomatic until it ruptures, resulting in catastrophic internal haemorrhage. Survival from ruptured abdominal aortic aneurysm with best available treatment has been reported to be as low as 15%. Accurate data are not available for Ireland, but ruptured AAA is responsible for 1.5% of all deaths in England and Wales. It is evident that all attempts should be made to repair aneurysms before rupture i.e. as an elective planned procedure with expected survival rates in the order of 95%<sup>3-5</sup>. Ruptured AAA's cause 1.3% of all deaths among males between the ages of 65 to 85 years<sup>6</sup>. One third of untreated AAA's rupture, with an associated mortality to 70%<sup>7</sup>. In contrast, elective repair of AAAs has a reported mean thirty day mortality of two to six per cent<sup>7</sup>. The risk of rupture of AAA is directly related to the maximum diameter of the aneurysm. Risk of rupture of aneurysms < 5cm in diameter is extremely low so that surgery is not justified. However aneurysms of >5.5 cms are at a significant risk of rupture and all aneurysms at 6 cm or greater should be surgically treated provided the patient is fit for surgery.

**1.2** The past fifty years have been marked by continuing progress in diagnosis and management, timing of intervention and optimization of surgical outcome in the treatment of AAAs. Since the first report of Open Abdominal Aneurysm repair by Dubost<sup>8</sup>, elective repair of abdominal aortic aneurysms has steadily increased. Statistics from the United Kingdom showed a doubling in the number of repairs from the year 1990 to 1995<sup>9</sup>. Endovascular aneurysm repair (EVAR), first reported by Parodi<sup>10</sup> and Volodos<sup>11</sup> in 1991, has over the last decade gained acceptance to the extent that it is now widely regarded as the standard care. EVAR is carried out via small groin incisions and involves deployment of a modular stent graft under fluoroscopic guidance. This technique is associated with shorter operative time, fewer complications and a shorter hospital stay<sup>12</sup>. A number of trials have shown a reduced mortality and 30 day morbidity for EVAR when compared to open repair<sup>13,14</sup>. The use of EVAR in older patients is still controversial, but vascular units are likely to continue using the technique in the older and higher risk patient<sup>15</sup>, who would be considered unsuitable for conventional repair.. Much debate has centered around the cost effectiveness of this treatment method but notwithstanding the higher costs of disposables, EVAR has been shown to be cost effective when compared to open repair<sup>16-21</sup>.

**1.3** The threshold for operating on aneurysms continues to be debated, but trials such as the UK Small Aneurysm trial have clearly demonstrated that there was no long-term survival benefit from early elective open repair of small abdominal aortic aneurysms measured between 4.5 – 5.5 cms<sup>22-24</sup>. Even after successful aneurysm repair, the mortality among these patients was higher than in the general population. They recommended that ultrasonographic surveillance was safe for aneurysms in this category. Researchers have found that the risk of rupture was independently and significantly increased with female gender.<sup>25</sup> This has led to a suggestion that the threshold for surgery should be lower in women.<sup>26</sup>

**1.4** Results of endovascular repair of the ruptured aneurysm have been very encouraging and EVAR has the potential to significantly improve survival following repair<sup>27-34</sup>.

**1.5** Thoracic aneurysmal disease has been a largely neglected field due to the associated high morbidity and mortality associated with open surgery. Endovascular techniques have allowed treatment of these often very complex patients with acceptable results. Delivery of optimal services in this field can be achieved by developing high volume in one or at most two centres linked to cardiothoracic surgical services.

## **1.6 Screening Program**

**1.6(i)** In 2008 the Department of Health in England and Wales initiated a National Abdominal Aortic Screening Programme (NAASP)<sup>35</sup>. The evidence presented below confirms that the incidence of AAA in 65 to 75 year old men is similar in Ireland to that of Britain and the U.S.A. Furthermore, a national screening programme would not only save lives, but would be cost effective<sup>36</sup>, with a single normal ultrasonographic scan at age 65 ruling out significant aneurysm disease for life in men<sup>37</sup>. AAA screening by ultrasound fulfils all WHO criteria for screening, and is non-invasive, using duplex ultrasound for diagnosis<sup>38</sup>. A recent pilot study in Connolly Hospital has confirmed that the incidence of AAA in 65 to 75 year old men in Ireland is 4.2 per cent<sup>38</sup>. This suggests that the recent recommendation for the introduction of a national screening programme in Britain in 65 to 75 year old men should be imitated in Ireland<sup>35</sup>.

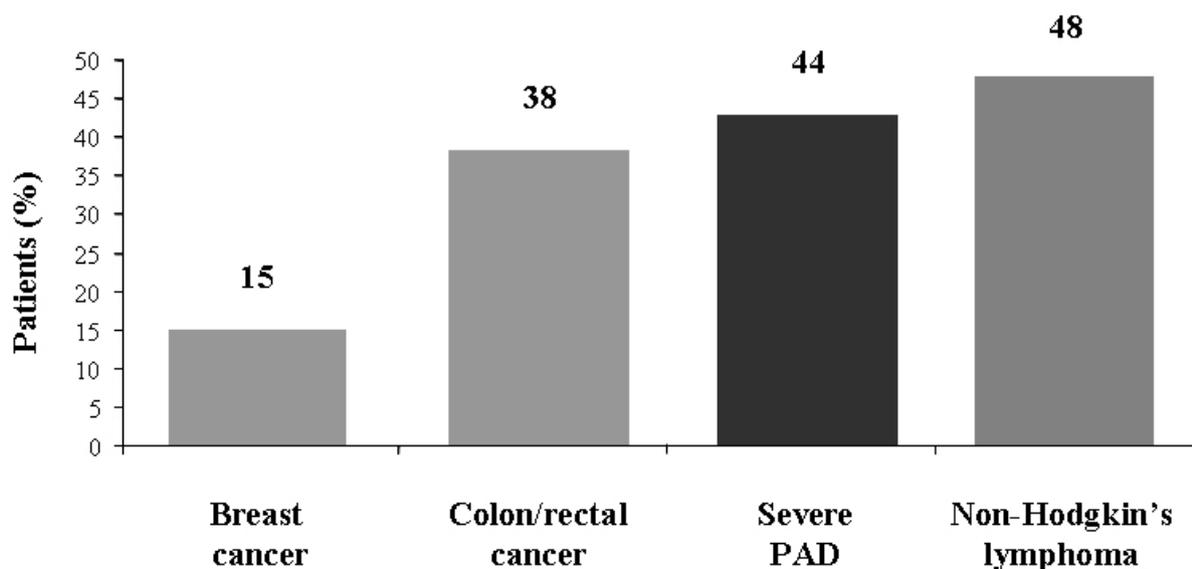
**1.6(ii)** Population screening in Ireland would also make economic sense. The cost effectiveness of screening for AAA was assessed by the MASS trial, which found that the mean additional cost of the screening programme was £ 63.39 per patient, with the cost effective ratio amounting to £36,000 per quality adjusted life year, falling to £8,000 per life year gained after ten years, with 710 patients being screened to prevent one death<sup>36</sup>. The pilot study in an English population confirms that there was a 42 per cent reduction in the risk of rupture, based on a low cost screening programme involving technicians visiting primary care centres<sup>36</sup>. The IAVS adds its voice to the international call for ultrasound screening of men aged 65 to 75 years, which is not only effective in reducing deaths but also is cost effective. Screening for AAAs could save twice as many lives as breast cancer screening, while costing a fraction of the price<sup>39</sup>. Screening programmes would be organised through the regional vascular centres

## 2. Peripheral Arterial Disease (PAD) – Atherosclerosis

**2.1** Atherosclerosis is well recognised and known as the disease which causes narrowing (stenosis) of the coronary arteries leading to angina and myocardial infarction (heart attack). This disease can however affect all the arteries of the body. The peripheral arteries most commonly affected are those to the lower limbs where the condition presents as leg pain on walking (Intermittent claudication). However, the most devastating outcome of non-cardiac atherosclerosis is stroke which frequently occurs as a result of carotid artery disease (See Carotid Artery Disease). Other arteries can be affected causing problems in the upper limbs or in the abdomen but their treatment comprises a very small percentage of the surgical workload.

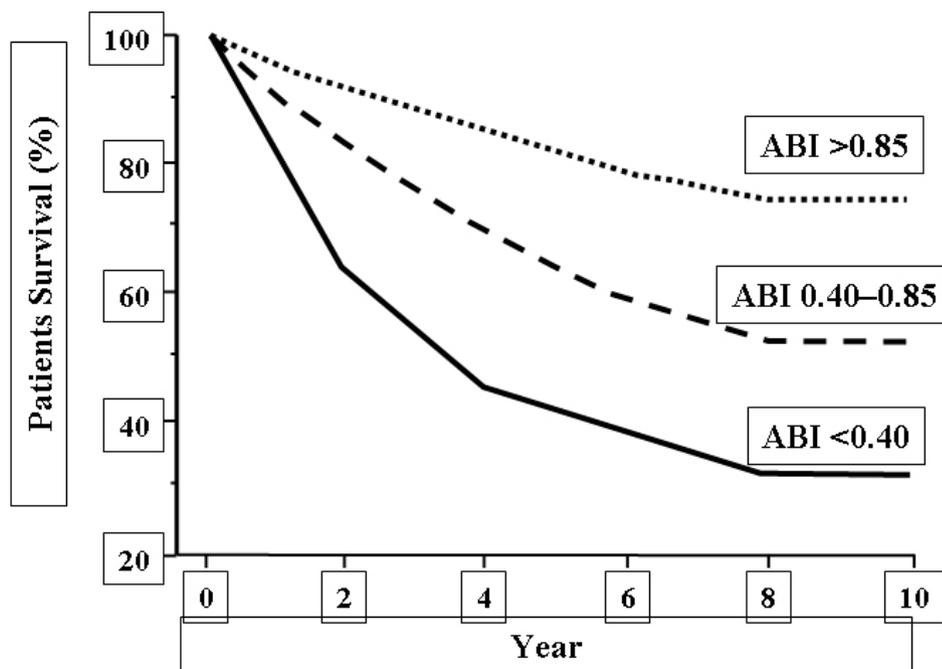
**2.1** PAD is often undiagnosed. For every 100 patients who present with intermittent claudication, 100 more patients exist with symptoms but do not present to their physician and a further 100 have asymptomatic disease. Only around 25% of those who present with PAD will have deterioration of their condition. However, after 5 years, only 50% will be alive without having had a cardiovascular event.

**2.3** The fact that the risk of death associated with peripheral arterial disease (PAD) is as high as for many common cancers<sup>40</sup> is not widely publicised. A sizeable US study showed that patients with severe PAD (ABI < 0.4) had a 5-year survival probability of only 56%<sup>41</sup>. This is comparable to the 52% survival in white patients with non-Hodgkin's lymphoma, as recorded from 1986–1993 by Ries *et al*<sup>42</sup> ( See figure below).



Legend: 5 year mortality of severe PAD compared with common malignancies

**2.4** Ankle –Brachial indices compare the blood pressure of the lower and upper limbs. There is a clear link between Ankle –Brachial indices and survival<sup>41</sup>. The diagram below illustrates that an ABI of 0.49 (severe disease) is associated with a 30% survival compared to an 80% survival with an ABI of > 0.85 (mild disease) at 10 years. Severe arterial disease i.e low ABI, adversely affects survival. ( See figure below)



*Legend: Survival curves of patients with mild, moderate and severe PAD*

**2.5** The 1998 document went into considerable detail discussing intermittent claudication, the most common manifestation of PAD. This is leg pain caused by walking and relieved by rest, and its prevalence is approximately 5% of the male population over 55 years of age<sup>43</sup>, occurring more commonly in men and increasing with age. 14.4% of men > 65 years of age have intermittent claudication<sup>44,45</sup>. It was argued that intermittent claudication need not and should not be treated surgically, as life and limb are not at risk. However, it can seriously affect the quality of life as can other non life –threatening conditions such as arthritis of the knee and hip, inguinal hernia or hiatus hernia, conditions for which surgery is the accepted treatment. The proven intervention was a bypass procedure using the patient’s own vein or synthetic material as graft, a procedure which was offered to a tiny minority of patients as the operation carried a mortality rate of 2-4%.

**2.6** It was envisaged that with the development of endovascular techniques, angioplasty would acquire a role in the treatment of intermittent claudication and indeed, today many patients receive endovascular treatment. The results of angioplasty with or without stenting are poor when compared to vein graft in particular. Nevertheless the risk/benefit ratio frequently favors intervention, as the morbidity is low due to; avoidance of general anaesthesia, no wound, infrequent complications and a very short hospital stay post intervention<sup>46,47</sup>.

## **2.7. Critical Ischaemia of the Lower Limb**

**2.7(i)** The natural history of lower limb atherosclerosis is progression with increasing limitation of walking distance until ultimately there is pain in the leg at rest. The condition reaches this stage in only about 10% of claudicants. This condition is called rest pain or critical limb ischaemia in which the viability of the leg is at risk. The European Consensus Document defines critical ischaemia as the presence of rest pain, ulceration or gangrene in association with certain objective measurements of circulation to the toes<sup>48</sup>. Due to the increasing age of the population there is a dramatic increase in the number of patients presenting with critical limb ischaemia with an estimated incidence ranging from 400 - 1,000 per million population per year<sup>49,50</sup>. There has been little change in the incidence, surgical treatment and outcomes in the past 10 years. Unfortunately lower limb loss is still a frequent occurrence. Although most vascular surgery of the lower limbs is an attempt to avoid amputation, regrettably large numbers of major limb amputations are still carried out annually. Up to 10% of patients presenting with critical ischaemia are treated initially with amputation without any attempt at limb salvage surgery, which would be inappropriate in certain cases. After initially successful procedures, up to 30% more of the patients will ultimately succumb to amputation. In England the rate of lower limb amputation has remained relatively static since 1995<sup>51</sup>.

**2.7(ii)** The 1998 document envisaged a reduction in amputation rate as a result of expected improved outcomes with the use of endovascular techniques, especially thrombolysis. Unfortunately this thrombus dissolving therapy has not proven as successful in lower limb ischaemia as it has done in cardiac ischaemia (heart attack) and now appears to be in brain ischaemia (stroke). As pointed out above, angioplasty is now a proven and accepted therapy for mild to moderate lower limb disease. Unfortunately its use in severe disease (critical ischaemia) remains less satisfactory and bypass surgery remains the best option for long term results<sup>52</sup>.

**2.7(iii)** Coronary artery disease is still one of the leading causes of mortality in Ireland but there has been a dramatic reduction (50%) in mortality rates from this condition over the past two decades. While improvement in awareness, diagnosis and treatment contributed to this decrease, it is also true that our improved understanding and management of the causative factors such as lifestyle, high serum cholesterol levels, etc., is also a significant factor. As atherosclerosis or occlusive arterial disease is a systemic disease, it was therefore, hoped that there would be a parallel decrease in peripheral manifestations of the disease, with a drop in need for surgical interventions and reduced amputation rates. To date this is not apparent and is a cause for concern. There is little doubt that the explanation for this rests with the dramatic rise in incidence of diabetes mellitus.

## **2.8. Diabetes Mellitus and Peripheral Vascular Disease**

**2.8(i)** Diabetes Mellitus (DM) has long been recognised as a major risk factor for PAD. In the Framingham Study with a 16 year follow-up, the age-adjusted risk ratio for the development of intermittent claudication (commonest symptom of PAD) was five fold higher in diabetic men than in controls and three fold higher in diabetic women<sup>53</sup>. Unfortunately DM is a significant and growing global epidemic. A significant growth in the world wide prevalence of DM has occurred since 1995. Diabetes prevalence in 2003 was estimated to be 194 million, or 5.1% of adults aged 20-79 years. This prevalence is expected to rise dramatically to 6.3% by 2025<sup>54</sup>. Social factors such as ageing population, urbanization, sedentary lifestyles and increasing obesity are predicted to accelerate this increase in DM prevalence<sup>55</sup>. Prevalence data for DM in Ireland is limited, however conservative estimates suggest a prevalence of 3.9% for diagnosed DM and 6% for diagnosed and undiagnosed diabetes Mellitus<sup>56</sup>.

**2.8(ii)** The PAD observed in patients with DM is typically more distal in distribution and often more extensive. Fifteen percent of people with DM develop a foot ulcer during their lifetime and 14-24% of those with a foot ulcer will require amputation<sup>57</sup>. Patients with DM have a 10-15 fold greater risk for amputation than those without DM<sup>58</sup>. The proportion of diabetics amongst patients with critical limb ischaemia is increasing worldwide and in Finland is now 44-46%, where there is an excellent vascular registry<sup>59</sup>. When DM and severe PAD co-exist, vascular surgery often on multiple levels is required for foot ulcer healing and limb salvage i.e. prevention of amputation.

**2.8(ii)** Arterial lesions in diabetic patients are most often infragenicular (below knee) and infragenicular bypass reconstruction has been shown to be effective in achieving wound healing and limb salvage. These procedures are very time consuming and usually associated with hospital stay of 30+days. Treatment of these lesions using endovascular techniques is still under investigation. Although controlled outcome data to support its use are scarce, it is believed there will be a role for this evolving treatment modality. It has been shown that with a multidisciplinary diabetic team involving Vascular Surgeons, Diabetologists, Advanced Nurse Practitioners, Podiatrists and Orthotists, amputation rates and in-patient lengths of stay can be reduced<sup>60</sup>.

## **3 Carotid Artery Disease**

**3.1** Stroke is the 3rd leading cause of death in Ireland<sup>61</sup>. It is estimated that 20% of ischaemic strokes are due to emboli related to high grade carotid artery stenosis with a smaller contribution from carotid artery occlusion. As there is considerable debate/confusion regarding the role of surgery in the treatment of carotid artery disease we deal in some detail with these issues in the following section.

### **3.2 Symptomatic carotid stenosis**

There is good level 1 evidence for the role of prophylactic carotid endarterectomy in the prevention of stroke in symptomatic patients with >70% stenosis<sup>62,63</sup>. The ECST (European) and NASCET (North American) trials were multicentre RCT's both run during the late 1980s and early 1990s. Reduced to their simplest form the results show that for patients with severe symptomatic carotid disease, surgical therapy confers a significant advantage over medical therapy.

**3.3** Pooled analyses from endarterectomy trials have shown that early surgery is associated with increased benefits compared with delayed surgery<sup>64</sup>. The benefit from surgery was greatest in men, patients <75 years of age, and those randomised within 2 weeks after their last ischaemic event and fell rapidly with increasing delay.

### **3.4 Asymptomatic carotid stenosis**

There is also level 1 evidence for the role of carotid endarterectomy in asymptomatic patients although the expected benefit is smaller and therefore should only be considered in low risk patients with good life expectancy. The US ACAS study<sup>65</sup> reported in 1995 that carotid endarterectomy was better than medical therapy for asymptomatic lesions >60% and the ACST trial results also suggested that CEA is better than medical Rx for asymptomatic disease<sup>66</sup>.

### **3.5 Role of carotid angioplasty / stenting**

Carotid angioplasty and stenting (CAS) is attractive to both patient and surgeon, performed under local anaesthesia with no neck wound, less BP disturbance and faster recovery and discharge from hospital. Several observational studies have shown that carotid angioplasty and stenting can be performed with reasonable results in individual centres<sup>67</sup>. The role of carotid angioplasty and stenting in symptomatic and asymptomatic disease is yet to be determined. A minority of vascular centres in Ireland perform this procedure at present. The international consensus still favors open surgery for symptomatic disease.

### **3.6 Regional variation in treatment of carotid disease in Ireland**

The Association of British Neurologists estimated (1992) the incidence of symptomatic carotid artery stenosis to be 43/100,000 per year<sup>68</sup>. Although estimates vary widely, it has been suggested that up to 16/100,000 of the population per year may benefit from CEA in terms of stroke prevention. The true prevalence of asymptomatic, high-grade internal carotid artery stenosis remains unknown, but the figure may be as high as 800/100,000. Recent studies have documented geographical inequality in the provision of CEA in Scotland and the Republic of Ireland. A more recent study compared carotid surgery practice between all health regions for the years 1996-1998 and 2001-2003 and showed that despite expansion in the number of vascular surgeons, carotid surgery is still underutilised as an effective method of stroke prevention in the Irish population<sup>69</sup>.

### **3.7 Summary of recommendations from ESVS, SVS and ENS**

In 2008 the European Society for Vascular Surgery, the Society for Vascular Surgery and the European Neurological Society published guidelines for the management of carotid disease. These organisations are the leading North American and European professional bodies representing the views of physicians and surgeons dealing with strokes and carotid disease. It is important to note that while published independently there was remarkable concurrence in their guidelines.

#### **Symptomatic Carotid Artery Disease**

- Available level 1 evidence indicates that surgery is the best option for symptomatic disease
- Operative treatment indicated for symptomatic patients >70% stenosis and probably with >50% stenosis.
- Carotid endarterectomy contraindicated for symptomatic patients with <50% stenosis.
- Surgery should be performed within 2 weeks of last symptoms.
- Perioperative stroke/death rate should be <6%.

#### **Asymptomatic carotid disease**

- Surgery can be recommended for men under 75 years of age with 70-99% stenosis.
- Benefit of surgery for women significantly less and should only be considered in younger, fitter patients.
- Perioperative stroke/death risk should be <3%.

## **Carotid artery stenting (CAS)**

- CAS is indicated in cases of contralateral laryngeal nerve palsy, previous radical neck surgery, cervical irradiation, symptomatic restenosis following carotid endarterectomy, with high bifurcation or intracranial extension of a carotid lesion provided that the risk of stroke and death is higher than normally accepted for surgical intervention.
- CAS should be offered to symptomatic patients if they are at high risk for endarterectomy, in high volume centres with documented low rates of stroke/death or inside a randomised controlled trials.
- At present CAS should only be offered to patients in high volume centres with documented low rates of stroke/death or inside a randomised controlled trials.
- CAS is associated with higher risk of embolisation in octogenarians.

### **3.8 IAVS Quality Recommendations**

- a. The establishment of a National Carotid Artery Operative Registry to capture data on all carotid interventions performed by vascular surgeons, cardiologists and radiologists.
- b. Provide an independent comparative audit of results from individual units to ensure quality control.
- c. The provision of adequate duplex scanning facilities in order to ensure rapid access to diagnosis of high grade carotid stenosis in patients with recent TIA and stable ischaemic stroke. Duplex scan results should be audited in individual units to ensure uniformity of assessment of degree of stenosis and quality controlled wherever necessary by measurements using other modalities such as MR or CT angiography.

## **4 Vascular Access Surgery for Haemodialysis**

**4.1** Renal (kidney) disease is a common health problem in Ireland. The most prominent manifestation of advanced kidney dysfunction is End Stage Kidney Disease (ESKD) requiring renal replacement therapy (RRT) including long-term haemodialysis (HD) or renal transplantation. The ‘Renal Diseases in Ireland-A Strategic Review’ Report of 2006 states “The single factor that will have the biggest impact on the long-term survival, length of stay in hospital and well being of HD patients is the early skilled provision of native vascular access (Arterio-venous (AV) fistula) for HD”. Creation of A-V fistulas is part of the vascular surgery workload.

**4.2** Kidney transplantation has not kept pace with the rise in prevalent dialysis patients. As the population ages we can anticipate an increasing number of ESKD patients. There are currently over 175,000 haemodialysis treatments delivered per year in Ireland. The National Renal Strategy Review Group anticipates a doubling of HD patient numbers by 2012 and increasing to 150% by 2014.

**4.3** At present, in Ireland, less than 60% of prevalent HD patients have a functioning AV fistula compared to a European median of more than 80%<sup>70</sup>. The National Renal Strategy Group reports that this is largely due to difficulty accessing vascular surgery services.

**4.4** The Group have estimated that there is a requirement for 135 access procedures per 100 new HD patients and 30 per 100 prevalent HD patients which would result in 200 to 250 procedures per year for each HSE (2006) area.

## **5 Vascular Trauma**

- 5.1** The nature of vascular trauma is understandably dependant on the environment one works in. Fortunately for the majority of practicing vascular surgeons the number of cases presenting for treatment is relatively small. The management of these often complex patients with multiple injuries poses a significant challenge and requires treatment within a multi-disciplinary team.
- 5.2** The actual number of patients presenting to departments is quite varied and published reports suggest that they range from 4-10 cases per annum in Europe<sup>71-75</sup> with a higher number in the United States<sup>76,77</sup>.
- 5.3** The number of percutaneous interventions has seen an increase as reported on in a large series from the United States<sup>78</sup>.
- 5.4** Institutions with A&E departments and those with interventional facilities must have rapid access to Specialist Vascular Surgical expertise

## 6

# Venous Disease and Leg Ulceration

**6.1** Lower limb venous disease causes socioeconomic and health problems. Most of the adult populations in developed countries are affected by the condition known as varicose veins, and in the UK, the treatment and complications of varicose veins consume approximately 2% of total NHS spending. Approximately 40% of people between the ages of 18 and 64 have significant lower limb varices and approximately 80% have some form of venous disease. The problem tends to affect women in a ratio of 3:1 and is often related to pregnancy and childbirth. There appears to be a hereditary factor, in that varicose vein are often seen in families.

**6.2** Varicose Veins rarely present as acute life threatening conditions and are given a low priority both clinically and in terms of research funds. However they have a significant impact on the quality of life. Varicose Veins can be classified as complicated or uncomplicated. Uncomplicated varicose veins are undoubtedly associated with a variety of symptoms and also cause distress aesthetically. There appears to be little relationship between the severity of symptoms and the clinical severity of the varicose veins. A number of studies show that surgery is associated with significant improvement in quality of life.

**6.3** The risk of developing complications as a result of varicose veins is difficult to estimate with any degree of accuracy, but it is probably less than 1% per year. Some patients may develop isolated segments of thrombophlebitis which is a sterile inflammation of the vein wall associated with thrombosis in the vein. This is a painful though not life threatening condition. Occasionally the condition is extensive and may be associated with DVT and may require surgical intervention

**6.4** Varicose veins have traditionally been managed by surgery either for symptoms or complications. Other modalities of treatment include sclerotherapy in appropriate patients or support hosiery. Overall results are good and there are additional developments in the area of endovenous work which may be of benefit, but have not yet been subjected to randomised controlled trials.

**6.5** There are also several other types of significant, though less common, venous disease processes which also involve the vascular surgeon but are significantly less prevalent than varicose vein disease. Many of these problems relate to venous thrombotic disease and congenital abnormalities. While these are relatively uncommon, they require a high degree of expertise and interaction between the vascular surgeon and interventional radiologist.

## **6.6** Venous Ulceration

The most significant complications relate to the development of lower leg skin damage and venous ulceration in association with chronic venous insufficiency. This latter condition may affect between 1 and 2% of the population over the age of 60 years, and it has been estimated that an unhealed ulcer costs between €3000 and €5000 per annum. The condition poses a major workload both in the community and in specialised hospital clinics. Discrimination between the different kinds of leg ulceration is essential for appropriate treatment.

## **7 Lymphoedema**

**7.1** Lymphoedema is the progressive swelling of a limb which occurs as a result of accumulation of fluid due to failure of the drainage mechanism known as the lymphatic system. In the body, blood is transported from the heart via the arteries, and is carried back from the peripheral tissues via the veins. However these are not leak proof vessels and there is some spillage of lymph which is a water-like fluid from these vessels which is returned to the circulation via lymphatic channels. Inadequate development or blockage of lymph vessels gives rise to the accumulation of lymphatic fluid within the limbs giving rise to lymphoedema.

**7.2** Various classifications of the disease have been developed depending on whether it is primary or secondary and also the actual nature of the disease. Lymphoedema normally seen by vascular surgeons affects the lower limbs and presents as an insidious progression of swelling. Other forms of swelling may be related to previous surgery or malignancy. There is a wide spectrum of lymphoedema and in most cases, it tends to be mild, and is treated conservatively. Surgical treatments are reserved for the very worst examples of the condition or those that do not respond to conservative measures.

**7.3** One of the main modalities of treatment is manual lymphatic drainage which is a service provided by specialist physiotherapists. Unfortunately there is a severe shortage of such trained personnel in Ireland and this issue needs to be addressed urgently. The IAVS is of the view that there should be one centre that deals with the complex cases of lymphoedema.

## **8                      Developments in Vascular Surgery**

**8.1**     The 1998 IAVS discussion document put considerable emphasis on two important changes taking place at that time which would influence the delivery of vascular surgery services; firstly, the evolving concept of a specialist vascular surgeon and, secondly, the changing nature of surgical training. The Comhairle Na nOspideal and Department of Health and Children “Report on The Provision of Vascular Surgery Services” in 2000 was ahead of its time in recognizing the right of every Irish citizen to elective and emergency vascular surgical care and in so doing, in all but name, recognized vascular surgery as a specialty. Furthermore, the Department of Health and Children sanctioned the creation of several new posts for consultant general surgeons with an interest in vascular surgery. Eight years later the Vascular Surgery Society of Great Britain and Ireland, at its 2008 Annual General Meeting in Bournemouth, elected to change vascular surgery from a subspecialty of general surgery to a mono-specialty.

**8.2**     It is anticipated that all new vascular surgery appointees will be specialist surgeons. Due to the Department’s foresight, this will have little effect on vascular surgery services, as vascular surgeons in this country already provide a comprehensive elective and emergency service. It will however have significant implications for the provision of general surgical on-call services and to a lesser extent the elective general surgery service. In all but two of the present vascular centres, the vascular surgeons provide an elective and emergency general surgery service.

## **9 Training in Vascular Surgery**

**9.1** Over the last ten years surgical training has been considerably streamlined, and further changes are envisaged, particularly within the general surgical sub-specialties in which vascular surgery is included.

**9.2** The advantages of maintaining links to the current basic and higher surgical training schemes are the continued assessment of trainees at different stages, and the maintenance of a competitive element to progression. Inclusion of general surgery as part of the programme for higher surgical trainees in vascular surgery is controversial but does have the advantage of advancing their skills and also allows changes in career paths at a later stage if required. Entrance to vascular surgery at a HST level may, in many instances, be the first significant exposure to the specialty for many trainees. Candidates will be selected for specialty training at the end of HST Year 2 by competitive interview.

**9.3** It would be important that advancement from HST to consultant post should not simply be a matter of progression but should continue to be competitive. Therefore the number of trainees progressing through vascular HST would exceed the number of consultant posts available. If the current complement of vascular surgeons in this country is maintained or increased slightly, it would be envisaged that there would be one consultant vacancy per annum through the natural retirement process.

**9.4** Outlined below is the proposed training plan for a young doctor who wishes to develop a career in vascular surgery.

<b>Year 1</b>	<b>Pre-Registration Year</b>
<b>Year 2</b>	<b>Basic Surgical Training – Year 1</b>
<b>Year 3</b>	<b>Basic Surgical Training – Year 2</b>
<b>Year 4</b>	<b>Gap Year / Research</b>
<b>Year 5</b>	<b>Higher Surgical Training- Year 1 (General Surgery)</b>
<b>Year 6</b>	<b>Higher Surgical Training- Year 2 (General Surgery)</b>
<b>Year 7</b>	<b>Higher Surgical Training- Year 3 (Vascular Surgery)</b>
<b>Year 8</b>	<b>Higher Surgical Training- Year 4 (Vascular Surgery)</b>
<b>Year 9</b>	<b>Higher Surgical Training- Year 5 (Vascular Surgery)</b>
<b>Year 10</b>	<b>Higher Surgical Training- Year 6 (Vascular Surgery)</b>
<b>Year 11</b>	<b>Fellowship abroad in Vascular Surgery</b>

## **10. The Current Provision of Vascular Services in Ireland**

**10.1** During the last ten years, vascular services have developed to a large extent along the lines defined in The Report of the Joint Committee on Vascular Surgery Services published in 2000<sup>1</sup>. This report recommended the organisation and further development of six major regional vascular centres each providing for populations in excess of 350,000, with some centres catering for populations of between 700,000 and 900,000.

**10.2** Some centres are based on two sites. The six regional centres are:-

- Regional Vascular Centre – Beaumont /Mater Hospitals
- Regional Vascular Centre – St. James’s/Tallaght Hospitals
- Regional Vascular Centre – St. Vincent’s/Waterford Regional Hospitals
- Regional Vascular Centre – Cork University/Mercy University Hospitals
- Regional Vascular Centre – University College Hospital Galway
- Regional Vascular Centre – Midwestern Regional Hospital, Limerick

Each centre will now be looked at in a little more detail.

### **10.3 Regional Vascular Centre - Beaumont/Mater Hospitals.**

There are three consultant Vascular & General Surgeons in each hospital providing a one in six vascular emergency rota at weekend for the population of North Dublin City, Fingal County, North Kildare (population 455,000), Former North Eastern Health Board (population 305,000) and Former north Western Health Board (210,000). In total, this regional vascular centre is responsible for a population of between 900,000 and one million. Beaumont is a Teaching Hospital for RCSI Medical School and the Mater is teaching Hospital for UCD Medical School.

#### **10.4 Regional Vascular Centre – St. James’s/Tallaght Hospitals.**

There are four Consultant “pure” Vascular Surgeons in St. James’s hospital and three in Tallaght Hospital who do not provide any emergency general surgery services. These seven surgeons provide a vascular service for the population of the Former South Western Area Health Board (515,000) and the Former Midland Health Board Area (205,000), i.e. a total population of an excess of 720,000. Both hospitals are Teaching Hospitals for the Medical School at Trinity College Dublin.

#### **10.5 Regional Vascular Centre - St. Vincent’s University Hospital/Waterford Regional Hospital.**

In St. Vincent’s there is one “pure” Vascular Surgeon and two Vascular and General Surgeons who practice general surgery in St. Michael’s Hospital and St. Columcille’s Hospital. St. Vincent’s provides a vascular service for the Former East Coast Area Health Authority covering a population of over 325,000 in South East Dublin, Dun Laoghaire, and East Wicklow. St. Vincent’s is a Teaching Hospital for UCD Medical School. Waterford Regional Hospital is the Regional Vascular centre for the South Eastern Region and is responsible for a population in excess of 460,000 in the counties Carlow, Kilkenny, South Tipperary, Wexford and Waterford. There are two Vascular and General Surgeons in Waterford supported by a locum Vascular/ General Surgeon with a third permanent approved post to be filled imminently. Waterford Regional Hospital is a Teaching Hospital of RCSI Medical School.

#### **10.6 Regional Vascular Centre: Cork University Hospital / Mercy University Hospital**

There are two Consultant Vascular & General Surgeons in the Mercy University Hospital and two Consultant Vascular & General Surgeons in Cork University Hospital. These four Vascular & General Surgeons provide a 1 in 4 emergency vascular rota covering a population in the region of 600,000. Both the Mercy University Hospital and Cork University Hospital are teaching hospitals for the UCC Medical School.

#### **10.7 Regional Vascular Centre: University College Hospital Galway**

There is one wholetime Consultant Vascular Surgeon, supported by two Consultant Vascular/ General Surgeons. The elective vascular surgery is performed by the three Consultants. This centre Caters for a population well in excess of 450,000. University College Hospital is a teaching hospital for UCG Medical School.

#### **10.8 Regional Vascular Centre: Midwestern Regional Hospital, Limerick**

There are four Vascular & General Surgeons who provide a 1in 4 emergency Vascular rota as well as a 1 in 12 General surgical rota for a population in excess of 361,000. Midwestern Regional Hospital is a teaching hospital for the University of Limerick and University College Cor

## **11 Provision of Vascular Services in the Future**

The objective should be to deliver optimum vascular surgical care at a location which is convenient to the patient. This is more complex than it first appears and is not a matter of simply locating the service at a number of convenient locations throughout the country. Here we discuss the more important issues which we believe need to be considered before deciding the vascular surgery service delivery sites.

### **11.1 Convenient to the patient.**

Hospital convenience is important for patients who require vascular surgery services as it is for all other patients but, more importantly, there is also a frequent need for urgent emergency care where rapid access to surgical treatment is needed to save life or limb. This applies in particular to sudden loss of blood supply to a limb as a result of trauma or, more commonly, blockage of an artery by a thrombus. Irreversible damage can occur after as little as five hours, but as a rule, little damage results if the blood supply is restored within eight hours. While this may seem a long time it must be remembered that within this timeframe the patient (relatives) must respond to the situation quickly and attend the family practitioner or accident and emergency department where medical personnel must appreciate the urgency of the situation. Accurate data is not available regarding the incidence of this scenario, but we believe very few limbs are lost in the acute situation. The second clinical situation which warrants rapid access is the ruptured abdominal aortic aneurysm. In recent years it has become apparent that in the majority of patients with a ruptured aneurysm the bleeding temporarily stops and the patient stabilizes, providing a window of opportunity to transfer the patient. Outcomes for patients transferred long distances for treatment are as good as for those who live within easy access of the surgical centre. Nevertheless the patient should be transferred as rapidly as possible.

### **11.2 Service Inter-dependence**

With increasing specialisation comes increasing reliance on other services, both surgical and medical. Here we outline the important specialty areas which work in close association with vascular surgery.

### **11.3 Endocrinology**

As outlined, foot problems (vascular/septic) are the most common indication for hospital admission for patients with diabetes mellitus and as 40% of patients requiring lower limb vascular intervention have diabetes mellitus, it seems rational to have both services on the same site. However, because of the incidence of diabetes mellitus, the ideal unit catchment population for diabetes mellitus is much smaller than that for vascular surgery so that not every hospital with a diabetes service will have a vascular surgery service. It may be possible, within the large population areas, to rationalise services so that these two services are concentrated in one hospital.

### **11.4 Cardiology.**

There is a similar interdependence between the vascular and cardiology services, but with a greater reliance on cardiology by vascular surgery than vice versa. As previously outlined vascular disease is a total body disorder and cardiac disease is virtually omnipresent in patients requiring vascular surgery. Therefore cardiac assessment and treatment is required frequently prior to and often following vascular interventions. The cardiology need for vascular surgery assistance is less frequent but usually more urgent. Arterial access complications occur in less than one percent of patients undergoing cardiac interventions but because of the large number of procedures undertaken, large cardiac catheter labs call on vascular surgeons once every 2-3 weeks. There are an estimated 5 million cardiac diagnostic/therapeutic procedures annually in the United States which result in approximately 75,000 vascular surgical procedures to repair injured arteries, a rate of 0.67%. As with endocrinology, every acute hospital will have a cardiology service, although not all will have a catheter laboratory. Ideally hospitals with cardiology catheter laboratories will also have a vascular surgery service. Where the ideal is not possible it is preferable to have a cardiology service with catheter laboratory on the vascular surgery site.

### **11.5 Neurology**

As discussed earlier carotid artery surgery has an important role in stroke prevention. It is now clear that maximum benefit is dependant on rapid access to surgery following a minor stroke/transient ischaemic attack (TIA). Patients who might benefit from carotid artery surgery present to every family practitioner and accident and emergency department where recognition of the condition with rapid referral is imperative. Best practice involves a rapid access TIA clinic, as described earlier, and weekly multidisciplinary meetings involving neurologists, stroke physicians and vascular laboratory technicians. Ideally all these services should be on site. It is possible to provide a service with a consultative service with frequent regular sessional consultant commitments but as evident from above the availability of an on-demand service only is not compatible with best practice.

### **11.6 Nephrology.**

Patients with renal failure are also at risk for peripheral vascular disease and need vascular surgery services. However they much more frequently require provision of vascular access to facilitate haemodialysis. This is best provided by creation of an arterio-venous fistula. This procedure is an elective or planned procedure for which patients can be referred to a different hospital if no vascular surgery service is available on site. Ideally however, vascular access should be provided within a regional setting.

### **11.7 Trauma / Orthopaedics.**

Arterial injury as a result of blunt or sharp trauma is relatively uncommon. Control is usually achieved in the accident and emergency department, after which the patient can be transferred to the nearest vascular centre. Infrequently arterial injury occurs in association with long bone and pelvic fractures. In the event of limb ischaemia rapid restoration of blood supply is paramount and this requires experienced orthopaedic and vascular surgeons working in tandem. Ideally large trauma centres should have a vascular surgery service. Our experience suggest that it is not a frequent occurrence in that a big unit may need an urgent vascular opinion about once a month

## **12** Ideal Catchment Population

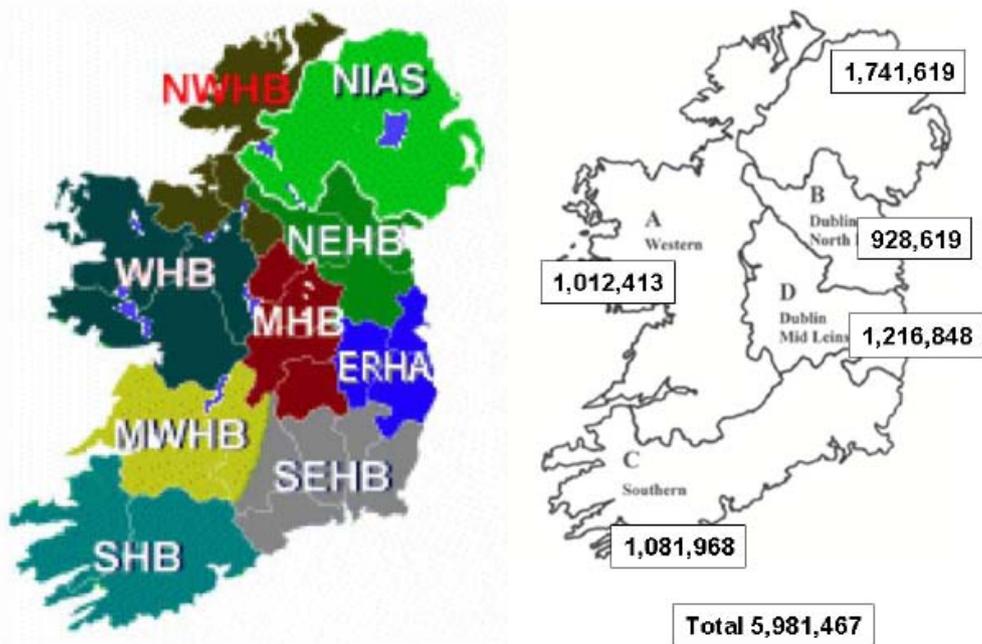
It is generally agreed that to achieve the ideal hospital size is an impossible goal. However it is reasonable to discuss what might be considered an ideal catchment population for the specialty of vascular surgery. Firstly the service must be capable of delivering optimum vascular surgery care to the population. This requires that the workforce have enough work to maintain skill levels. Where an uncommon procedure or condition exists within the specialty it should be possible to have the expertise concentrated among one or two surgeons. Estimates of the optimum surgeon: population ratio varies. This is partly due to the traditional practice where the vast majority of vascular surgeons also provided an elective and emergency general surgery service. The IAVS submission to Comhairle na nOspideal of 1998 recommended one surgeon per 150,000 population. Each vascular centre will provide an emergency service and this should be no more onerous than 1:4, and ideally 1:6. Using these figures as guidelines a vascular centre should cater for the needs of between 600,000 and 1,200,000 people.

## **13** Training.

**13.1** There are two training elements to consider, undergraduate and postgraduate. Ideally medical students should have access to as many clinical conditions as possible, although this is not always the case, e.g., not all medical schools have neurosurgery or cardiothoracic surgery units. While it is desirable to have vascular surgery units attached to each medical school it is not felt to be essential. The final consideration is the training of surgeons for the future. As discussed earlier it is estimated that the consultant vascular surgeon replacement requirement will be one per year. As it is proposed that four of the specialist training years are spent in dedicated vascular surgery units only four vascular higher surgical trainees will be in training at any one time. Due to the greatly shortened training period for surgeons and the implementation of the EWTD trainees need to work/train in a unit with a high throughput of both elective and emergency work.

## **14.** Consultant Manpower and Centre Requirements

**14.1** At the last census (2006) the population of the Republic of Ireland was recorded to be almost 4.3 million.. There is widespread acceptance (81,82) that as the average age of the patient population increases and as we move to a more consultant provided service that there will be increased requirements for the services of vascular surgeons. An adequate number of vascular surgeons must be available to provide a comprehensive service. Further appointments will depend on identifying regions that are currently inadequately supported and upon any reorganisation of services that may occur. This can only be determined when the HSE regions have been defined.



**14.2** The current structure of four HSE Administrative Areas has a population of approximately one million each. Therefore each region needs a vascular service with 7 vascular surgeons to provide an elective and emergency service for the population that it serves. Lower density populations in more remote regions may be best served by a vascular centre based on two sites as a clinical network<sup>80</sup>, where expertise, resources and duty rosters are shared, whereas, conurbations with high density populations can best be served by a vascular centre on one site.

**14.3** There are two models for the provision of specialist services, namely centralised or networked. The decision as to which is the best option will be based on the considerations discussed above. The decision may also be influenced by the rigidity with which the HSE implement referral patterns within the regions. The following illustrates the advantages and disadvantages of centralisation.

#### **14.4 Advantages of centralisation**

- More economical: Provision of costly equipment at one vs. two or three centres
- Allowance of sub-specialty specialisation within vascular surgery
- All patient data on one site, easy access to files
- Improved training with higher throughput and greater exposure to all aspects of the specialty for trainees. Allows for outreach clinics in remote areas

#### **14.5 Disadvantages of centralisation**

- Reversal of HSE Policy on Regional Self Sufficiency for common conditions such as vascular disease since the current Regional Vascular Centres would be reduced requiring the transfer of Permanent Staff to the enlarged single centre in the respective regions, with particular reference to the HSE West and HSE South Regions.
- Possible Loss of on-site vascular expertise for renal, trauma, endocrine and cardiac services.

#### **14.6 Advantages of a Network Service**

- Local provision of elective and emergency service
- On-site consultation service supporting renal, cardiology and care of the elderly services.

#### **14.7 Disadvantages of a Network Service**

- More expensive, duplication of technology and staff
- Cross-cover with other centre/s, surgeon or patient travel/transfer
- Potential difficulty with in-house vascular problems.

**14.8** Some regions (with high density populations) may be best served by centralised services and others (with low density populations) by networks.

## **15 Requirements for a Vascular Center**

- 15.1** A Vascular Centre must have between 3 - 7 full time Vascular Surgeons
- 15.2** Adequate patient beds (In Scotland 36 beds for a population of 600,000 has been suggested)
- 15.3** Protected Intensive Care / High Dependency Unit beds
- 15.4** Each surgeon should have access to at least one and a half days of operating sessions
- 15.5 CT and MRI**
- 15.5** Suitable facilities for Endovascular interventions
- 15.6** Access to Limb fitting and rehabilitation facilities for amputees
- 15.7** Non-invasive laboratory

**Staff:** Two technologists minimum under the direction of the Vascular Surgeons

**Equipment:** Hand-held Doppler  
Photoplethysmography and chart recorder  
Treadmill or stressor  
Colour-coded ultrasound machine x2

## **15.8 Audit**

It is essential that all Vascular units be part of an ongoing audit network. This would ideally be held once a month where representatives from all centres would attend with their junior staff. Ongoing audit is necessary to ensure that clinical practice is carried out to the highest standards possible and will allow the IAVS to play a leading role in this matter.

## **15.9 Database**

The fact that Irish Vascular Surgery has no robust mechanism to quantify our workload is unsatisfactory. Any surgeon involved in Vascular Surgery must be obliged to submit data to a National database. This database must be a web enabled product that will allow every centre in the country to enter data on an ongoing basis. Resources (Data Managers) must be made available at local level to facilitate data entry. The IAVS will endeavour to produce a yearly report that will allow an in-depth analysis of the workload of centres caring for vascular patients. This will not only provide the vascular community a tool for ongoing audit but also be an invaluable source for clinical research. Furthermore data will be used to identify trends of vascular disease and allow an accurate means of planning for the future care of vascular patients.

## Summary

- The 'Report of the Joint Committee on Vascular Surgery Services' published by Comhairle na nOspideal & Department of Health and Children in April 2000 was far-sighted and set out a programme whereby every citizen would have access to specialist vascular surgery treatment, both elective and emergency.
- Increasing specialisation and radical changes in surgical training has led to the recognition that vascular surgery must become independent of general surgery as evidenced by the decision in 2008 by the Vascular Surgery Society of Great Britain and Ireland to change to a mono-specialty, independent of general surgery.
- Vascular surgery has evolved at an accelerated rate in the last ten years, largely along the lines predicted in 'The Provision of Vascular Surgery Services in the Republic of Ireland' prepared by the Irish Association of Vascular Surgeons.
- The use of endovascular techniques has increased dramatically especially in the treatment of aortic aneurysm and peripheral vascular disease, but remains unproven in the treatment of carotid artery disease except in a small minority of patients.
- Screening for abdominal aortic aneurysm has been shown to be cost effective and could save twice as many lives as breast cancer screening. The IAVS recommends the development of a programme similar to the National Abdominal Aortic Screening Programme (NAASP) introduced by the Department of Health in England and Wales in 2008.
- People with diabetes mellitus constitute up to 40% of patients requiring peripheral artery disease treatment. The incidence of diabetes in western society is increasing dramatically with an increase in prevalence in excess of 20% predicted in the next 15 years.
- At present in the Republic of Ireland vascular surgery services are provided by ten hospitals arranged as seven centres by the Comhairle report of 2000, each with its own designated catchment area.
- As a result of changes in work practice and ongoing changes underway and envisaged in other areas of hospital health care delivery it is now opportune to review the provision of vascular surgery services.
- We have discussed some of the important issues which need to be considered when planning the provision of vascular surgery services for the foreseeable future. As all the

indications point to an increasing demand at a time of reduced resources the task of rationalisation is more urgent and more problematic.

#### Reference List

1. Report of the Joint Committee on Vascular Surgery Services: Comhairle Na nOspideal & Department of Health & Children. 2000.  
Ref Type: Report
2. Irish Association of Vascular Surgeons. The provision of vascular surgery services in the Republic of Ireland. 1998. Dublin, Ireland.  
Ref Type: Report
3. Ingoldby CJ, Wujanto R, Mitchell JE. Impact of vascular surgery on community mortality from ruptured aortic aneurysms. *Br J Surg* 1986; **73**: 551-3.
4. Johansson G, Swedenborg J. Ruptured abdominal aortic aneurysms: a study of incidence and mortality. *Br J Surg* 1986; **73**: 101-3.
5. Dent A, Kent S, Young T. Ruptured abdominal aortic aneurysm: What is the true mortality. *Br J Surg* 1986; **73**: 118.
6. Sakalihan N, Limet R, Defawe OD. Abdominal aortic aneurysm. *Lancet* 2005; **365**: 1577-89.
7. Collins CG, Leahy AL. Screening of abdominal aortic aneurysms. *Surgeon* 2006; **4**: 83-5.
8. DUBOST C, ALLARY M, OECONOMOS N. Resection of an aneurysm of the abdominal aorta: reestablishment of the continuity by a preserved human arterial graft, with result after five months. *AMA Arch Surg* 1952; **64**: 405-8.
9. Department of health Hospital Episode Statistics - 1989 - 1996. 1997. Department of Health.  
Ref Type: Report
10. Parodi JC, Palmaz JC, Barone HD. Transfemoral intraluminal graft implantation for abdominal aortic aneurysms. *Ann Vasc Surg* 1991; **5**: 491-9.
11. Volodos NL et al. Clinical experience of the use of self-fixing synthetic prostheses for remote endoprosthetics of the thoracic and the abdominal aorta and iliac arteries through the femoral artery and as intraoperative endoprosthesis for aorta reconstruction. *Vasa Suppl* 1991; **33**: 93-5.
12. Jordan WD, Alcocer F, Wirthlin DJ, Westfall AO, Whitley D. Abdominal aortic aneurysms in "high-risk" surgical patients: comparison of open and endovascular repair. *Ann Surg* 2003; **237**: 623-9.
13. Endovascular aneurysm repair versus open repair in patients with abdominal aortic aneurysm (EVAR trial 1): randomised controlled trial. *Lancet* 2005; **365**: 2179-86.
14. Prinssen M et al. A randomized trial comparing conventional and endovascular repair of abdominal aortic aneurysms. *N Engl J Med* 2004; **351**: 1607-18.
15. Schermerhorn ML et al. Life expectancy after endovascular versus open abdominal aortic aneurysm repair: results of a decision analysis model on the basis of data from EUROSTAR. *J Vasc Surg* 2002; **36**: 1112-20.

16. Holzenbein J et al. Endovascular AAA treatment: expensive prestige or economic alternative? *Eur J Vasc Endovasc Surg* 1997; **14**: 265-72.
17. Tarride JE et al. Cost-effectiveness analysis of elective endovascular repair compared with open surgical repair of abdominal aortic aneurysms for patients at a high surgical risk: A 1-year patient-level analysis conducted in Ontario, Canada. *J Vasc Surg* 2008.
18. Kapma MR et al. Emergency abdominal aortic aneurysm repair with a preferential endovascular strategy: mortality and cost-effectiveness analysis. *J Endovasc Ther* 2007; **14**: 777-84.
19. Patel ST, Haser PB, Bush HL, Jr., Kent KC. The cost-effectiveness of endovascular repair versus open surgical repair of abdominal aortic aneurysms: A decision analysis model. *J Vasc Surg* 1999; **29**: 958-72.
20. Bosch JL et al. Abdominal aortic aneurysms: cost-effectiveness of elective endovascular and open surgical repair. *Radiology* 2002; **225**: 337-44.
21. Forbes TL, DeRose G, Kribs S, Harris KA. A cost-effectiveness analysis of standard versus endovascular abdominal aortic aneurysm repair. *Can J Surg* 2002; **45**: 420-4.
22. Greenhalgh RM et al. Early elective open surgical repair of small abdominal aortic aneurysms is not recommended: results of the UK Small Aneurysm Trial. Steering Committee. *Eur J Vasc Endovasc Surg* 1998; **16**: 462-4.
23. Powell JT et al. Final 12-year follow-up of surgery versus surveillance in the UK Small Aneurysm Trial. *Br J Surg* 2007; **94**: 702-8.
24. Mortality results for randomised controlled trial of early elective surgery or ultrasonographic surveillance for small abdominal aortic aneurysms. The UK Small Aneurysm Trial Participants. *Lancet* 1998; **352**: 1649-55.
25. Brown LC, Powell JT. Risk factors for aneurysm rupture in patients kept under ultrasound surveillance. UK Small Aneurysm Trial Participants. *Ann Surg* 1999; **230**: 289-96.
26. Swedenborg J. Abdominal aortic aneurysm in the interval 5.0-5.5 cm, art or evidence? *Scand J Surg* 2008; **97**: 128-30.
27. Ohki T et al. Endovascular graft repair of ruptured aortoiliac aneurysms. *J Am Coll Surg* 1999; **189**: 102-12.
28. Veith FJ, Gargiulo NJ. Endovascular aortic repair should be the gold standard for ruptured AAAs, and all vascular surgeons should be prepared to perform them. *Perspect Vasc Surg Endovasc Ther* 2007; **19**: 275-82.
29. Kubin K et al. Endovascular therapy of ruptured abdominal aortic aneurysm: mid- and long-term results. *Cardiovasc Intervent Radiol* 2008; **31**: 496-503.
30. Harkin DW, Dillon M, Blair PH, Ellis PK, Kee F. Endovascular ruptured abdominal aortic aneurysm repair (EVRAR): a systematic review. *Eur J Vasc Endovasc Surg* 2007; **34**: 673-81.
31. Alsac JM, Kobeiter H, Becquemin JP, Desgranges P. Endovascular repair for ruptured AAA: a literature review. *Acta Chir Belg* 2005; **105**: 134-9.
32. Brandt M et al. Endovascular repair of ruptured abdominal aortic aneurysm: feasibility and impact on early outcome. *J Vasc Interv Radiol* 2005; **16**: 1309-12.

33. Hinchliffe RJ et al. Endovascular repair of ruptured abdominal aortic aneurysm--a challenge to open repair? Results of a single centre experience in 20 patients. *Eur J Vasc Endovasc Surg* 2001; **22**: 528-34.
34. Peppelenbosch N et al. Emergency treatment of acute symptomatic or ruptured abdominal aortic aneurysm. Outcome of a prospective intent-to-treat by EVAR protocol. *Eur J Vasc Endovasc Surg* 2003; **26**: 303-10.
35. National Screening Committee policy - abdominal aortic aneurysm screening. In: National Screening Committee, UK; 2007. 2007.

Ref Type: Report

36. Ashton HA et al. The Multicentre Aneurysm Screening Study (MASS) into the effect of abdominal aortic aneurysm screening on mortality in men: a randomised controlled trial. *Lancet* 2002; **360**: 1531-9.
37. Crow P et al. A single normal ultrasonographic scan at age 65 years rules out significant aneurysm disease for life in men. *Br J Surg* 2001; **88**: 941-4.
38. Brosnan M, Collins CG, Moneley DS, Kelly CJ, Leahy AL. Making the case for cardiovascular screening in Irish males:detection of abdominal aortic aneurysms and assessment of cardiovascular risk factors. *Eur J Vasc Endovasc Surg* 2008.
39. Templeton, S. K. NHS 'fund bias' against men may cost 2,500 lives a year. *The Sunday Times* . 19-6-2005.

Ref Type: Newspaper

40. Criqui MH. Peripheral arterial disease--epidemiological aspects. *Vasc Med* 2001; **6**: 3-7.
41. McKenna M, Wolfson S, Kuller L. The ratio of ankle and arm arterial pressure as an independent predictor of mortality. *Atherosclerosis* 1991; **87**: 119-28.
42. Ries LAG et al. SEER Cancer Statistics Review, 1973-1997. 2000. US: National Cancer Institute.

Ref Type: Report

43. Fowkes FG et al. Edinburgh Artery Study: prevalence of asymptomatic and symptomatic peripheral arterial disease in the general population. *Int J Epidemiol* 1991; **20**: 384-92.
44. Hale WE, Marks RG, May FE, Moore MT, Stewart RB. Epidemiology of intermittent claudication: evaluation of risk factors. *Age Ageing* 1988; **17**: 57-60.
45. Balkau B, Vray M, Eschwege E. Epidemiology of peripheral arterial disease. *J Cardiovasc Pharmacol* 1994; **23 Suppl 3**: S8-16.

46. Cilostazol for Peripheral Arterial Disease. Cochrane Database Systematic Review . 2008.

Ref Type: Internet Communication

47. Falconer TM, Eikelboom JW, Hankey GJ, Norman PE. Management of peripheral arterial disease in the elderly: focus on cilostazol. *Clin Interv Aging* 2008; **3**: 17-23.
48. European Working Group on Critical Leg Ischaemia. Chronic critical leg ischaemia. *Circulation* 1991; **84**: 1-26.
49. Critical limb ischaemia: management and outcome. Report of a national survey. The Vascular Surgical Society of Great Britain and Ireland. *Eur J Vasc Endovasc Surg* 1995; **10**: 108-13.

50. Norgren L. Definition, Incidence and Epidemiology. In: Dormandy J, Stock G, eds. *Critical Leg Ischaemia: Pathophysiology and Management*. Berlin: Springer, 1990: 7-13.
51. McCaslin JE, Hafez HM, Stansby G. Lower-limb revascularization and major amputation rates in England. *Br J Surg* 2007; **94**: 835-9.
52. Adam DJ et al. Bypass versus angioplasty in severe ischaemia of the leg (BASIL): multicentre, randomised controlled trial. *Lancet* 2005; **366**: 1925-34.
53. Kannel WB, McGee DL. Update on some epidemiologic features of intermittent claudication: the Framingham Study. *J Am Geriatr Soc* 1985; **33**: 13-8.
54. Roberts G. 2008.  
Ref Type: Personal Communication
55. Wills M. Orthopedic complications of childhood obesity. *Pediatr Phys Ther* 2004; **16**: 230-5.
56. Nolan J. The Diabetes Explosion. 2008.  
Ref Type: Personal Communication
57. Lepantalo M. Surgical treatment of the Diabetic Foot. In: Greenhalgh RM, ed. *More Vascular and Endovascular Challenges*. 2007.
58. Feinglass J et al. Rates of lower-extremity amputation and arterial reconstruction in the United States, 1979 to 1996. *Am J Public Health* 1999; **89**: 1222-7.
59. Virkkunen J, Heikkinen M, Lepantalo M, Metsanoja R, Salenius JP. Diabetes as an independent risk factor for early postoperative complications in critical limb ischemia. *J Vasc Surg* 2004; **40**: 761-7.
60. Apelqvist J, Bakker K, van Houtum WH, Schaper NC. The development of global consensus guidelines on the management of the diabetic foot. *Diabetes Metab Res Rev* 2008; **24 Suppl 1**: S116-S118.
61. Walsh T, Browne J, Ugwu E, O' Riordan R, Lyons D. Quality of stroke care at an Irish Regional General Hospital and Stroke Rehabilitation Unit. *Ir J Med Sci* 2008.
62. Beneficial effect of carotid endarterectomy in symptomatic patients with high-grade carotid stenosis. North American Symptomatic Carotid Endarterectomy Trial Collaborators. *N Engl J Med* 1991; **325**: 445-53.
63. Randomised trial of endarterectomy for recently symptomatic carotid stenosis: final results of the MRC European Carotid Surgery Trial (ECST). *Lancet* 1998; **351**: 1379-87.
64. Rothwell PM et al. Analysis of pooled data from the randomised controlled trials of endarterectomy for symptomatic carotid stenosis. *Lancet* 2003; **361**: 107-16.
65. Endarterectomy for asymptomatic carotid artery stenosis. Executive Committee for the Asymptomatic Carotid Atherosclerosis Study. *JAMA* 1995; **273**: 1421-8.
66. Halliday A et al. Prevention of disabling and fatal strokes by successful carotid endarterectomy in patients without recent neurological symptoms: randomised controlled trial. *Lancet* 2004; **363**: 1491-502.

67. Golledge J, Mitchell A, Greenhalgh RM, Davies AH. Systematic comparison of the early outcome of angioplasty and endarterectomy for symptomatic carotid artery disease. *Stroke* 2000; **31**: 1439-43.
68. Brown MM, Humphrey PR. Carotid endarterectomy: recommendations for management of transient ischaemic attack and ischaemic stroke. Association of British Neurologists. *BMJ* 1992; **305**: 1071-4.
69. Quinlan MR, Egan B, Feeley TM, Tierney S. Changing trends in surgical treatment of carotid disease in Ireland (1996-2003). *Ir J Med Sci* 2008; **177**: 193-6.
70. National Renal Strategy Ireland. 2006. Dublin, National Population Health Directorate.  
Ref Type: Report
71. Abdulkarim A, Fleming FJ, Kavanagh EG, Burke PE, Grace PA. Vascular trauma in an Irish regional hospital. *Surgeon* 2008; **6**: 157-61.
72. Kjellstrom T, Risberg B. Vascular trauma. Review of 10 years' experience. *Acta Chir Scand* 1980; **146**: 261-5.
73. Magee TR, Collin J, Hands LJ, Gray DW, Roake J. A ten year audit of surgery for vascular trauma in a British teaching hospital. *Eur J Vasc Endovasc Surg* 1996; **12**: 424-7.
74. Razmadze A. Vascular injuries of the limbs: a fifteen-year Georgian experience. *Eur J Vasc Endovasc Surg* 1999; **18**: 235-9.
75. Tobin SA, Gurry JF, Doyle JC, Connell JL, Vidovich JD. Vascular trauma at a university teaching hospital. *Aust N Z J Surg* 1988; **58**: 873-7.
76. Feliciano DV et al. Management of vascular injuries in the lower extremities. *J Trauma* 1988; **28**: 319-28.
77. Humphrey PW, Nichols WK, Silver D. Rural vascular trauma: a twenty-year review. *Ann Vasc Surg* 1994; **8**: 179-85.
78. Mattox KL et al. Five thousand seven hundred sixty cardiovascular injuries in 4459 patients. Epidemiologic evolution 1958 to 1987. *Ann Surg* 1989; **209**: 698-705.
79. The Vascular Surgical Society of Great Britain and Ireland. The Provision of Vascular Services. Vascular Advisory Committee. 1998. London, The Vascular Surgical Society of Great Britain and Ireland.  
Ref Type: Report
80. The Vascular Surgical Society of Great Britain and Ireland. The Provision of Emergency Vascular Services. 2007. London, The Vascular Surgical Society of Great Britain and Ireland.  
Ref Type: Report
81. Harris KA, Provan JL. Canadian Human Resources Needs in Vascular Surgery. *Can J Surg* 1998; **41**: 39-45
82. Raymont A, Simpson J. Projection of surgical need in New Zealand: Estimates of the need for surgery and surgeons to 2026. *NZ Med J* 2008; **121**: 11-8