



ETF 2024

European Trainee Forum

Status of vascular and interventional radiology training in Europe

A report by the CIRSE European Trainee Forum Subcommittee



Cardiovascular and Interventional Radiological Society of Europe

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Summary

Interventional radiology (IR) is transforming medicine through minimally invasive image-guided therapies. Despite the growth of the specialty and the huge demand for more interventional radiologists (IRs), the training pathways across Europe have not all evolved in parallel with the clinical and academic needs of the discipline. The objective of this survey is to map the training pathways throughout Europe in order to identify potential issues and identify ways for further improvement and development.

Interviews with CIRSE's European Trainee Forum (ETF) subcommittee members were performed regarding training pathways in their countries of residence. The interviews were based on a specially designed questionnaire created to assess the various aspects of IR training.

In summary:

- This report includes responses from the representatives of 29 European countries.
- Interventional radiology has gained official subspecialty status in only 11 of the 29 European countries (37.9%), though structured IR training programmes are available in 17 (58.6%).
- There is significant heterogeneity in terms of duration of IR training, with 11 countries offering up to a 1 year, 10 countries offering up to 2 years and only 5 offering more than 2 years.
- The subspecialty status is required to perform IR in 5 of 29 countries. (France, Latvia, Romania, the Netherlands, the UK). In Switzerland, requirement of subspecialty status depends on the canton. In Kanton Zürich, the EBIR certification is required for reimbursement of certain complex IR procedures.
- Only 11 of the 29 countries have an official IR certification examination post completion of training.
- Clinical training is only included as part of the IR curriculum in 8 countries, where it ranges from 2-6 months of vascular surgery or intensive care.
- Finally, only 7 national IR societies have trainee subcommittees in their structure.

Recommendations overview

The progress in obtaining subspecialty status for IR in European countries is slow, and the duration, structure, and certification of IR training remain heterogeneous. A consensus among the European IR leaders is needed in order to achieve a homogenous, well-structured, competitive, and clinically orientated IR curriculum in Europe with clear guidelines regarding the required duration and structure of training to achieve competency. More active involvement of the trainees in national and international IR societies is also deemed essential for the future growth of the specialty.

Introduction

Over the last two decades, there has been an increase in the availability of minimally invasive interventional radiology (IR) procedures. Every year, new indications and new therapies and treatments become available allowing for the treatment of more patients through a pinhole incision with fewer complications and shorter recovery times, typically without general anaesthesia. IR is not considered a “luxury” specialty anymore, but rather, an essential asset in any hospital dealing with traumas, cancers and strokes among others, in such a way that it is hard to imagine a modern hospital without 24/7 IR services [1].

Interventional radiology, as a specialty between surgery and radiology, requires the development of a certain skill set. Constant practice, repetition, and clinical exposure are necessary to master these skills and be prepared for the many different cases and possible complications which a practitioner may encounter in their career [2]. Due to the great variety of IR procedures performed internationally, which range from aortic work to stroke thrombectomy, multiple cancer therapies and various embolizations, the above process has to be repeated in many different patient settings, some of which are elective, whereas others can be far more urgent. All these skills have to be built on a strong diagnostic radiology foundation, which also takes time to develop. These factors can make IR training challenging to organize and deliver.

The European Trainee Forum (ETF) was established in 2015 under the auspices of the Cardiovascular and Interventional Radiology Society of Europe (CIRSE) [3]. The ETF’s primary purpose is to enhance the participation of young IR physicians in international scientific and educational activities and to create a space within CIRSE to further their careers through networking opportunities. For this, the ETF organizes a number of events and activities at CIRSE congresses and beyond, ranging from lecture sessions and social activities all the way to career support. In addition, the ETF aims to increase CIRSE’s understanding of national differences and particularities in IR training, in order to deliver effective support for anyone on their way to becoming part of the IR community.

The purpose of this study was to assess the current status quo regarding the available interventional radiology training pathways in Europe. This overview of IR training pathways in different European countries will enable local and international stakeholders to come together to identify challenges and work towards solutions that will improve the way the future IR specialists in Europe will be trained.

Methods

The members of the European Trainee Forum Subcommittee are representatives of their national IR societies and, as such, they were asked to provide a short paragraph regarding the structure of the IR training pathway in their countries. They were also given a questionnaire to fill out with more targeted questions regarding the IR training environment in the countries where they currently work. Responses were collected from November 2018 until March 2019 and updated between May and August 2023. The participants were advised to consult their available local resources (i.e. their national IR society) in order to provide up-to-date information. All members of the ETF Subcommittee are trainees in IR or junior IR consultants within 2-5 years of completing their training. The question regarding the subspecialty status of IR in a country was also sent to the presidents of the national societies to confirm the accuracy of certain statements.

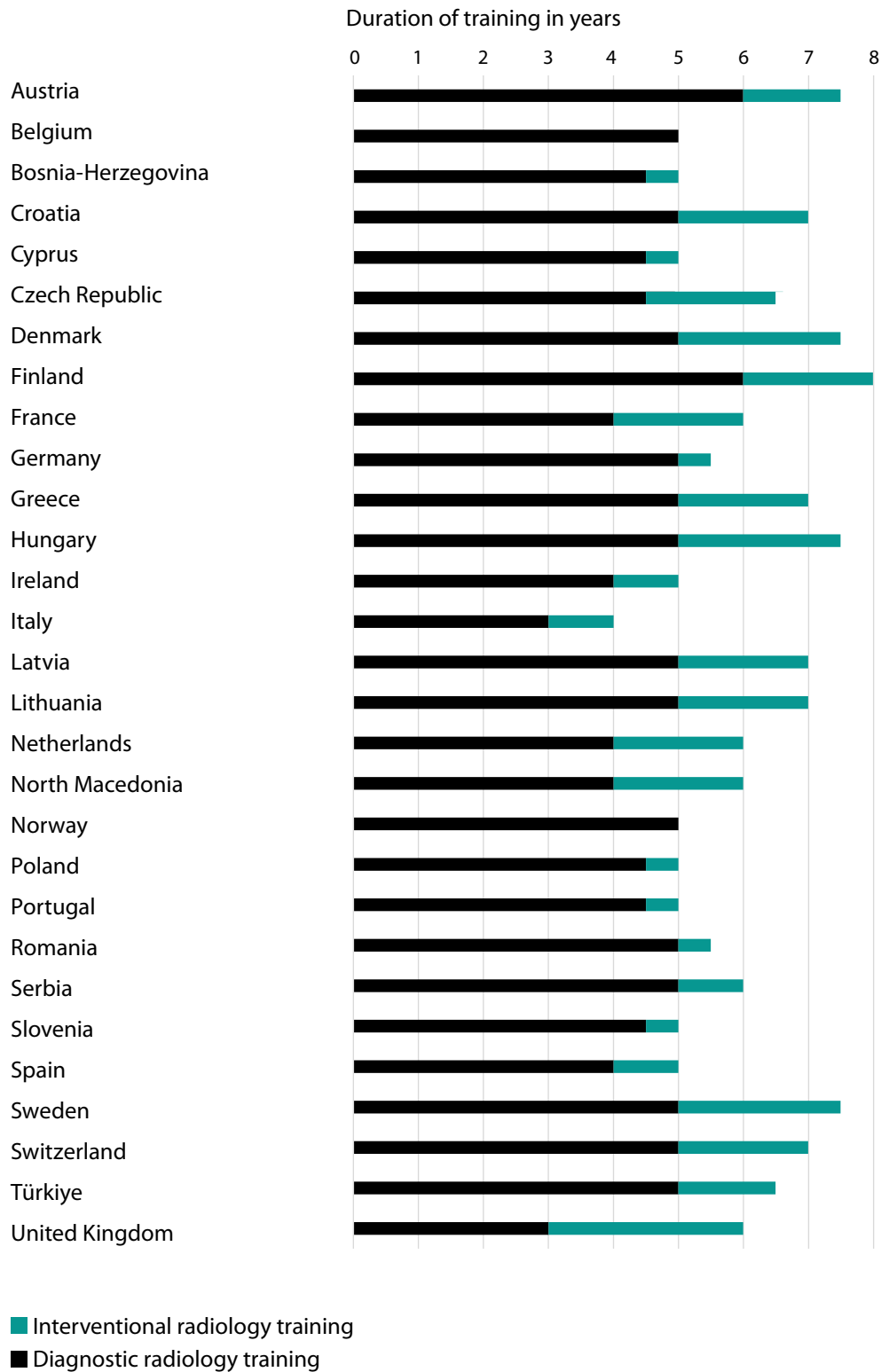
Results

The current report includes responses from 29 respondents representing the following countries: Austria, Belgium, Bosnia-Herzegovina, Croatia, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, the Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Serbia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Interventional radiology has gained official subspecialty status in only 11 of the 29 countries (37.9%). However, it appears that there is at least a basic structure to the available IR training programmes in most participating countries (17 out of 29, 58.6%), though this is with sometimes significant variations within the different regions of the same country. Nevertheless, despite considerable progress, in some countries the number of available positions is very limited and there are restrictions in available government funding. In the majority of European countries, it appears that aspiring IRs have to first complete their general radiology training before they can apply for an interventional programme. This means that trainees have to undergo an average of 4.6 years of general radiology training before they can start their training in IR.

At the same time, and as illustrated in Figure 1, there is significant heterogeneity in terms of duration of dedicated IR training, with 11 countries offering up to a 1 year, 10 countries offering between 1 and 2 years and only 5 offering more than 2 years of training.

Expected duration of training for a radiology resident to become an IR



The majority of European countries included in this study have a national IR training curriculum or other equivalent such as CIRSE's European Curriculum and Syllabus for Interventional Radiology (15/29), but only 11 countries have an official IR certification examination after the completion of training (Table 1).

Table 1: Status of national IR examination post completion of training

Country	National IR exam	No IR national exam	EBIR recommended
Austria	x		x
Belgium		x	x
Bosnia-Herzegovina		x	
Croatia	x		
Cyprus		x	
Czech Republic	x		
Denmark		x	x
Finland	x		
France ¹		x	x
Germany ²	x (DeGIR)		
Greece	x		x
Hungary ³	x		x
Ireland		x [^]	x
Italy		x	x
Latvia		x	x
Lithuania		x	
Netherlands ⁴		x	x
North Macedonia		x	
Norway		x	
Poland		x	
Portugal		x	x
Romania	x		
Serbia ⁵	x		x
Slovenia ⁶	x		
Spain		x	x
Sweden		x	x
Switzerland		x	x
Türkiye ⁷	x (TDIR)		x
United Kingdom		x	x

¹ France – in order to practice interventional neuroradiology, a national exam should be taken

² Germany – DEGIR exam is optional, however it is increasingly required for IRs

³ Hungary – EBIR is planned to be accepted as an equivalent to the national exam

⁴ Netherlands – after 5 years practising IR, the EBIR needs to be taken

⁵ Serbia – each university has its own form of examination

⁶ Slovenia – future IRs need to pass a midterm IR exam during their residency

⁷ Türkiye – the criteria for TDIR (Turkish Diploma of Interventional Radiology) include 2 years practice in IR after residency, a logbook of IR experience and successful completion of the training programme

[^] CIRSE's European Curriculum and Syllabus for IR adopted

However, in countries without a national examination, there is usually an official recommendation that trainees should aim to participate in the European Board of Interventional Radiology examination (EBIR). According to the study participants, and as illustrated in Table 2, clinical training is only included as part of the IR curriculum in 7 countries, where it ranges from 2-6 months of vascular surgery or intensive care.

Table 2: Countries with clinical training as part of their IR training curriculum

According to our study participants, and as illustrated in Table 2, outside of interventional radiology, clinical training is only included as part of the IR curriculum in 2 countries, where it ranges from 3-6 months of vascular surgery or intensive care. However, clinical training is increasingly important in IR with the development of IR clinics. Part of IR training includes patient rounds before and after procedures.

Czech Republic	3 months in vascular surgery department
Hungary	6 months, incl. 1 month of vascular surgery, 2 months ER/ICU/invasive cardiology, 2 months free choice (gastroenterology, oncology, urology, etc.)
Türkiye	Patient and Clinical Management Course is included in the training programme

Finally, the opportunities for endovascular training appear to vary significantly among European countries, with only four ETF representatives considering the opportunities for endovascular training in their country as sufficient (Table 3). In most countries, it was stated that the opportunities could vary significantly depending on the location of training within the country.

Table 3: Endovascular training opportunities during training

Some (11)	Belgium, Croatia, Denmark, France, Greece, Hungary, Portugal, Romania, Serbia, Spain, Türkiye
Many (5)	Austria, Finland, Latvia, Slovenia, United Kingdom
Varies locally (8)	Czech Republic, Germany, Ireland, Italy, Poland, Netherlands, Sweden, Switzerland

Apart from Bosnia-Herzegovina and Cyprus, where national IR Societies are currently being established, all other countries participating in this report have a national IR society (Table 4). However, only three countries have a national IR trainee society; Austria (JÖGIR), the United Kingdom (BSIRT) and Germany. The majority of locations have never previously conducted an IR trainee satisfaction survey and therefore have limited feedback regarding IR trainee experiences. The only countries which have run such surveys in the past are the United Kingdom in 2016 and France in 2017/2018.

Table 4: National IR Society names

Austria	ÖGIR (Austrian Society of Interventional Radiology)
Belgium	IR Section of the Belgian Society of Radiology
Bosnia-Herzegovina	no national society
Croatia	sIRcro (Croatian Society for Interventional Radiology)
Cyprus	no national society
Czech Republic	CSIR (Czech Society of Interventional Radiology)
Denmark	DFIR (Danish Society of Interventional Radiology)
Finland	FSIR (Finnish Society of Interventional Radiology)
France	FRI-SFR (Federation of Interventional Radiology – French Society of Radiology)
Germany	DeGIR (German Society of Interventional Radiology)
Greece	GSIR (Hellenic Society of Interventional Radiology)
Hungary	HSIR (Hungarian Society of Interventional Radiology)
Ireland	ISIR (Irish Society of Interventional Radiology)
Italy	SIRM Italian College of Interventional Radiology (as well as IESIR)
Latvia	LAIR (Latvian Association of Interventional Radiology)
Lithuania	LIRA (Lithuanian Interventional Radiology Association)
Netherlands	NVIR (Dutch Society of Interventional Radiology)
North Macedonia	SIRNM (Society of Interventional Radiology of North Macedonia)
Norway	NFIR (Norwegian Society of Interventional Radiology)
Poland	IR Section operating under the auspices of PLTR (Polish Medical Society of Radiology)
Portugal	APRI (Portuguese Society of Interventional Radiology)
Romania	SNRIR (Romanian Society of Neuroradiology and Interventional Radiology)
Serbia	DIRS (Serbian Society of Interventional Radiology)
Slovenia	Subsection of Slovenian Association of Radiology
Spain	SERVEI (Spanish Society of Vascular and Interventional Radiology)
Sweden	SSVIR (Seldinger Society of Vascular and Interventional Radiology)
Switzerland	SSVIR (Swiss Society of Vascular and Interventional Radiology)
Türkiye	TGRD (Turkish Society of Interventional Radiology)
United Kingdom	BSIR (British Society of Interventional Radiology)

Interventional radiology training summary – country update

Austria

The Austrian Society for Interventional Radiology and Minimally Invasive Therapy (ÖGIR) and the Austrian Society for Neuroradiology (ÖGNER) see training in interventional techniques as a core task. These activities are supported by ÖGIR and ÖGNER. The ÖGIR and ÖGNER – in cooperation and following the criteria of the German Association for Interventional Radiology and Minimally Invasive Therapy (DeGIR) and the German Society for Neuroradiology (DGNER) – offer interested radiologists the possibility of a structured training programme in interventional radiology or neuroradiology at the end of which is an ÖGIR or ÖGIR / ÖGNER certification. The certification concerns two levels of education:

Level 1 – Basic Qualification in Interventional Radiology and/or Interventional Neuroradiology

Level 2 – Specialization in Interventional Radiology and/or Interventional Neuroradiology.

The voluntary level 1 qualification should lead to a deeper understanding of IR and interventional neuroradiology (INR) techniques. At the end of this training, fellows who complete level 1 should not only be able to apply the techniques to be taught in the context of the continuing education and training system but also have additional basic knowledge in the IR and/or INR spectrum. More complex interventions require specialized training. In general, this training is completed after acquiring the specialist recognition. This is where level 2 specialization in IR or INR begins. Specific training goals include the mastery of vascular IR procedures such as revascularization procedures, aneurysm therapy and embolization, slice-controlled diagnostic and therapeutic interventions, as well as other non-vascular minimally invasive methods.

The specialization is based on 6 thematic modules:

Module A vessel-opening procedure including lysis, PTA, stent, endoprostheses, thrombectomy, etc.

Module B vessel occluding procedures including coils, liquid embolics, particles, plugs etc.

Module C diagnostic punctures, drainage, PTCD, biliary tract, TIPS, gastrostomy, port etc.

Module D oncological procedures incl. TACE or other tumour-specific embolizations, ablations, percutaneous tumour therapies

Module E vessel-opening neuro-interventions (PTA / stent) of extracranial supra-aortic arteries.

PTA / stent of intracranial arteries, mechanical recanalization in stroke, local lysis in stroke.

Module F Neurovascular embolization treatments (embolization and similar procedures in intracranial aneurysms, embolization of intracranial and spinal vascular malformations, other intracranial embolizations).

In the level 2 training programmes, specialist interventional radiologists and neuroradiologists will deepen their knowledge and skills in image-guided minimally invasive therapy.

It is of relevance that the knowledge and skills in IR are already part of the “board examination,” so that 1/3 to 1/2 of the requirements for the EBIR are formally already met. Level 1 can be applied for before the board examination.

Belgium

In Belgium, interventional radiology is not recognized as a subspecialty of radiology and is not protected by a diploma. Every radiologist (and every physician including vascular surgeons, cardiologists, gastroenterologists, urologists, etc.) can theoretically perform interventional procedures. Most of the time, IR is not well known by the general population or even by healthcare professionals and it lacks funding from social security.

Access to IR is difficult for residents as there is no proper pathway/diploma. Moreover, many hospitals do not perform interventional procedures or perform only limited procedures. Thus, radiology residents must be very motivated and make their own arrangements in collaboration with universities and suitable hospitals which offer training in IR procedures. Usually, residents interested in IR and many interventional radiologists perform a mixture of diagnostic and interventional work. Only a few centres, such as tertiary hospitals, have full-time interventional radiologists and assign full-time residents to IR training, though the training periods are limited (usually 3 to 6 consecutive months).

Bosnia and Herzegovina:

Interventional radiology is not an official subspecialty of radiology in Bosnia and Herzegovina because there are no official radiology subspecialties in general, but this is expected to change in the near future. The Association of Radiologists in Bosnia and Herzegovina is currently working on a draft which should enable different subspecialties in the field of radiology, including IR.

Radiology residency lasts five years and includes a 4-month IR rotation. During these four months, the trainee is supposed to get familiar with different vascular and non-vascular procedures. After finishing their radiology residency, board certified radiologists can decide whether they want to perform IR procedures, depending on their personal interests and local capacity. Fellowship is desirable but not obligatory.

Currently, there is no association of interventional radiologists on a national level, mostly because this is an emerging subspecialty and there are only a few radiologists who perform IR procedures in university hospitals.

Croatia

Interventional radiology in Croatia has the status of a subspecialty under clinical radiology. The path to become an IR in Croatia involves 6 years of medical school and 5 years of clinical radiology residency. Additionally, there is a 3-month obligatory master of science postgraduate study of clinical radiology which has to be completed during the residency period. After the clinical radiology residency has been completed and a board exam passed, a further 2 years of subspecialty training are required, at the end of which there is an oral exam in order to obtain IR certification. In addition to IR, neuroradiology and ultrasound are the only other subspecialty fields under clinical radiology in Croatia.

Even though an IR subspecialty training officially exists, it is not structured, and unfortunately, it does not guarantee that a doctor will receive adequate training from all necessary fields, as it typically only includes the procedures that are performed in the trainee's original hospital.

Cyprus

In Cyprus, interventional radiology has not gained official subspecialty status and there is no official IR training pathway. The curriculum of the 5-year specialization in general radiology includes 6 months of interventional radiology. IR training is usually done abroad, in any accredited hospital, after obtaining a specialization in general radiology. EBIR certification is optional and not mandatory to practice IR in Cyprus.

Czech Republic

Four and a half year of training are required to obtain a specialization in diagnostic radiology before it is possible to apply for an IR training programme. The Czech IR training curriculum consists of two years of practice at an accredited IR department with a short practice in vascular surgery. There are 10 departments accredited by the Czech Ministry of Health and they all are in public hospitals. A minimum number of 200 percutaneous transluminal angioplasties, 25 venous interventions, 3 TIPS, 10 embolizations and chemoembolizations, 90 non-vascular and 25 biliary interventions are required. Finally, there is a practical and theoretical IR certification exam.

Denmark

There is no official IR training pathway in Denmark. IR is situated in several departments with each department responsible for their own training. In most places, IR is subdivided into neuro, vascular, oncology, musculoskeletal, and abdominal, but there are no clear boundaries. There is no official national IR certification process, although the Danish Society of Interventional Radiology recommends CIRSE's EBIR exam. In the public health care system, the resources for training in IR are rather limited and many doctors do not get the time to train in areas and procedures other than what their own department is specialized in.

Finland

There is a 2-year IR training programme that follows 6 years of general radiology training in Finland. The main goal of IR training is to give young IRs knowledge of the most common and important procedures in different IR fields. The training will offer the trainee the possibility to learn about endovascular and non-vascular procedures and follows the European Association of Radiology and CIRSE's guidelines to achieve high standards in line with other European countries. Training lasts 2 years (at least 2-5 hours per week) and has to be undertaken at a University hospital. In addition, the trainee has to attend IR-related education courses for a total of at least 30 hours (for example, CIRSE, ECIO etc.). At the end of the second year, there is an examination which aims to assess the trainee's competence.

France

In November 2017, a new national residency programme in radiology was introduced in France. The new programme is structured in 3 different phases. During the first phase (first year), residents receive training in the basics of radiology (e.g. physics, contrast media, radiologic anatomy, and emergency radiology). In the second phase (second-fourth years) trainees rotate every six months in different radiology subspecialties (neuro, cardiovascular, abdominal, obstetrics and gynaecology, head and neck, MSK, breast, thoracic, urology, oncology, paediatric) in order to gain experience in the various aspects of diagnostic radiology. During this phase, training in basic percutaneous interventions (e.g. biopsies, drainages) is obtained during each rotation.

In the last phase, trainees have two options: one year (fifth year) of training in one or two areas of diagnostic radiology; or two years (fifth and sixth) of training entirely spent in departments providing advanced interventional procedures in one of the three main domains of IR (oncology, vascular, neuro IR). Therefore, only residents completing 6 years of training are prepared to start an IR career.

Germany

In Germany, there is no direct pathway to access interventional radiology (IR) training. To get into IR training, one must first complete diagnostic radiology training. One to two years of IR training is possible (but not mandatory for the exam) during the radiology training, which is 5 years. Training in IR usually takes place in the last two years of residency. In radiology, general training in interventional radiology is somewhat regulated within the education for board certification as a radiologist. A relatively low numbers of procedures are required. More sophisticated optional training and certification are provided by the German Society of Interventional Radiology (DEGIR). This type of certification is increasingly required to apply for a position in IR. The EBIR exam is accepted as equivalent certification.

Greece

To become an interventional radiologist in Greece, a 5-year residency in diagnostic radiology must be first undertaken. The curriculum of diagnostic radiology includes 6 months of interventional radiology training. After completing general radiology training, trainees are eligible to apply for the 2-year IR subspecialty-training programme. There are currently several IR training centres certified by the Ministry of Health. If one of these centres does not offer the full range of IR procedures then the trainees are expected to gain these competencies at a different centre. At the end of subspecialty training, trainees must pass an exam in order to get the certification of IR. EBIR holders can also obtain Greek subspecialty status if they have done 2 years of training. At the moment, there are a limited number of such IR fellowship positions, with the funding for these positions only becoming available very recently (approved by the Greek Ministry of Health in May 2019).

Hungary

Subspecialty status for IR was achieved in 2018. The first fellows were enrolled in 2020, and a few have already finished the training. In the general radiology training programme, 3 months of IR training are included which can be undertaken in any accredited hospital. After completing the first speciality training programme (radiology, vascular surgery, cardiology, etc.), doctors can then apply for an interventional radiology trainee position. Training takes 2 years for radiologists or 3 years for non-radiologists. Depending on the first specialty, the programme includes radiation protection and diagnostic radiology (X-Ray, US, CT, MRI) for clinicians, while radiologists have 3 months of clinical practice. After finishing the training programme, participants need to take an exam to get certified as specialists in IR. The licence is valid for 5 years. To maintain the IR licence, continuous IR activity (at least 100 procedures per year) is required.

Ireland

Radiology training in the Republic of Ireland is a 5-year programme governed by the Faculty of Radiologists, Royal College of Surgeons in Ireland. During this programme, all trainees attend a lecture programme and complete a fellowship examination, which is primarily focused upon diagnostics but also assesses basic IR competencies. All trainees complete a mandatory one-day basic IR skills day and they have a variable clinical IR exposure (1-6 months) depending upon the site of training and interest of the trainee. Following completion of general radiology training (4 years), those interested in IR will usually complete a fifth year dedicated to IR. Typically a sixth year of training in IR will then be undertaken overseas, however, the period of training is not explicitly defined. There are eight one-year fellowship positions available nationally, but the number of trainees filling these positions varies year to year. The Faculty of Radiologists has adopted the CIRSE IR curriculum and the EBIR exam is highly recommended, however, EBIR certification is not currently a requirement of the Irish Medical Council to practice IR in Ireland.

Italy

There are over 160 hospitals throughout Italy in which (IR) is routinely practised. Among these, there are approximately 40 academic centres that offer residents the opportunity to dedicate part of their residency to IR training. Many of these centres offer the residents a minimum period of 6 months to spend in interventional radiology. The period can be extended to a maximum of 3 years on the basis of the individual attitudes and interests. Performing approximately 400 IR cases is considered to be the threshold to obtain competence. Dedicated interactive conferences on IR are organized in the country to ensure training in vascular and non-vascular interventional procedures. In particular, the annual “Campus in interventional radiology” in Pisa welcomes 60 Italian and 12 European residents for a three-day live-cases conference. On the same occasion, all residents have the chance to get hands-on experience with simulators. Finally, trainee radiologists are offered several university master courses for in-depth training in vascular, nonvascular, and neuro IR.

Latvia

To become an IR in Latvia, it is necessary to complete radiology training, which is 5 years, and then complete IR training, which is 2 years. The official IR training pathway started in 2020. There is an exam at the end of the radiology training and IR training, and the EBIR exam is recommended on an individual basis. There are many vascular and non-vascular training opportunities during radiology residency and IR residency.

Lithuania

In Lithuania, interventional radiology is not recognized as a subspecialty of radiology, and there is no structured, official pathway to access IR training. Trainees must first finish a 5-year general radiology training, during which there are a few modules of IR. Since 2023, future IRs must complete 2 years of training/work in an accredited IR department under experienced IR doctor supervision. IR practice is not subdivided into neuro, vascular or nonvascular fields. During IR training there is no structured clinical training as part of the IR training curriculum. In Lithuania, there are four accredited IR centres in which IR practice can be learned. After finishing IR training, no national IR or EBIR exam is required.

The Netherlands

In the Netherlands IR is an official subspecialty of radiology, with its own society and training programme. Radiology training starts with 2.5 years of diagnostic radiology, after which a trainee chooses a subspecialty for another 2.5 years of training (i.e. abdominal radiology, IR, etc.). In the second part of the 2.5 years, trainees spend 50% of their time on their subspecialty and 50% on other diagnostic subspecialties. There is no national IR exam. A fellowship is optional, but not obligatory for registration as an interventional radiologist. The registration is valid for 5 years. For the first re-registration after 5 years, the EBIR exam needs to be taken. The national society has more than 330 members as of January 2024.

North Macedonia

Interventional Radiology in North Macedonia is still evolving. Residency in general radiology requires four years of training. During this period, residents are obliged to spend 3-6 months in the angiography department where they can learn basic IR procedures. In general, well-trained radiologists can perform IR procedures such as vascular, non-vascular, oncological, or neurointerventions if they have adequate skills and if they work in a centre where these procedures are performed on a regular basis.

A North Macedonian medical faculty officially approved a programme for IR training for the first time in 2022. The training takes two years and residents can apply after finishing their residency in diagnostic radiology. During the two-year subspecialty training, each candidate is required to spend one month in each department for thoracic, abdominal, and vascular surgery, as well as in the neurosurgery, urology, and oncology departments. A certain period of training for performing vascular and non-vascular procedures as well as oncologic vascular and non-vascular procedures based on the curriculum is also required.

Norway

Interventional radiology is not yet recognized as a subspecialty of radiology and is not protected by a diploma. In principle, every trained physician can perform interventional procedures, although in practice they are normally done by radiologists or invasive cardiologists. Some other specialties might have an involvement in the field as well, such as urologists and vascular surgeons. All larger hospitals in Norway have an IR department, but the diversity and volume of procedures performed vary greatly. Some hospitals have subdivisions of IR, such as vascular, non-vascular, neurological, oncological, musculoskeletal and so on. At some of the larger centres, radiologists may work exclusively as IRs, while IRs at other centres they might divide their time between the angiography, non-vascular interventions and diagnostic radiology etc.

As there is no official training pathway, radiology residents who are interested in IR are limited to whatever is being offered at their own medical centre. During their 5-year radiology residency, residents interested in IR will have to be dedicated in order to gain access and training. If starting to work at an IR department after completing their residency, candidates usually will need at least a couple of years of experience, depending on volume and procedures offered, before working on call by themselves. IR is still a little-known field of medicine in both the general population and among other healthcare professionals.

Poland

In order to become an IR in Poland, trainees must undergo 5 years of radiology residency and be a board-certified radiologists. During the 5 years of general radiology residency, 2 months in the angiography suite are mandatory. There are also 6 months of additional internship, which can be used for IR training. Therefore, a maximum of 8 months can be spent on IR while undertaking general radiology training. This time can be prolonged if the department is happy to accommodate a request for additional training.

Currently, every radiologist, at least theoretically, can do IR, since the minimum qualifications are not defined. The optimal way to get wider experience in IR would be to undertake additional training at an interventional radiology department, but there are only 3 such centres in Poland. The alternative is to train in a department of general radiology where IR is a part of the provided services. The Interventional Radiology Section of the Polish Medical Radiological Society issues IR certificates for those radiologists who can demonstrate a minimum of 1,000 procedures in their logbooks that cover the entire spectrum of vascular and non-vascular interventional radiology.

Portugal

During the general radiology training programme (5 years), the IR rotation lasts 3 months. Trainees who are interested in IR can get up to 12 months of additional training during the last year of residency. The IR section of the Portuguese Society of Radiology and Nuclear Medicine (SPRMN), the Portuguese College of Radiology (part of the Portuguese Medical Association) and the Portuguese Association of Interventional Radiology (APRI) have recently succeeded in the creation of an official subspecialty with specific requirements for the application and a specific training programme. The EBIR is strongly recommended for all IRs, and EBIR holders do not need to take the theoretical part of the national exam for the sub-specialization in IR.

Romania

Despite being performed in Romania for more than 20 years, IR is still a relatively new field, even though the number of centres and practitioners is steadily increasing. Growing interest in IR has been observed recently, most likely as a result of the efforts of the Romanian Society of Neuroradiology and Interventional Radiology (SNRIR).

The Romanian Ministry of Health recognized IR as a radiology specialization in 2018. A curriculum plan was developed by SNRIR, and tutors and training facilities were assigned. The diagnostic radiology training programme for IR entails 5 years of study, including a 3-month IR rotation during residency, and is followed by an IR fellowship. Only those who pass the national exam are granted the ability to practise.

The Romanian system for acquiring IR competency has undergone some significant changes. Peripheral and Neurovascular are the two paths that have replaced the previous 6-month fellowship that allowed for the full practice of IR. While the neurovascular IR pathway takes a total of 24 months of fellowship, the peripheral IR pathway's fellowship time length is still 6 months. Another significant difference is that neurosurgeons and neurologists are also eligible for the neurovascular IR fellowship and competency. The neurovascular fellowship follows the ESMINT curriculum.

Through seminars, workshops, and the dissemination of information about educational opportunities and foreign awards, SNRIR plays a crucial part in educating IRs.

Serbia

During radiology residency, residents have to spend four months at an IR department to obtain basic knowledge about interventional radiology. After this, it is possible to continue training within the department, provided there is local capacity. Trainees can attend a one-year residence at an interventional radiology department. Training is organized in a way where their attendance at vascular and non-vascular IR is mandatory for certain periods of time at each department. Part of this period is arranged at related clinical departments, especially oncology and surgery. During this time, trainees are periodically obliged to take written exams or provide case reports. Furthermore, they must complete clinical training so that they participate in everyday cases and procedures which allow them to practise and improve their skills.

At the end of this one-year residency, the trainees have to sit an oral and written exam, along with submitting an essay within the field of IR, which they justify in front of a three-member board. Each University has its own form of exam. The EBIR is recommended but it is not compulsory.

Slovenia

In Slovenia, IR procedures are mainly practised by interventional radiologists. Six years of undergraduate medical school and a 6-month internship are obligatory before applying for a radiology residency. The residency programme duration is five years, with four years spent in general radiology rotations and one year of dedicated subspecialty training, either in IR or another subspecialty of diagnostic radiology.

A 6-month interventional radiology rotation is included in the compulsory programme. Residents who wish to practise IR have to add between 3 months and 1 year of additional rotations in the final year of their residency. They have to perform a recommended minimum number of procedures defined by the national residency programme and undertake a midterm IR examination during their rotation. There is no formal IR fellowship and IR does not have a formal status of subspecialty. Additional IR education is undertaken at the IR departments where IR is being practised, and each IR has to perform a certain number of yearly procedures to remain licensed. The EBIR examination is not mandatory but it is recommended.

Spain

In Spain, to become an interventional radiologist, trainees must undergo a 4-year residency in diagnostic radiology first. During this time, the curriculum of radiology includes at least 3 months of interventional radiology rotations with an optional 3 more elective months in the last year of residency. Thus, a total of 6 months can be used in IR training.

Officially, 3 months in the angiography suite are obligatory, but this may vary depending on local availability. After the 4 years, trainees can qualify as a radiology consultant, and can then apply at any of the hospitals offering an IR training placement to train by shadowing a mentor. Occasionally, these training placements are exclusively for IR, but sometimes the service needs of the radiology department must also be covered. Fortunately, since 2014 there has been a recognized fellowship which offers more specific training through SERVEI (the Spanish Society of Interventional Radiology), although this has no official recognition by the Ministry of Health. There are 16 fellowship positions offered and only 4 of them are funded. Successful candidates spend one year in the hospital of their choice, which has to be certified as an IR training provider by SERVEI. In Spain, there is no specific exam for IR specialization.

Sweden

In Sweden, there is no official IR training programme. Future IRs must first complete a comprehensive 5-year general radiology training, which includes fundamental IR skills. The extent of specialized IR training during residency varies by institution. After qualifying as radiology specialists, those aiming for a career in IR typically seek consultant positions within IR departments. These positions commonly involve diagnostic radiology duties as well. IR has yet to achieve official subspecialty status by the government agency within the country, but the Seldinger Society of Vascular and Interventional Radiology offers a recognized certification. Radiology specialists can apply for this certification after completing an equivalent of 2.5 full-time years in IR practice, supported by a detailed competency framework adapted from CIRSE's curriculum to suit Swedish conditions. It is noteworthy that certain IR procedures, such as endovascular aneurysm repair (EVAR) and peripheral vascular interventions, generally fall under vascular surgery in Sweden. Interventional neuroradiology procedures are performed by neurointerventionists, trained in line with the European Board of Neurointervention (EBNI) and the European Society of Minimally Invasive Neurological Therapy (ESMINT) guidelines.

Switzerland

In Switzerland, advanced training in IR is usually preceded by 5 years of training in diagnostic radiology, during which some fundamental training in IR is mandatory. Most major hospitals offer an IR fellowship that may partially take place during diagnostic training. It is the responsibility of each hospital to decide on the format, although most fellowships are 2 years. Some fellowship programmes require one year of clinical practice, whereas others do not. Because each hospital has a different focus and there is no national training programme, the extent of training varies according to the place of fellowship. The amount of exposure to endovascular, non-vascular and oncologic IR procedures during training varies from hospital to hospital. In some hospitals, vascular surgeons perform aortic interventions, however, there are still several large university-affiliated hospitals where IRs are still involved in all aortic procedures.

Most other endovascular interventions are performed solely by IR or by vascular surgeons and angiologists. Neuroradiology is an official sub-specialty and specially trained interventional neuroradiologists in most centres perform neurovascular interventions.

Türkiye

In Türkiye, IR has not been yet officially accepted as an academic subspecialty; however, in most tertiary care teaching hospitals and universities, IR units are active and make substantial contributions to public health. IR training starts during radiology residency, lasting 4-8 months depending on the centre. After residency, radiologists interested in IR continue training as fellows with 1 or 2 years of additional training, depending on the centre.

The Turkish Society of IR (TSIR) initiated a training programme including 3 courses for the Turkish Diploma of Interventional Radiology (TDIR) to standardize education and overcome the lack of certification. The CIRSE IR Curriculum and Syllabus were adopted while generating the programme. The criteria for TDIR include 2 years of practice in IR after residency, a logbook of IR experience and successful completion of the training programme. CIRSE endorsed the TDIR. However, TDIR is a national certificate and members are strongly encouraged to take EBIR.

United Kingdom

Following the completion of medical undergraduate training, junior doctors are expected to complete two years of foundation training in a variety of medical and surgical specialties before applying to clinical radiology. IR within the United Kingdom is a subspecialty of clinical radiology. Training is for 6 years, with 3 years spent on general diagnostic radiology and attainment of the Fellowship of the Royal College of Radiologists (FRCR) followed by 3 years of subspecialty training in IR and further diagnostic radiology.

There is a formal national IR curriculum set out by the Royal College of Radiologists (RCR), which encompasses the whole range of vascular and non-vascular IR procedures including interventional oncology, with the exception of neuro-intervention, which has a separate training route and curriculum. There is no formal exit exam at the end of IR training, however the EBIR is highly recommended.

Discussion

Despite its rapid growth and impact upon modern medicine, interventional radiology is a relatively new specialty growing in a very competitive world. As a specialty, it appears that IR is moving slowly in the right direction. In the last few years, there has been significant progress in terms of gaining more independence as a specialty, improving the structure and quality of training and improving public awareness of the specialty [4]. However, this progress has been slow and heterogeneous across Europe. This report aims to provide an overview of the IR training status in Europe in order to identify current limitations and challenges with the intention of sparking an active discussion about how to make things even better for future IR trainees in Europe. This report also provides information regarding the IR training pathways in certain European countries.

One of the first findings of this report is that IR is not a recognized subspecialty in the majority of European countries. Subspecialty status is essential in order to create dedicated structured training programmes and improve competitiveness in terms of attracting the best possible talent. Funding limitations, especially in recession-hit times, are always a limiting factor, especially in Southern Europe, but it is likely that this problem will be gradually overcome. Moreover, despite the fact that there is a recognized CIRSE IR Curriculum [5], there seems to be significant heterogeneity when it comes to the structure, duration, and desired outcomes of training across Europe. In the majority of European countries, an aspiring IR has to complete nearly 5 years of diagnostic radiology training (DR) before they can apply for dedicated IR training. One of the main issues with this approach is that it may negatively influence retention rates since high-quality trainees who might be interested in a surgical specialty like IR are deterred by the fact that they have to undergo a 5-year DR training programme without any guarantees of a subsequent IR fellowship. Even in countries like the UK, with a solid 3-year IR training programme [6], this is still considered a limiting factor in the process of attracting surgical-minded candidates.

The question of how long it actually takes to become a competent IR also appears to have variable answers according to each country of residence, with many countries still accepting less than 18 months of IR training as enough time to produce a competent operator. Given the wide variety and complexity of IR procedures [5,6] this seems to be a very optimistic approach, which is the reason why an increasing number of countries are offering at least 2 years of subspecialty training to cover the need for more comprehensive IR and clinical training. It is the same reason why the Royal College of Radiologists in the UK recommends at least two years of full-time training in IR [6]. It must be acknowledged that the time required to achieve competencies can vary depending on the training centre and the volume of cases available locally, however, it is hard to imagine covering the entire IR curriculum in less than 2 years. With this in mind, it is becoming apparent that we need a consensus on what should be considered as the bare minimum duration of IR training. The use of simulation technologies is also an important new element that could be considered in low volume centres or in order to maintain competencies in procedures that are not frequently performed. Training in stroke catheter directed thrombectomy could be an example [7]. Finally, the adoption of nation-wide electronic logbooks could also improve the way trainees document their exposure to IR as well as ensure that they have received adequate training maintaining local standards comparable to the national average.

The above are particularly important in order to make sure that patients receive the best possible standard of care, no matter where they reside, but also in order to protect IR from poorly trained individuals who could potentially damage the reputation of the specialty. It is also the reason why proper certification is of paramount importance. The introduction of the European Board of Interventional Radiology (EBIR) exam [8] has been a benchmark examination for many countries that do not organize their own national exams, and there are an increasing number of IR specialists who recognize the need for international certification of their IR skills by taking the EBIR exam.

The process of entering an IR training programme has also been a matter of significant controversy due to the current lack of clarity and complicated entry requirements, which can cause confusion and hesitation for potential candidates. The more aggressive school of thought would support assigning an IR training number from the beginning of training, even if DR training will have to take precedence. In 2016, the ETF Subcommittee ran an online survey regarding IR training in 14 countries with 134 trainees taking part. Almost 72 % of trainees responded that getting into an IR training programme is very or somewhat complicated, with the lack of training opportunities and available positions being the biggest challenge [9]. When trainees were asked how IR training in their country could be improved, more structured and well-defined training pathways were the most popular answers, and this was consistent amongst most European countries. The American model is the first such model with direct assignment of an IR training number from the beginning of radiology training [10]. The trainee will still receive at least 3 years of DR training before proceeding to the 2-3-year dedicated IR training fellowship, but they will be guaranteed IR training from the beginning with improved access from the early days of training. It is not a coincidence that after only 3 years of applying this system, IR has become one of the most popular specialties in the United States [11].

The issue of clinical training as an integral component of IR is also a cause of considerable debate. A survey of 296 trainees organized by the BSIR trainee committee in 2016 [12] identified a lack of clinical training, with more than 60% of the participants reporting limited exposure to vascular outpatient clinics and ward rounds. This is in agreement with the findings that in only 2 out of the 29 participating countries is there some form of clinical training. It is hard to argue against the need for more clinical training for IRs. The future of the specialty may well be dependent on this. There are an increasing number of voices within the IR community supporting the need for more clinical training in order to improve the value for money as physicians as well as in order to improve patient care through enhanced continuity, quality, and improved patient satisfaction [13-20].

National IR societies have played an important role in improving training standards across Europe, and they have been of paramount importance in establishing the specialty. However, more can be done to improve the involvement of trainees in these societies. According to the report, only 7 European countries have dedicated IR trainee committees. The role of these trainee committees, such as the ETF subcommittee or the BSIR trainee (BSIRT) committee, is to allow trainees to become more active in the functions of their national societies and have a voice with regard to their professional future while they develop leadership and management skills which are essential for the future of IR. At the same time, the trainees can contribute to the activities of their society with energy and enthusiasm.

In addition, joint global IR trainee satisfaction surveys in collaboration with other national and international IR societies will provide additional information that can drive change and improvement in the way future IR specialists are trained.

Conclusion

The comprehensive understanding of national interventional radiology training standards across Europe is imperative for discerning challenges, instigating positive transformative measures, and allowing for the evolutionary trajectory of IR training. This dynamic process necessitates continual monitoring, rigorous communication, and adaptive measures at both the national and international levels.

Presently, discernible strides have been made in securing subspecialty status for IR in various European countries. However, it is noteworthy that the duration, structural framework, and certification protocols inherent in IR training exhibit significant heterogeneity across the continent. This heterogeneity underscores the importance of unifying efforts towards standardization to foster a cohesive and streamlined approach to IR training.

Moreover, intricacies persist in various facets, including the delineation of entry pathways to the specialty and the provision of opportunities for clinical training. These issues remain largely unresolved, manifesting considerable disparities among European countries. Even the core competencies of the IR curriculum, notably endovascular training, display significant variances.

A critical facet meriting attention is the active engagement of trainees in both national and international IR societies. Recognizing the pivotal role of trainees in shaping the trajectory of the specialty and fostering heightened participation in these societies is deemed indispensable. This proactive involvement can significantly contribute to the refinement, growth, and evolution of IR training standards, ensuring a more coherent and progressive future for the discipline. In essence, through the adoption of a collaborative and inclusive scientific approach, the IR community can collectively surmount challenges and cultivate a more harmonized and scientifically rigorous landscape for training across Europe.

Once the IR community overcomes the above-mentioned challenges, it will surely become more visible among medical students as well. There is no doubt that IR is becoming an increasingly important part of modern medicine.

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Appendix 1 – Survey questions

Status of vascular and interventional radiology training in Europe – A report by the CIRSE European Trainee Forum Subcommittee

Name of country:

Name of representative incl. affiliations:

The purpose of this paper will be to give an overview of IR training in Europe and to identify problems and ways of improving training opportunities for the future IR trainees. All contributors will be authors of the final version of the manuscript. Every member of the ETF Subcommittee is asked to do the following:

1. Please provide a short paragraph (150 words) with a summary of the IR training status and pathway in your country. Please also mention any particular challenges you or other trainees have faced:

2. Please answer the following questions

Status of IR in your country: i.e. subspecialty under radiology, non-subspecialty status, independent specialty, unspecified	
Number of IRs in the country per 100,000 population (if known)	
Is there an official training pathway for IR? (yes/no)	
Duration of the IR training pathway:	
Structure of training: (i.e. 5 year of diagnostic and 1 year of IR or other)	
Is it easy to get into an IR training programme? Please say why? (i.e. No, because not many posts or because not advertised nationally etc.)	
Is there a national IR training curriculum (or other equivalent use like CIRSE's European Curriculum and Syllabus for IR)	
Number of IR posts (if known, please contact your local radiology society or national radiology council)	
Endovascular training opportunities during training: many, some, limited, varies locally, none (if taken by vascular surgeons)	
Is there a national IR society?	
Name of the national IR society (website, social media account details)	
Is there a national IR trainee society?	
Clinical training included in IR training: Yes/No (If yes, please provide details)	
Opportunities for international IR trainees: yes/limited/no (if yes, please provide details)	
When was the last national IR trainee survey conducted? (Please attach a summary of findings or references, if possible)	

