



ETF 2020

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

April 2020

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Table of Content

Executive Summary	2
Recommendations overview	2
Introduction	3
Methods	3
Results	4
Interventional radiology training summary – country update	8
Austria	8
Belgium	8
Croatia	9
Czech Republic	9
Denmark	9
Finland	9
France	10
Germany	10
Greece	10
Hungary	10
Ireland	11
Italy	11
Latvia	11
The Netherlands	11
Poland	12
Portugal	12
Romania	12
Serbia	13
Slovenia	13
Spain	13
Sweden	14
Switzerland	14
Turkey	15
United Kingdom	15
Discussion	16
Conclusion	18
References	19
Appendix 1 – Survey questions	20

Executive Summary

Interventional radiology (IR) is transforming medicine through minimally invasive image-guided procedures. Despite the explosive 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. Our objective was to map the training pathways across Europe in order to identify potential issues and identify ways for further improvement and development.

Interviews with the subcommittee members of the CIRSE European Trainee Forum (ETF) were performed regarding the training pathway in their country 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 24 European countries.
- Interventional radiology has gained official subspecialty status in only 9/24 (37.5%) of the European countries, though structured IR training programmes are available in 15/24 (62.5%).
- There is significant heterogeneity in terms of duration of IR training, with 9 countries offering up to a 1 year, 10 countries offering up to 2 years and only 5 offering more than 2 years.
- In only 11 out of the 24 countries, there is an official IR certification examination post completion of training.
- 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.
- Endovascular training opportunities also vary significantly at an international level with inconsistent levels of exposure for the trainees.
- Finally, only 3 national IR societies have trainee subcommittees in their structure.

Recommendations overview

There is slow progress in terms of obtaining subspecialty status for IR in European countries, while the duration, structure and certification of IR training remains heterogeneous. 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, especially regarding peripheral arterial and aortic work. More active involvement of the trainees in national and international IR societies is also deemed essential for the future growth of the specialty.

Introduction

The last few decades we have witnessed the explosion of minimally invasive procedures in interventional radiology (IR). Every year new indications and new techniques become available allowing us to treat more patients through a pinhole incision with fewer complications, shorter recovery times and typically without general anaesthesia. At the same time IR is not considered a “luxury” specialty anymore but rather, it is an essential asset in any hospital dealing with trauma, cancer and/or stroke, in such a way that it is hard to imagine a hospital without 24/7 IR services [1]. Despite this great progress, the way we have been training IR specialists has not changed significantly in recent decades.

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 in order to master these skills and become able to deal with the many different cases and the 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 embolisations, 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 organise 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 organises 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 in order to identify challenges and work towards solutions that will improve the way we will train the future IR specialists in Europe.

Methods

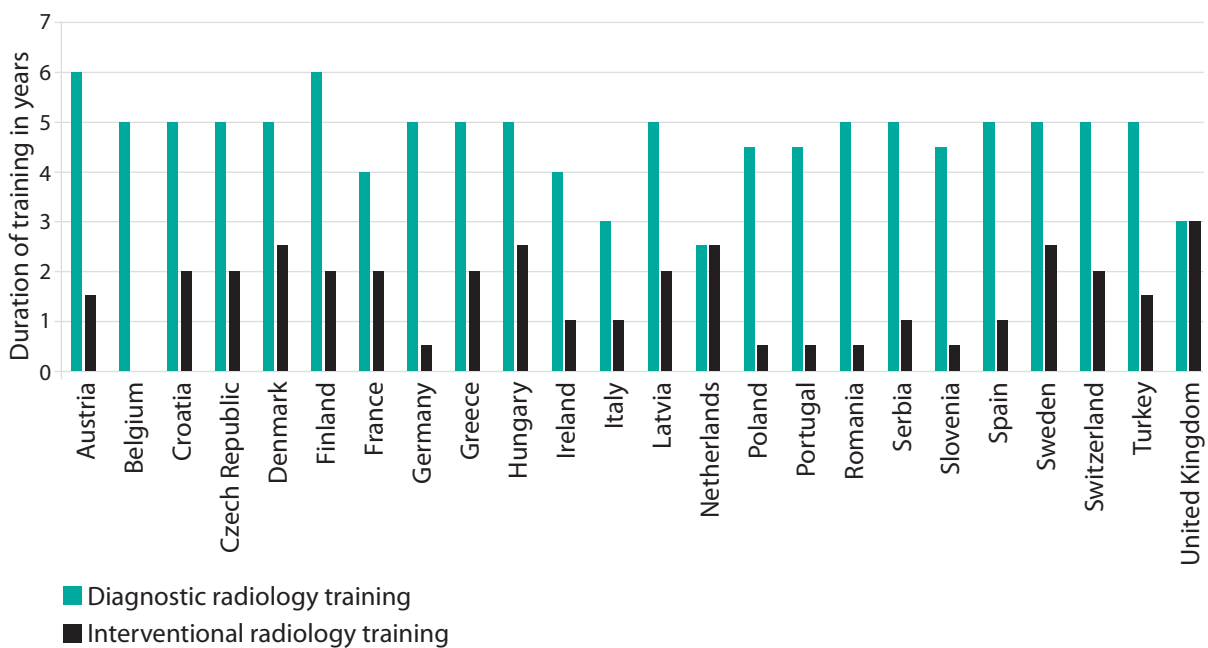
The members of the European Trainee Forum Subcommittee are representatives of their national IR societies and, as such, they were asked to provide a short paragraph regarding the structure of the IR training pathway in their countries. They were also given a questionnaire to fill out with more targeted questions regarding the IR training environment in the countries where they currently work. Responses were collected from November 2018 until March 2019. The participants were advised to consult 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 from completion of training. The question regarding the subspecialty status of IR in a country was also sent to the presidents of the national societies in order to confirm the accuracy of certain statements.

Results

The current report includes responses from 24 respondents representing the following countries: Austria, Belgium, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, the Netherlands, Poland, Portugal, Romania, Serbia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

In only 9/24 (37.5%) of the European countries interventional radiology has gained official subspecialty status. However, it appears that there is at least a basic structure to the available IR training programmes in most participating countries (15/24-62.5%) even if this is with sometimes significant variation within the different regions of the same country. Nevertheless, in some countries despite considerable progress, 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 4.9 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 9 countries offering up to a 1 year, 10 countries offering up to 2 years and only 5 offering more than 2 years of training.

Figure 1: 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 like the CIRSE's European Curriculum and Syllabus for Interventional Radiology (15/24), but only 11 countries have an official IR certification examination post 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
Croatia	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
Netherlands ⁴		x	x
Poland		x	
Portugal		x	x
Romania	x		
Serbia ⁵	x		x
Slovenia ⁶	x		
Spain		x	x
Sweden		x	x
Switzerland		x	x
Turkey 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 Turkey – 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 the 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 our 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

Czech Republic	3 months in vascular surgery department
Denmark	Very limited
France	3rd phase of the radiology residency dedicated to IR lasts 2 years
Hungary	6 months, incl. 1 month of vascular surgery, 2 months ER/ICU/invasive cardiology, 2 months free choice (gastroenterology, oncology, urology, etc.)
Ireland	IR clinic and patient rounds
Serbia	After one month at IR dept. during radiology residence, it is possible to participate in everyday cases and procedures under supervision.
Turkey	Patient and Clinical Management Course is included in the training programme

Finally, the opportunities for endovascular training appear to vary significant among the various European countries, with only four ETF representatives considering the opportunities for endovascular training in their country as sufficient (Table 3). In most countries (19/24) it was stated that the opportunities could vary significantly depending on the location of training within their country.

Table 3: Endovascular training opportunities during training

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

Apart from Portugal, where a national IR Society is currently being established, all of the 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), United Kingdom (BSIRT) and Germany. The majority of states have never previously conducted an IR trainee satisfaction survey, therefore there is very 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: Name of the national IR Societies

Austria	ÖGIR (Austrian Society of Interventional Radiology)
Belgium	IR Section of the Belgian Society of Radiology
Croatia	sIRcro (Croatian Society for Interventional Radiology)
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	ICIR Italian College of Interventional Radiology (as well as IESIR)
Latvia	LAIR (Latvian Association of Interventional Radiology)
Netherlands	NVIR (Dutch Society of Interventional Radiology)
Poland	IR Section operating under the auspices of PLTR (Polish Medical Society of 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)
Turkey	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 – Specialisation in Interventional Radiology and / or Interventional Neuroradiology.

The voluntary Level 1 – Basic Qualification in Interventional Radiology and Interventional Neuroradiology 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 specialised training. In general, this training is completed after acquiring the specialist recognition. This is where Level 2 specialisation in IR or INR begins. Specific training goals include the mastery of vascular IR procedures such as revascularisation procedures, aneurysm therapy and embolisation, slice-controlled diagnostic and therapeutic interventions as well as other non-vascular minimally invasive methods.

The specialisation 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 emboliate, particles, plugs etc. Module C

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

procedures incl. TACE or other tumor-specific embolisations, ablations, percutaneous tumor therapies

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

of intracranial arteries, mechanical recanalisation in stroke, local lysis in stroke. Module F Neurovascular

embolisation treatments (embolisation and similar procedures in intracranial aneurysms, embolisation

of intracranial and spinal vascular malformations, other intracranial embolisations). In the Level 2 training

programmes, interventional specialist 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 formally already 1/3 to 1/2 of the requirements for EBIR is met. Level 1 can be applied for before the board examination.

Belgium

In Belgium, interventional radiology is not recognised as a subspecialty of radiology and is not protected by diploma. So, every radiologist (and every physician including vascular surgeon, cardiologist, gastroenterologist, urologist etc.) could perform interventional procedures. Most of the time, IR is not well known by general population or even by healthcare professionals and it lacks funding by social security.

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

Croatia

Interventional radiology in Croatia has the status of a subspecialty under radiology.

The path to become an IR in Croatia involves 6 years of medical school, 1 year of internship and 5 years of clinical radiology residency. After they finish diagnostic radiology training, a further 2 years of subspecialty training is required at the end of which there is an oral exam in order to obtain IR certification. Only neuroradiology and IR are subspecialty fields under radiology and it has been like this for the last 15 years.

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, but typically only the procedures that are performed in the trainee's original hospital.

Czech Republic

Five years of training are required to obtain specialization in diagnostic radiology and before you can apply for an IR training programme. The Czech IR training curriculum consists of two years of practice at an accredited IR department with 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 Embolisation and chemoembolisation, 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 the CIRSE 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/procedures other than what their own department is specialised in.

Finland

There is a 2-year IR training programme after the 6 years of general radiology training in Finland. The main goal of IR training is to give the young IR 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. The training follows the European association of radiology and the CIRSE 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 examples CIRSE, ECIO etc.). At the end of the 2nd year, there is an examination which aims to assess the trainee 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 (1st year), residents receive training in the basics of radiology (e.g. physics, contrast media, radiologic anatomy, and emergency radiology). In the second phase (2nd-4th years) trainees rotate every 6th month in different radiology subspecialties (neuro, cardiovascular, abdominal, obstetrics & gynaecology, head & 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 (5th/6th year) trainees have two options: one year (5th year) of training in one or two areas of diagnostic radiology; or two years (5th and 6th) of training entirely spent in departments providing advanced interventional procedures in one of the 3 main domains of IR (oncology, vascular, neuro IR). Therefore, only residents doing 6 years of training are prepared to start an IR career.

Germany

In Germany there is no direct pathway in order to access interventional radiology (IR) training. Furthermore, other specialties may also perform certain IR procedures (such as angiography). In order to get into IR training, 4-5 years of diagnostic radiology must first be completed. Training in IR usually takes place in the last year of residency. In radiology, general training of interventional radiology is vaguely regulated within the education for board certification as a radiologist. Rather low numbers of procedures are required. More sophisticated optional training and certification is provided by the German society of IR (DEGIR). This type of certification is increasingly required to apply for a position in IR.

Greece

In order 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, you are eligible to apply for the IR subspecialty-training programme with a total duration of 2 years. 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 you have to 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 is 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

Interventional radiology gained subspecialty status in 2018. In the general radiology training programme, there are 3 months of IR training included, which can be undertaken in any accredited hospital. After completing the first speciality training program (radiology, vascular surgery or cardiology, etc.), doctors can then apply for an interventional radiology trainee position. Training takes 2 years for radiologists, 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 / year) is required. First training programme is planned to start in 2020.

Ireland

Radiology training in the Republic of Ireland is a five-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, however the number of trainees filling these positions varies year-on-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 135 hospitals distributed throughout Italy, in which (IR) is routinely practiced. 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 organised 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 have hands-on experience with simulators. Finally, the 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 is planned to start in academic year 2019/2020. At the moment, first official IR certificates were given to doctors who met the criteria up until 30.04.2019 including having a valid diagnostic radiologist certification and having performed at least 250 IR procedures of which at least 150 are endovascular IR procedures in the last 3 years. No national IR exam and EBIR exam is recommended on an individual basis. There are many opportunities for vascular training in Latvia, however, there are no opportunities for relevant clinical training.

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 or other). In the second part of 2.5 years, trainees spend 50% of their time at their subspecialty and 50% at other diagnostic subspecialties. There is no national IR exam. A fellowship is optional, but not obliged 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 315 members (IR's and IR-trainees) as of January 1, 2019.

Poland

In order to become an IR in Poland, you must undergo 5 years of radiology residency and be a board-certified radiologist. During the 5 years of general radiology residency you are obliged to spend 2 months in the angiography suite. There is also 6 months of additional internship, which you can use for IR training. Therefore, you can spend a maximum of 8 months on IR while undertaking general radiology training. This time can be prolonged if the department is happy to accommodate your 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 period. Trainees who are interested in IR can get additional training with up to 12 months 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 newly formed Portuguese Association of Interventional Radiology (APRI) have been working on the creation of an official subspecialty with a specific training programme (which includes ICU, surgical ward, at least 2 different IR units) that includes two possible ways in which to become an IR: (1) 24 months dedicated IR training if the radiologist has not had at least 12 months of IR training during his/her residency, with the salary being paid by the industry since at the moment there is no federal funding available; (2) 12 months of dedicated IR training in the remaining cases. In order to be recognised as IRs, all radiologists have to take and pass the EBIR exam at the end of their training programme.

Romania

Although practiced in Romania for over 20 years, IR is still an emerging specialty, because of the small numbers of available centres and practitioners. In the recent years, there has been increasing interest regarding IR and this is most likely due to the work of the Romanian Society of Neuroradiology and Interventional Radiology (SNRIR).

In 2018, the Romanian Ministry of Health recognised IR as a subspecialty within radiology. SNRIR created a curriculum plan, with designated training centres and tutors. The IR training pathway consists of 5 years of diagnostic radiology training, including a 3 months rotation of IR during residency, followed by an IR fellowship of 6 months. The right to practice will be obtained only after passing a national exam. SNRIR plays a key role in educating IRs, through courses, workshops and by disseminating information about educational opportunities and international grants.

Serbia

During radiology residency, residents have to spend four months at an IR department in order 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 organised 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. Also, during this time trainees are periodically obliged to take written exams or provide case reports. Furthermore, during this training, they are also obliged to fulfil clinical training, so they participate in everyday cases and procedures, which allow them to practice 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 three-member board. Each University has its own form of exam. EBIR is recommended but it is not compulsory.

Slovenia

In Slovenia, IR procedures are mainly practised by interventional radiologists. Undergraduate medical school of 6 years duration and six months of an internship is obligatory before applying for the residency in radiology. The residency programme duration is five years, with four years spent in general radiology rotations and one year of dedicated subspecialty training, whether this is IR or another subspecialty of diagnostic radiology.

Six months of interventional radiology rotation is included in the compulsory programme. Residents who wish to practice IR have to add between 3 months to 1 year of additional rotation 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 you 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 rotation and if you like that field you can spend 3 more months in the last year of residency in your 3-month elective rotation. Thus, a total of 6 months can be used in IR training. Officially, you are obliged to spend 3 months in the angiography suite, but this may vary depending on local availability. After the 4 years you qualify as radiology consultant, and you can then apply at any of the hospitals offering an IR training placement and you train by being the shadow of a mentor. Occasionally, these training placements are exclusively for IR but sometimes you have to cover the service needs of the radiology department. Fortunately, and starting from 2014, there is a recognised fellowship which offers a more specific training through SERVEI (Spanish Society of Interventional Radiology), although this has no official recognition by the Ministry of Health. There are only 10 fellowship positions offered and only 3 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 to get IR speciality.

Sweden

In Sweden there is no official IR training programme and in order to be trained in IR you first need to complete a 5-year general radiology training. The opportunities for IR training vary depending on the hospital one works at. Upon becoming a specialist in radiology, most people aspiring to work in IR will apply for a post as a specialist at a radiology department in a large hospital that has an established IR practice. However, at most departments one will be working with diagnostic radiology as well. IR is currently not an official subspecialty, but there is an official certification for IR, for which trainees may apply after becoming a specialist in radiology and subsequently having worked the equivalent of 2.5 years full-time in IR. There is a written description of competencies and aims that are required for application. This is an adaptation of the CIRSE Curriculum, adjusted to the Swedish reality. It is important to note though that vascular interventions like EVAR and peripheral vascular IR usually fall under vascular surgery. neurointerventions are usually performed by a selected group of neuroradiologists (or in some hospitals neurosurgeons).

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 hospital where IR's 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 centers perform neurovascular interventions.

Turkey

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

The Turkish Society of IR (TSIR) initiated a training programme including 4 courses for the Turkish Diploma of Interventional Radiology (TDIR) to standardise the education and to overcome the lack of certification. The CIRSE IR Curriculum & Syllabus were adopted while generating the programme. The criteria for TDIR include 2 years 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 explosive growth and impact upon modern medicine, interventional radiology is a relatively new specialty growing in a very competitive world. Having a brief past generally means that you have to work harder than others to establish yourself and sustain future growth. As a specialty, it appears that we are 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 for our 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 the future IR trainees in Europe. This report also provides information regarding the IR training pathways in certain European countries.

One of the first positive findings of this report is that in the majority of European countries, IR is not a recognised subspecialty, which 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 the recession-hit Europe is always a limiting factor, especially in South Europe, but it is likely that this problem will be gradually overcome. Moreover, despite the fact that there is a recognised 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 diagnostic radiology training (DR) first, which on average takes 5 years, 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 as a limiting factor in the process of attracting surgical-minded candidates.

The question of how long does it actually take to become a competent IR also appears to have variable answers according to your 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 in order 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 competences 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 our patients receive the best possible standard of care, no matter where they reside, but also in order to protect our specialty 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 organise their own national exams and there is an increasing number of IR specialists who recognise 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 controversies 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 he/she 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 recent survey of 296 trainees organised 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 our findings that in only 4 out of the 19 participating countries there is some form of clinical training. It is hard to argue against the need for more clinical training for IRs. The future of our specialty may well be dependent on this. There is an increasing number of voices within the IR community supporting the need for more clinical training in order to improve our 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, we believe that more can be done in order to improve involvement of trainees in those societies. According to our report, only 3 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, have a voice with regard to their professional future, while they develop leadership and management skills which are essential for the future of our specialty. At the same time, the trainees can contribute in the activities of their society with energy and enthusiasm.

Currently, we are in the process of analysing the data from the first global IR trainee satisfaction survey in collaboration with many national and international IR societies. This survey will provide us with additional information that can drive change and improvement in the way we train the future IR specialists.

Conclusion

Understanding national and local IR training standards across Europe is very important in order to identify challenges, drive positive change and address the issues, which impede the evolution of IR training. This is a dynamic process that requires constant monitoring, communication and adjustment at a national and international level. Currently, it appears that there is progress in terms of acquiring subspecialty status for IR in European countries, however, the duration, structure and certification of IR training remains remarkably heterogeneous across the continent. In addition, issues such as entry pathways to the specialty and opportunities for clinical training remain largely unresolved, with significant variations among European countries even with regards to core competencies of the IR curriculum such as endovascular training. Finally, more active involvement of trainees in national and international IR societies is deemed essential for the future growth of the specialty.

References

1. Makris GC, Uberoi R. Interventional Radiology-The Future: Evolution or Extinction? *Cardiovasc Intervent Radiol*. 2016;39(12):1789-1790.
2. Siragusa DA, Cardella JF, Hieb RA, Kaufman JA, Kim HS, Nikolic B, Misra S, Resnick SA, Saad WE, Vatakencherry G, Wallace MJ; Society of Interventional Radiology. Requirements for training in interventional radiology. *J Vasc Interv Radiol*. 2013 Nov;24(11):1609-12.
3. <https://www.cirse.org/trainees/etf/>
4. Heitkamp DE, Gunderman RB. The interventional radiology/diagnostic radiology certificate: asking the hard questions. *Radiology*. 2014 Nov;273(2):322-5.
5. CIRSE Executive Committee. European Curriculum and Syllabus for Interventional Radiology. February 2017.
6. Royal College of Radiology. Subspecialty training curriculum for interventional radiology. November 2016.
7. Liebig T, Holtmannspötter M, Crossley R, Lindkvist J, Henn P, Lönn L, Gallagher AG. Metric-Based Virtual Reality Simulation: A Paradigm Shift in Training for Mechanical Thrombectomy in Acute Stroke. *Stroke*. 2018 Jul;49(7):e239-e242.
8. <https://www.cirse.org/education/ebir/>
9. European trainee forum CIRSE. IR trainee survey in Europe; 2016. CIRSE Archives; November 2016.
10. The IR/DR certificate and the new IR residency. *IR Quarterly* 2014;2:28-30.
11. <https://www.ama-assn.org/residents-students/specialty-profiles/residency-match-7-most-competitive-medical-specialties>
12. British Society of Interventional radiology trainee committee. IR trainee satisfactions survey. BSIR archive; October 2016.
13. Kaufman JA. The interventional radiology/diagnostic radiology certificate and interventional radiology residency. *Radiology*. 2014 Nov;273(2):318-21.
14. Keller EJ, McGee KA, Resnick SA, Trerotola SO, Valji K, Johnson MS, Collins JD, Vogelzang RL. Who We Are and What We Can Become: An Analysis of Professional Identity Formation in IR. *J Vasc Interv Radiol*. 2017 Jun;28(6):850-856
15. Harsha AK, Schmitt JE, Stavropoulos SW. Match day: online search trends reflect growing interest in IR training. *J Vasc Interv Radiol*. 2015 Jan;26(1):95-100.
16. Cline J, Duncan DP, Molloy C, Zuberi OS. Survey of Intern Year Experiences for Those Going into Interventional Radiology: Comparing Surgery, Medicine and Transitional Year Internships. *Acad Radiol*. 2019 May 4. pii: S1076-6332(19)30175-8.
17. Zener R, Demers V, Bilodeau A, Benko AJ, Abraham RJ, Wong JK, Kachura JR. Clinical IR in Canada: The Evolution of a Revolution. *J Vasc Interv Radiol*. 2018 Apr;29(4):524-530.e2.
18. Murphy TP. Clinical interventional radiology: serving the patient. *J Vasc Interv Radiol* 2003; 14:401-403.
19. Baerlocher MO, Asch MR. The future interventional radiologist: clinician or hired gun? *J Vasc Interv Radiol* 2004; 15:1385-1390.
20. Levin DC, Rao VM, Parker L, Bonn J, Maitino AJ, Sunshine JH. The changing roles of radiologists, cardiologists, and vascular surgeons in percutaneous peripheral arterial interventions during a recent five-year interval. *J Am Coll Radiol* 2005; 2:39-42.

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)	

