



Training in thoracic surgery within Europe—the different pathways

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Abstract: Initiatives of European experts in surgical education revealed a series of variations and disparities among thoracic surgery training programs in Europe. Some problems were common to all European countries. To give a general overview of the problem, as clearly pointed out by Massard *et al.*, disparities among countries were identified in the certifying body, designation and domain of the specialty, length and content of the specialty, and number of operations required to obtain the national certification. A long list was developed of problems that need to be addressed before considering the possibility of a unified European training program. In 2014, the European Society of Thoracic Surgery-European Respiratory Society (ESTS-ERS) task force developed the first syllabus for our specialty and completed it with a training curriculum. These two documents provide a solid background not only for a unified European curriculum but also for successful trainee formation. Currently, certification and accreditation are country-specific due to different regulations among countries, making automatic recognition of certification impossible without individual evaluation. The European Section of Thoracic Surgery at the European Union of Medical Specialists (UEMS) is an office created for establishing a common standard of quality to certify the training of our juniors. Today, UEMS diplomas lack legal value in most European countries, adding just a quality-control diploma on top of the national certification and favoring internal selection within the country and certain international mobility of our specialists. On the other hand, information about the needs and expectations of European trainees is known based on the data obtained through surveys. Trainees all over Europe scored their training as highly satisfactory but identified areas of improvement. Among them, more formal training in research and an increased offer of international exchange programs were particularly important. Annual meetings, courses, and webinars are sound educational activities offered by scientific societies and well attended by trainees. Innovation and technology should be used to improve the quality of our training programs. The application of the syllabus and the training curriculum will improve our specialty. We are facing an exciting future in terms of education in thoracic surgery.

Keywords: Thoracic surgery training; Europe; harmonized syllabus; training curriculum; accreditation; surgical education

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Introduction

According to the European Union of Medical Specialists' (UEMS) main statement, each European member state is responsible to organize the training of its future medical doctors and the assessment of their medical competence to ensure they can provide the highest quality of care to patients. Although we have a common idea of our specialty, there are several discrepancies between countries in terms of quality and safety of care that need further global effort

to address. Some problems are common to all European countries and others not, but everywhere we are facing a changing paradigm on the best training for our specialty. In this paper, the term “thoracic surgery” or “general thoracic surgery” refers to the surgical discipline not including any cardiac procedure.

Since the initial training program developed by Halsted and Hopkins in the late 19th century (1), the key point of all the improvements had been adjusting the educational

offer in terms of the quantity and quality of the procedures and knowledge to the changing working situation. The increasing complexity of patients and the administrative work made the standardization of programs a must. The idea of a unified training curriculum was developed at the beginning of the 20th century in the US. However, in Europe, despite the foundation of the European Union in 1993, we are far from a unified supranational training program. To give a general overview of the problem in Europe, as clearly pointed out by Massard *et al.* (2), disparities have been identified with the certifying body, designation and domain of the specialty, length and content of the specialty, and number of operations required to obtain the national certification.

It is no doubt that trial and error over real cases is not the way to learn anymore (3). Accordingly, the whole learning process must be precisely established to allow the trainee to grow while ensuring the patient's safety within the specific hospital situation. Two pillars support this statement: the closed supervision by well-formed and committed attending surgeons and new teaching tools like the widespread use of simulation programs based on electronic, plastic, cadaver, and animal models, among others. This learning process is based on clear knowledge of what and how to learn and needs constant adaptations to the advancing world. For instance, the big technological revolution we have gone through has not finished yet. It is offering new opportunities, but it is forcing us to make a big adaptation effort because we should teach the best to our current trainees while we ourselves learn it. On the other hand, in most European countries, supervisors must have the relevant qualifications, experience, and training to undertake the role. Again, the degree of qualification varies among countries, with countries in which high levels of requirements are requested, such as the UK, and others where requirements are much lower. The objective of this paper is to provide an overview of the main issues about thoracic surgery training in Europe.

Theoretical and practical medical training in thoracic surgery

The joint effort of the European Union resulted in a large number of regulations that have not yet reached the medical field. The current lack of common regulations has resulted in variations and disparities among specialties that are largely affecting the training programs (3). These differences limit the mobility of specialists among countries

and create a gap in terms of patient attention, making the unification of the core curriculum of any specialty a must.

Pathways to the surgical specialty are diverse in Europe. Medical doctors can reach it after passing a national examination, such as in Spain or Italy. However, after the initial selective process, the trainee can enter directly into the specific path of thoracic surgery or can start a common core of general surgery before being able to choose the specialty, such as in Italy or France. In the UK, a common general surgery training of 2 years initiates the path. Afterwards, trainees go through the national selective examination before attempting to choose cardiothoracic surgery as their specialty, with special interest in the thoracic domain. They will receive a full cardiothoracic education. In the Netherlands, a complete thoracic surgery path comes after completing a general surgery residency program. On the other hand, in Belgium the specialty as most think of it does not even exist. Within certain limits, we Europeans stand out for diversity.

The situation analysis of the thoracic surgery training in the European countries developed by the European Society of Thoracic Surgery-European Respiratory Society-European Association of Cardiothoracic Surgery (ESTS-ERS-EACTS) task force in 2014 permitted to identify the differences and the core content shared by countries at that time. This was the first attempt to establish a syllabus for our specialty. The task force generated a document based on a broad consensus that considers the peculiarities and individual needs of each country (2). It can be used to guide the design of individual learning programs.

The ESTS-ERS-EACTS task force soon went one step further and developed a training curriculum (4). It accurately describes how to acquire the necessary knowledge and skills. Based on the 56 module sections initially created in the syllabus, the training curriculum describes the content to be learned, dividing it into theoretical and practical (skills), and mandatory and optional contents; the way to fulfill the requirements; and how to assess whether a trainee has obtained the knowledge. But implementation is still pending despite the broad agreement reached among relevant surgeons of several European countries. Probably the most updated national regulations are those published in 2021 in the UK by Shah *et al.* (5). This national curriculum describes in depth the whole process, including details about the theoretical and practical curriculum (number of procedures), duration of training, competences to be obtained, supervision, key roles in the certification process, evaluation, etc. It is a good national curriculum but adjusted

to a cardiothoracic profile.

Another interesting point in the technical training is the minimal number of procedures required to become certified. This is variable, but most countries require between 100 and 200 total procedures as the main surgeon. No data are available about the minimum number of supervised procedures. In Germany, for instance, until the number of procedures and a good quality of performance are reached, supervisors will not certify the trainee, who will continue in training.

Within the syllabus and the training curriculum, robotics is considered an optional module. When the widespread use of robotics occurred in our specialty, it was clear that progressive, standardized, and well-organized training should be offered to achieve proficiency in major robotic lung resection (4,6-9). But, at least in Europe, the learning process is currently led by manufacturers that designed the simulation activities and choose qualified thoracic surgeons who act as proctors mentoring the whole learning process until certification (6). However, there is broad agreement that training and certification should occur under the supervision of scientific societies (6). Following these two ideas, dedicated surgeons of the ESTS have joined in to form the ESTS-Robotic Working Group. Its main aim is to design and deliver a standardized, structured, and progressive program of training in robotics under the supervision of top-level robotic surgeons. This program should include online education, simulation, supervised procedures, evaluation, and credentialing (6). It also will include a fellowship opportunity. Fulfilling all the requirements will be necessary to achieve certification from the Society.

Current senior surgeons learned even complex procedures in real patients. Few opportunities for surgical simulation were available until recently, which could have had an impact on their patients' quality of care. Nowadays, electronic simulation and 3D printing can help any surgeon to understand and perform anatomical lung resection before executing it on a real patient. Therefore, they have clear advantages, considering the risks and the variety of procedures to be learned in thoracic surgery (10,11). Simulation should be a basic part of training. Medical training facilities working with cadaver models can be found all over Europe. However, facilities offering animal models are not so widespread. Animal models can be used live or in parts. Live animal surgery must comply with current regulations and is expensive. However, the possibility to work with partial animal models is interesting, as it provides real tissue models. The ESTS encourages the use

of simulators as part of the practical activities in the annual meeting and in different courses.

Learning a surgical specialty where skills are a key part of the global knowledge needs specific pathways. In this context, visual learning is relevant. Technological advances have provided previously unimaginable sources of knowledge, among them, virtual video libraries. Everywhere, surgeons are collecting valuable videos of their cases that can be shared on large platforms. Besides other platforms, this is the case of the ESTS video library. The ESTS is collecting useful videos submitted to the annual meeting, ESTS webinars, and images from other extraordinary sources. These videos provide dedicated images that can be used for individual and group learning. Nowadays, anyone can search the web for almost any procedure and find it. But technological advances go further. They are helping improve the educational contents of videos by easily editing key steps of the procedures or by evaluating the performance of surgeons using artificial intelligence algorithms (12,13). Incredible new educational opportunities are on the way.

Training in complementary knowledge: non-technical skills and research

Not only dedicated theoretical or practical knowledge should be taught to our trainees. There are other important values that should complete their education, such as professionalism, ethics, and non-technical skills (1). These skills are not innate, but can be taught, evaluated, and refined over time (14). Communication, teamwork skills, patient safety, quality improvement and ethical codes are considered professional values to learn. Again, the training curriculum (4) considers this an important area of improvement. It includes a mandatory module dedicated to attitude and non-technical skills development. Within this area, the ESTS is again reinforcing aspects related to scientific communication through a dedicated course. This course has been designed to fill one of the gaps discovered in the general analysis of the European situation (15).

According to the ESTS Learning Affair Committee survey published in 2014 (16), among others, access to lab research is a topic that definitively needs further impetus in the training programs. In Europe, not only are few sources of funds available, limiting the access to full formal research, but training in research is also scarce (15). Not every trainee should be involved in research, but they should at least understand the methodology for high-quality research

(15,17). One of the sources for formal research currently available is the fellowship program offered annually by the ESTS Biology Club. Up to now, due to the difficulty securing funds for this purpose, a minority of candidates enjoyed that kind of support. The ESTS is working to improve its offer by increasing the number of juniors who can benefit from this aid.

Accreditation

Accreditation is a key component of the training because we should be delivering training on relevant topics. Therefore, we need to verify whether trainees have learned those contents. However, this is not universal either. Most countries ask for a final examination for credentials, but no examination is required in Spain. In Spain, certification relies on the coordinated evaluation of the attending surgeons and the hospital director of education after a thorough evaluation of the candidate. The process relies on the annual review of progress, including a complete log book of procedures. In most countries, the training program lasts 5 or 6 years (as a mean), except in Germany, where certification is achieved after a variable number of years.

As previously reported (18), licensing and registration of medical doctors in Europe depend on national regulations impossible to summarize. For instance, Hungary and Germany have a complex bureaucratic process not only for foreign-trained specialists but also for local doctors. Denmark has two different systems of registration depending on the origin of the foreign doctors. Those coming from Nordic countries with bilateral agreements go through a specific procedure different from doctors of other European countries. Registration and licensing of non-European foreign specialists are not unified either. Because they are country-regulated, international political agreements have a key role in the process.

The European Section of Thoracic Surgery at the UEMS (19) is an office created for establishing a common standard of quality to certify the training of our juniors. Although the current accreditation was established in 2013, today UEMS diplomas lack legal value in most European countries, adding just a quality-control diploma on top of the national certification and favoring internal selection within the country and certain mobility of our specialists.

Currently, 26 countries participate in the European Section of Thoracic Surgery at the UEMS. For those who want to be accredited, two different examinations can be taken. One is organized by the UEMS itself [European

Board of Thoracic Surgery (EBTS)], in which the ESTS collaborates, and the other is organized by the EACTS and the European Board of Cardiothoracic Surgery (EBCTS). Up to now, the EACTS controls its exam, which is administered during its annual congress, and provides a cardiothoracic recognition (EBCTS). Currently, both certifications have the same legal value. UEMS members of the thoracic section are working to unify both exams in the near future.

The EBTS examination is organized annually by the UEMS. Since the initial exam in 2013, 148 thoracic surgeons have become fellows of the EBTS, and 53 were trainees. Currently, only 51 of trainees have passed the exam. The other two have the second exam pending. Sixty-one were accredited using the grandfather clause, and 36 EBCTS members have been converted to the EBTS. Candidates are eligible for examinations only after obtaining their national certification. The EBTS certification cannot serve as a working permit. The current certification process has two exams separated by at least 2 years of independent practice. The first exam is a multiple-question exam normally held in the UEMS Brussel facilities or at the annual meetings of the ESTS. The second exam is an oral examination based on discussion of clinical case scenarios. For more information, visit Thoracic Surgery-Examination (<https://uemsthorax.eu/>).

Discussion

The main challenge to training thoracic surgery in Europe is the harmonization of the training between countries (20). Due to the political structure of the continent, changes will be proposed but keeping the freedom to adapt it to the local/regional/national context (21). In Europe, the process started with the design of the syllabus and the training curriculum. Meanwhile, scientific societies, such as the ESTS, are developing and improving a large school to share the most updated knowledge. It would be desirable for national regulations to change, adapt, and incorporate the harmonized curriculum. The thoracic leaders of each country must direct this process. The UEMS will likely have a key role in the process and once the change has happened. It will supervise and play a central role in accreditation by certifying the professional competency of trainees and evaluating the training units all over the continent. It looks like a difficult process, but all specialties have the same problem therefore a common solution needs to be developed.

Despite the gender problem recently uncovered (22), the

large number of female students entering medical school is quickly changing the number of females in the surgical field. Thoracic surgery is not an exception. Published data are worrisome (23) due to the high percentage of female trainees who, for example, show a lesser degree of autonomy reported by supervisors. Efforts by the scientific societies are being made to reverse this situation. Training opportunities should be the same for both sexes.

Regardless of differences, the uniting factor for trainees is the desire for the best possible training to achieve a satisfactory level of competence (15). It is important to know that trainees across Europe are satisfied with their training (2,15,16), although they pointed out areas for improvement. A general interest exists among trainees in pursuing training across Europe. However, limitations such as language barriers, differences in certification, and problems obtaining funds limit the enriching interchange of our juniors across countries (16). Therefore, they attend high-quality courses organized by relevant European scientific societies. The ESTS is especially involved in education and has developed a variety of educational tools, such as courses covering from basic to advanced theoretical knowledge and practical skills, thereby filling some of the gaps shown in the trainees' surveys. Through those events, trainees start to create their professional social network.

Clinical training based on active engagement of the trainee, to whom relevant content is presented and proper feedback is offered, has a high probability of success. That is why training programs cannot be makeshift. Both the training syllabus and the training curriculum are relevant tools and should be taken into account for quality improvement of any training program within Europe. These two documents provide a solid background not only for a unified training curriculum but also for successful trainee formation. At the local level, a precise progressive stepwise program must be developed and should include the possibility for scheduled simulation and, whenever possible, facilitating external exposure in other institutions. Finally, robotics is becoming a relevant surgical tool that should be considered within our training programs, and certification should be under the warranties of the scientific societies.

Conclusions

In conclusion, Europe stands out for diversity, which is not always positive. The possibility of a common curriculum based on the syllabus and the training curriculum will improve the quality of the education and increase the

mobility of specialists within Europe. The effort to implement a common training curriculum and the acknowledgement of the UEMS as a European certifying office will lead to a more harmonized situation. Meanwhile, training in thoracic surgery would benefit from the diverse opportunities offered by technology and innovation. The variety of high-level educational activities is increasing the opportunities to learn and is creating a social network for future thoracic surgeons. Although programs must be adequate, trainees need to remember that it is their motivation and self-directed learning that will lead them to fully develop.

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