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# Training curriculum for European thoracic surgeons: a joint initiative of the European Society of Thoracic Surgeons and the European Respiratory Society

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## Abstract

Because of the differing definitions of the margins of thoracic surgery as a specialty and the variability in the training curricula among European countries, the European Society of Thoracic Surgeons formed a task force to elaborate a consensual proposal. The first step comprised creating a harmonized syllabus that was completed and published in 2018. This publication presents a proposal for a curriculum upon which the task force and the external expert reviewers have agreed. The curriculum was developed by the task force: each module and item describe the expected level of knowledge, skills and attitudes to be attained by the participants; learning opportunities, assessment tools and minimal clinical exposures have been defined as well. Competence in terms of non-technical skills has been defined for each module according to the CanMEDS (<http://www.royalcollege.ca/rcsite/canmeds/canmeds-framework-e>) glossary. The different modules were subsequently submitted to an internal and an external review process and re-edited accordingly before final validation. The authors hope that this document will serve as a roadmap for both thoracic surgical trainees and mentors. It should further guide continuous professional development. However, evolving scientific and technological advances are expected to modify the diagnosis and treatment of diseases and disorders in the future and hence will mandate periodical revisions of the document.

**Keywords:** Thoracic surgery • Education

## INTRODUCTION

Several directives of the European Union have addressed the obligation of mutual recognition of professional qualifications between member states in order to favour mobility among European countries. This approach applies more specifically to medicine, a so-called 'regulated profession' [1], where obtaining access to training is often limited by a 'numerus clausus' principle. However, we know that there may be considerable variations among European countries for a given specialty that concern

both the content of training and the training curriculum. Although the patients are suffering from the same disease, both health care systems and training of health care providers differ markedly. From the results of a situational analysis conducted by the European Union of Medical Specialists (Union Européenne des Médecins Spécialistes; UEMS) Section of Thoracic Surgery, we were informed that this situation applies particularly to thoracic surgery [2, 3]. The official designation of the specialty in many European countries is thoracic surgery, although in some of those countries, thoracic is linked to cardiac or vascular under

different names: cardiothoracic or thoracic and cardiovascular. Thoracic surgery does not exist as such in Belgium and Luxembourg. As a result, the content of specialty training is subject to huge variations. Similarly, duration of training varies from 5 to 10 years; the certifying body has its national specificities; and the amount of operating experience to be achieved during training is set differently. A similar situation has been obviated concerning pulmonary medicine [4].

This problematic issue has concerned the European Respiratory Society (ERS) since 2005, when it launched the HERMES initiative, where HERMES stands for Harmonized Education in Respiratory Medicine for European Specialists [4]. The principle of this initiative was the consensual development of a training curriculum achieved by following a step-by-step protocol: starting from a situation analysis, the working group drafted a syllabus validated by large-based Delphi rounds and subsequently developed the curriculum according to the modules and items of the syllabus. After the success of the first project on Adult Respiratory Medicine, which launched in 2005 and led to an accredited European examination, ERS developed several other projects, such as paediatric respiratory medicine, respiratory intensive care, sleep medicine, physiotherapy and thoracic oncology [5–10].

## THORACIC SURGERY

The European Society of Thoracic Surgeons, to date the largest society devoted to general thoracic surgery worldwide, was invited to participate in the task force on thoracic oncology [10]. Its representatives (Gilbert Massard, Alex Brunelli, Dirk van Raemdonck) felt that there was an opportunity to set up a task force together with the Assembly for Thoracic Surgery and Transplantation of the ERS, building on the considerable experience accumulated by the ERS in terms of curriculum development. This project was approved by the leaderships of both societies and was launched in 2014. Thoracic domain representatives of the European Association for Cardiothoracic Surgery (EACTS) were also invited to participate in this joint ERS-ESTS project. Thoracic surgery covers a wide variety of diseases and disorders concerning the lung, trachea, pleura, diaphragm, mediastinum and upper gastrointestinal tract [11]. Over the past decade, there has been a steep increase in high-technology skills associated with lung transplants, extracorporeal respiratory support, minimally invasive surgery by video thoracoscopy or robotic assistance, intrapleural chemotherapy, electromagnetic bronchovascular navigation and 3-dimensional modelling of segmental anatomy. Thoracic surgery hence appears as a highly specialized field whose specialists are appreciated as interdisciplinary partners not only in oncology but also for complex infectious diseases, trauma care, chest wall reconstruction and others. Thoracic surgeons are probably the surgeons with the broadest knowledge of oncology, because they participate on a regular basis on multidisciplinary tumour boards covering at least thoracic oncology, colorectal tumours, urogenital cancers, breast cancers, sarcomas and lymphomas. The need for high-quality training programmes covering all aspects in terms of knowledge and technical skills became obvious. Last but not least, the UEMS accredited a European Board of Thoracic Surgery examination in 2013. As a result, it appeared mandatory to set up a syllabus for the specialty and to develop a training curriculum [2, 3].

## CURRICULUM DEVELOPMENT

The task force was co-directed by Gilbert Massard (ERS) and Dirk van Raemdonck (ESTS). ERS was further represented by Stefano Elia, Martin Huertgen, Laureano Molins and Dragan Subotic; the ESTS representatives included Hasan Batirel, Alex Brunelli, Kostas Papagiannopoulos and Gonzalo Varela. Hasan Batirel also served as the UEMS representative. We invited Paul van Schil to represent the thoracic domain of the European Association for Cardio-thoracic Surgery and Anna Elisabeth Frick, as the delegate of the ESTS early career members.

The first 2 steps of our work, i.e. the situation analysis and the syllabus, were published in 2018 [2, 3]. Given that the margins of the specialty differ from country to country, the Delphi rounds helped us to outline the core content shared by any country in terms of knowledge and skills: the latter is outlined in the so-called mandatory modules [2, 12]. Less consensual issues, such as lung transplants, paediatric thoracic surgery and diseases and procedures of the oesophagus and the cardia, are presented as optional modules. In fact, we sought a broad-based consensus representing the whole European continent by inviting all ESTS members and all members of the ERS assembly for thoracic surgery and transplantation to participate [2].

It is useful to remember that a syllabus includes a list of the knowledge and skills required for European recognition, whereas a curriculum describes how to acquire the knowledge and skills needed to achieve the prescribed learning outcomes. As we did for previous ERS-driven curriculum development projects, we reviewed the whole syllabus in order to detail the learning process module by module, item by item [13].

For each item, we described separately the level of competence to be achieved in terms of knowledge, skills and professional attitudes [13]. For knowledge and skills, we used Bloom's taxonomy, whereby groups of transitive verbs define the cognitive competence levels: remembering, understanding, applying, analysing, evaluating and creating [14]. For attitudes and non-technical skills, we utilized the CanMEDS glossary [15, 16]. For each module, we suggested specific specialized articles and, in particular, the 'ESTS Textbook of Thoracic Surgery', ESTS-driven educational events and existing international guidelines. Similarly, we listed the assessment tools to be used by mentors [17]. Education specialists first trained the task force to use this complex method, which was applied in previous ERS projects and detailed precisely in the publication of the respiratory physiotherapy curriculum [9]. Subsequently, modules were allocated to pairs of task force members and the manuscripts were reviewed during face-to-face meetings. The final draft was sent to external reviewers and modified according to their comments. The complete document is presented as additional material ([Supplementary Material](#)).

## DISCUSSION

To the best of our knowledge, the final draft is the most detailed curriculum for thoracic surgery published thus far. The final draft has been validated by a consensus of experts from all over Europe, accounting for national variability. Because it encompasses input from educational specialists, it is compliant with contemporary concepts of medical education, including Bloom's taxonomy to characterize learning domains and Miller's model of

competence for clinical skills [14, 17]. Miller's pyramid has been integrated not only for psychomotor skills but also for cognitive skills, whereby assessment of learning outcomes is evaluated by knowledge-based testing for 'knows' and 'knows how' and by skills assessment for 'shows how' and 'does'.

The current curriculum may be used in its entirety as a general recommendation but can also be used on a modular basis to organize educational events or courses, with a clear definition of desired competence levels and recommended assessment tools (Table 1). From the learner's perspective, the European thoracic surgical trainees represent the main target audience. The curriculum indicates what knowledge and which skills should be developed and appears to be a useful roadmap for our trainees. The impact of a Moodle-based online curriculum has been measured on a population consisting of North American thoracic surgical trainees: the scores of high-volume users who took in-service training examinations were improved compared to those of low-volume users [18]. Accordingly, trainees may plan to complete their training by participating in fellowships to learn items that are not available in their programmes or by attending dedicated educational events offered by the ESTS and others. We stressed the development of non-technical skills and professional attitudes, for which the CanMEDS physician competency framework edited by the Royal College of Physicians and Surgeons of Canada has been most helpful [15, 16]. Briefly, there are 7 overlapping roles: medical expert, communicator, collaborator, leader, health advocate, scholar and professional. The medical expert represents the linchpin of the framework. The communicator establishes relationships with the patients and the relatives; the collaborator is part of a team of different specialists and different categories of health care professionals; the leader guides a team and is responsible for decision-making; the health advocate is dedicated to improving health at the community level; the scholar is committed to life-long learning and continuous professional development; the professional delivers the best possible care while being guided by professional ethics. Recent publications stressed particularly the importance of developing non-technical skills in a team approach, for instance to improve the planning and safety of a minimally invasive lobectomy [19] or to manage an operating room crisis [20].

The same curriculum may also serve as a guide for continuous professional development and preparation for recertification for certified specialists and, more particularly, for colleagues who practice outside of large academic institutions.

From the teacher's perspective, the curriculum may be helpful to implement training programmes and to organize teaching seminars or skills laboratories. Additionally, because it lists expected competence levels and tools for assessment, it may be used to organize in-training evaluations and examinations.

The authors hope that this curriculum will be disseminated through the national societies for thoracic surgery and will be followed for both training programmes and examinations. The UEMS-accredited European Board of Thoracic Surgery concentrates on mandatory modules when organizing its yearly examination. The examination was in fact reorganized in 2019 into 2 parts: (i) part 1 tests knowledge with multiple choice questions and (ii) part 2 is an oral examination that uses standardized clinical vignettes to test cognitive skills. Other tools to be developed are self-assessment tools for both trainees and practicing thoracic surgeons to allow self-diagnosis of weak areas to be covered by appropriate learning resources.

The task force intentionally limited the description of the curriculum to the desired competency levels, available learning

**Table 1:** Current and future challenges in specialty training

Target areas for the curriculum
Specialty training
Continuous professional development
Challenges for the future
Improve transition towards independent practice
Teach non-technical skills!!
Adapt to quickly evolving technology
Popularize the European Board examination

resources and ways to assess learning outcomes. We avoided 2 important debates. (i) Should we train only monospecialists in thoracic surgery or should the training include a common trunk with cardiac surgery? Some arguments favour exposure to cardiac surgery, such as the increasing utilization of extracorporeal membrane oxygenation in thoracic surgery. (ii) The second issue is whether a thoracic surgical trainee should be exposed to general surgery and other surgical specialties, or non-surgical fields such as pulmonary medicine and intensive care. The present curriculum includes general knowledge and skills in surgery and pulmonary medicine, which can be acquired in medical school, during the first few years of training in thoracic surgery and during rotations in other specialties. For this reason, it is unlikely that a resident would be able to gain all the knowledge and skills in this curriculum in a single department or institution. However, real life data are disappointing. A recent survey among residents engaged in an integrated cardiothoracic surgical training programme disclosed that fewer than 40% of trainees were exposed to endoscopy and only 30% had experience in pulmonary medicine [21]. An additional question is the duration of training. UEMS recommends a minimal duration of 5–6 years. We know that, in fact, duration varies from 5 to 10 years among UEMS member states [2]. The truth is that the delay from the beginning to obtaining a confirmed competence level is modulated by individual learning abilities and manual skills and by the opportunities offered by the training programme. In real life, many health care organizations also estimate that a considerable part of the work may be performed by the trainees, who are less expensive than certified consultants; this practice tends to prolong the duration of the trainee status. The opinion of the task force is challenged by existing national regulations, which also adhere to the health care needs of their respective countries.

A further challenge for the present curriculum is mainly on the skills side [22]. With rapidly evolving new technologies, we anticipate that new diagnostic tools or surgical procedures will raise specific training issues. In a voluntary survey of recent graduates, 56% reported that they lacked confidence with robotic pulmonary resections; 45%, with minimally invasive oesophageal procedures; and 61%, with robotic oesophageal surgery [23]. To a lesser degree, innovations at the level of medical therapies, which may have an impact on multidisciplinary treatment strategies, will interfere with specialist education in the future. These facts stress the clear need for periodic revisions of the present document.

## SUPPLEMENTARY MATERIAL

Supplementary material is available at *EJCTS* online.

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## Author contributions

**Gilbert Massard:** Conceptualization; Investigation; Methodology; Project administration; Validation; Writing—original draft; Writing—review & editing. **Nathalie Tabin:** Conceptualization; Methodology. **Lars Konge:** Formal analysis; Methodology; Validation. **Anna Elisabeth Frick:** Writing—original draft. **Hasan Batirel:** Writing—original draft. **Alessandro Brunelli:** Writing—original draft. **Stefano Elia:** Validation; Writing—original draft. **Martin Huertgen:** Validation; Writing—original draft. **Laureano Molins:** Writing—original draft. **Kostas Papagiannopoulos:** Validation; Writing—original draft. **Dragan Subotic:** Writing—original draft. **Paul van Schil:** Writing—original draft. **Gonzalo Varela:** Validation; Writing—original draft; Writing—review & editing. **Dirk van Raemdonck:** Validation; Writing—original draft; Writing—review & editing.

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