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## An international survey of training in adult intensive care medicine

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**Abstract** *Objective:* The aim of this international survey of training in adult intensive care medicine (ICM) was to characterise current structures, processes, and outcomes to determine the potential for convergence to a common competency-based training programme across national borders. This survey is the first phase of a 3 year project which will use consensus methods to build an international competency-based training programme in ICM in Europe (CoBaTrICE). *Methodology:* A survey by questionnaire, email, and direct discussion was undertaken with national ICM representatives from seven geographical regions. *Results:* Responses were obtained from 41 countries (countries which share common training programmes were grouped together;  $n=38$ ). Fifty-four different training programmes were identified, 37 within the European region; three (6%) were competency-based. Twenty (53%) permitted multidisciplinary access to a common

training programme; in nine (24%) training was only available within anaesthesia. The minimum duration of ICM training required for recognition as a specialist varied from 3 months to 72 months (mode 24 months). The content of most (75%) ICM programmes was standardised nationally. Work-based assessment of competence was formally documented in nineteen (50%) countries. An exam was mandatory in twenty-nine (76%). *Conclusion:* There are considerable variations in the structures and processes of ICM training worldwide. However, as competency-based training is an outcome strategy rather than a didactic process, these differences should not impede the development of a common international competency-based training programme in ICM.

**Keywords** Intensive care · Critical care · Training · Education · Curriculum · Professional competence

### Introduction

European legislation demands the free movement of professionals and supports mutual recognition of medical qualifications between member states [1, 2, 3]. This implies training to common minimum standards but at present there is no formal legislative basis to impose such standards. For intensive care medicine (ICM) at least, past reports of national training programmes demonstrate diversity in access, structures, assessment, accreditation,

and regulation of ICM training within Europe [2, 4, 5, 6] and worldwide [7, 8, 9, 10].

For harmonization and free movement to become a practical reality there needs to be international agreement about a common 'end product' — specialists with a minimum standard of knowledge, skills, attitudes, and behaviours. Competency-based training makes this convergence possible by defining these skill-sets a priori, and assessing their acquisition during training in the workplace (see Electronic Supplementary Material, S4: Glossary, Appendix I).

The ESICM survey in 1998 did not specifically identify any competency-based training (CBT) programmes at that time [5]. Since this report, efforts to harmonise standards of ICM training through the provision of guidelines and recommendations have been made at both European and international levels [2, 10, 11, 12, 13]. However, there is still no formal international consensus about what the outcomes of specialist training should be.

Competency-based training in Intensive Care Medicine in Europe (CoBaTriICE) is a unique project which will use consensus techniques to define the competencies required of a specialist in ICM, link these competencies to a syllabus and relevant educational resources, and provide guidelines for the standardised assessment of competence in the workplace. In the first phase of this project, we have conducted a survey of adult intensive care training programmes throughout Europe and other world regions. The purpose of this survey was to determine whether CBT is now being developed for ICM, and to review current national educational structures, processes, and outcomes in order to explore possible barriers to implementation. Preliminary results have previously been presented in abstract [14].

## Methods

Organisations responsible for training in intensive care medicine in Europe and six other geographical regions were invited to participate in CoBaTriICE. A specialist in ICM who had the explicit support of their national society or training organisation was identified as the National Coordinator (Europe) or Reporter (other world regions) in each country which agreed to participate.

A self report survey was distributed by email to these national coordinators and reporters. Following initial review, further clarification was sought by email, telephone and personal meetings over 6 months. The survey determined for each country the structure, content and format of ICM training, methods of assessment and accreditation, and the regulatory framework (Table 1 and ESM: S5: Appendix II).

The diversity of definitions meant that it was not sufficient simply to ask if a training programme was competency-based (although this was asked directly during the clarification period); we attempted to obtain training documents, curricula, and assessment guidelines, where available, in order to identify the fundamental components of a CBT programme outlined in Appendix 1. The extent to which the characteristics of CBT (Appendix 1) are applied within current programmes was also explored within the questionnaire (See ESM: S5)

## Results

### Responses

Survey responses were obtained from 41 countries, 29 of which were in the European region. Clarification was sought from all participants; four did not respond, thus data for these countries is incomplete.

Countries which share common training programmes have been grouped together; these are Denmark, Norway, and Sweden (Scandinavia), and Australia and New Zealand (ANZ). Data analysis is therefore based on 38 countries or regional groupings. In ten (26%), national ICM training programmes are new or their development is nearing implementation. For this survey we have therefore used these new programmes as the current descriptor (Table 1).

### Structures

Formal adult ICM training programmes are available in 36 of the 38 countries or regions surveyed. ICM training is not available in Cyprus as there is no university medical school. In the Ivory Coast, ICM is an integral part of a 12-month Emergency Medicine programme and cannot be identified explicitly.

Fifty-four different training programmes have been identified, 37 of which are within the European region. There is considerable diversity in the way these programmes are structured, with some countries offering a single training programme, others multiple, and each training programme may be accessed by one or by several pathways. The structure of these training programmes can be classified according to four models: supra-speciality (39%), single sub-speciality (22%), multiple sub-speciality (30%), and primary speciality (9%) (Appendix 2).

#### *Supra-speciality model*

The most frequent structure of training is the supra-speciality model which permits multidisciplinary access from a range of base specialities (for example, internal medicine, surgery, anaesthesia) to a common ICM training programme. Training may be undertaken during and/or after base speciality training in a modular or single block format.

#### *Single sub-speciality model*

Thirteen European countries (34%), offer a single sub-speciality model of training in which access to ICM is limited to trainees from anaesthesiology. In 9 of these 13 countries, this is the sole model of training, and only anaesthetic trainees can undertake an ICM programme. The Nordic countries (Scandinavia and Finland) share a

**Table 1** Summary of data

	Argentina	Austria	ANZ	Belgium	Brazil	Bulgaria	Canada	Croatia	Cyprus	Czech R	Egypt	Estonia	Finland	France	Germany	Greece	Hong Kong	Hungary	India	Indonesia	Ireland	Israel
Number of formal ICM training programmes	1	3	1	1	1	1	1	1	0	1	3	1	2*	2	7	1	2	2 p	2	1	1	1
Models of training (Su/Si/Mu/Pt)	Su	Mu/Su	Pr	Su	Su	Si	Su	Su	-	Si	Mu	Si	Su/Si	Su/Si	Mu	Su	Pr	Si/Su	Su	Su	Su	Su
Multidisciplinary access to ICM training	Y	Y	Y	Y	Y	N	Y	Y	-	N	-	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
Number of National ICM curricula	0	2	1	1	1	1	1	1	-	0	-	1	2	2	7	0	2	2	0	-	1	1
Competency-based training	N	N	N	N	N	N	Y	N	-	N	N	N	N	N	N	N	N	N	N	N	N	N
Training under review/dev	N	N	N	N	N	N	N	N	-	N	Y	Y	N	N	N	N	N	N	N	N	N	N
Type of accreditation (D/B/S/No)	S/D	D/B/No	S/D	D	D	B	D	D	-	B	B	B	D/B	D/B	D	D	S/D	D	D	D	D	D
Assessment of progress (F/I)	I	F	F	F	F; I	F	F	F	-	I	-	I	I	F	F	I	F	F	I	I	I	I
Exam (M/O/No)	M	M/No	M	M	M	M	No p	O	-	M	M	M	M	M	O	M	M	M	M	M	M	M
Named coordinator for training	Y	Y	Y	Y	Y	Y	Y	Y	-	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Unit approval/minimum standards teaching centre	Y	Y	Y	Y	Y	Y	Y	Y	-	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Approval via external visit	N	Y	Y	Y	Y	Y	Y	Y	-	N	N	N	N	N	N	N	N	N	N	N	N	N
Inadequate trainers' time is a national challenge	Y	N	N	N	N	N	N	N	-	N	N	N	N	N	N	N	N	N	N	N	N	N
Inadequate trainees' time is a national challenge	Y	N	Y	Y	Y	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N
Inadequate local educational resources/ internet access	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
There is formal protected teaching time for trainees	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	Y	N	N	N	N	Y	N	N	Y
Undergraduate ICM training (F/I/No)	No	No	I	F	F	F	F	I	-	I	F	F	F	F	F	I	F	F	No	I	F	F

**Table 1** continued

	Italy	Ivory Coast	Latvia	Lithuania	Malaysia	Netherlands	Poland	Portugal	Scandinavia	Slovakia	Slovenia	Spain	Switzerland	Turkey	UK	USA	TOTAL
Number of formal ICM training programmes	1	0	1	1	1	1	1	1	1*	1	1 p	2	1	1 p	1	4	54
Models of training (Su/Si/Mu/Pt)	Si	Si ^	Si	Si	Su	Su	Si	Su	Si	Si	Su	Pr/Si	Pr	Su	Su	Mu	-
Multidisciplinary access to ICM training	N	Y^	N	N	Y	Y	N	Y	N	N	Y	N	Y	Y	Y	Y	Y=25
Number of National ICM curricula	1	1^	1	1	1	1	1	0 (p)	1	1	1	1	1	1	1	4	42
Competency-based training	N	N^	N	N	N	N	N	N	N	N	N	N p	N	N	N	Y	Y=3
Training under review/dev	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	Y=10
Type of accreditation (D/B/S/No)	B	-	B	B	No	D	D	D	No	B	D	S/B	D/S	D	D	D	-
Assessment of progress (F/I)	F	-	I	F	I	I	F	I	I	I	F	F; I	F	I	F	F	F=19
Exam (M/O/No)	M	M^	M	M	No	M	M	M	M	M	M	No	M	O	O	M	-
Named coordinator for training	Y	Y^	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y=33
Unit approval/minimum standards teaching centre	Y	Y^	N	Y	Y	Y	Y	Y	Y	N	Y	Y/N	Y	N	Y	Y	Y=32
Approval via external visit	Y	N	N	N	N	Y	N	N p	Y/N	N	Y	N	Y	N	Y	Y	Y=16
Inadequate trainers' time is a national challenge	N	Y	N	Y	Y	N	Y	Y	Y	N	N	Y	N	N	Y	Y	Y=27
Inadequate trainees' time is a national challenge	N	N	N	Y	N	Y	N	N	N	N	N	N	Y	Y	Y	Y	Y=13
Inadequate local educational resources/ internet access	N	Y	Y	Y	N	N	N	N	N	N	N	Y	N	N	N	N	Y=8
There is formal protected teaching time for trainees	Y	N	Y	Y	N	Y	N	N	N	N	N	Y	Y	N	Y	Y	Y=19
Undergraduate ICM training (F/I/No)	F	F	F	F	No	No	No	I	F	I	I	I	F	I	I	I	F=19

(Y yes, N no, Su supra-speciality model, Si single sub-speciality model, Mu multiple sub-speciality model, Pr primary speciality model (see Appendix 2), D dual certification, B base certification, S speciality ICM certification, No none (see Appendix in esm), F formal, I informal, M mandatory, O optional, p proposed, \* shared training programme, ^ non-ICM training programme, - no data/not applicable)

common single speciality training programme which is not formally restricted to anaesthetic trainees, and could therefore be offered as a supra-speciality programme; however, the regulations and criteria for other specialities to access this programme have not yet been defined.

ICM training is mandatory for anaesthetists in these 13 countries, but of variable duration. ICM is also a mandatory element in many other anaesthesiology curricula and other base training programmes worldwide. The extent to which anaesthesia-based ICM training may be recognised as speciality ICM training varies. In Ireland, anaesthetists may undertake 12 months ICM training subject to the regulations and standards of their supra-speciality programme, but this shorter pathway allows them to practice as 'anaesthetists with a special interest in ICM', rather than specialists in ICM. In Spain, ICM is a primary (base) speciality; however, 3–12 months ICM is included as an integral part of base speciality training in anaesthesiology. This allows these anaesthetic specialists to practice ICM independently, and hence it has been included in the dataset as a formal single sub-speciality training programme.

#### *Multiple sub-speciality model*

In 4 (11%) countries, multiple base specialities each offer a programme of ICM training (16 in all) to their own trainees. Nationally, the content, duration, and standards of ICM training vary between each base speciality with the exception of Germany.

#### *Primary speciality model*

ICM is an independent primary speciality which can be accessed directly after undergraduate medical training in 4 (11%) countries. All except Spain offer two formal pathways for training: the ICM programme can be accessed either independently or in combination with another primary base discipline. In Switzerland the latter is recommended; although ICM can be undertaken as a primary speciality no trainees are reported to have chosen this route, preferring a supra-speciality pathway.

Multidisciplinary access is only possible if overlaps between primary programmes are acknowledged and accounted for. If they are not (e.g. Spain and Hong Kong excluding anaesthesiology and internal medicine), the trainee must re-enter specialist training, irrespective of prior learning, in order to undertake a primary ICM programme.

#### *Undergraduate ICM training*

Formal undergraduate teaching in ICM was reported by 19 (50%) countries.

#### *Educational processes*

##### *Duration*

All programmes define a minimum duration of ICM training (see Table 2), but there is considerable diversity, ranging from 3 months to 72 months (mode 24 months) out of a total specialist training period of 33 months to 96 months. This wide variation requires slightly deeper analysis. For example, in the Czech Republic, a minimum 4-year period of clinical practice must be undertaken before the 3-month ICM training module; thus, although this programme is the shortest, the minimum duration between basic medical registration and completion of specialist training in ICM (81 months) is higher than the group mean of 72 months.

In ten countries (26%), overlaps in the content of the base programme and the ICM programme may be recognised by allowing a proportion of training time in the one to count against the required period of training in the other.

##### *Quality controls*

Quality assurance of ICM training is not uniform; responsibility for determining national standards of ICM training and practice is shared between government ministries, universities, and professional medical organisations, but the role and authority of each group varies between countries (See ESM, S1 and S2). Eight have formed multidisciplinary training committees which manage and regulate ICM training. Intensive care units must be formally approved as suitable for training in 32 (84%) countries; in 16 (42%) this is obtained through an external visiting programme. Minimum national criteria for approval vary, but broadly relate to unit size, bed occupancy, case mix, 24-h cover, staff skill mix, and hospital facilities.

##### *Educational support*

Training occurs in the clinical setting in all countries. This necessary link between service and training can create difficulties: the majority of respondents (71%) reported that trainers have inadequate time to devote to teaching, and that legal limitation on hours of work for trainees produces additional challenges to providing educational activities within normal working time (34%).

**Table 2** Minimum duration of training in months

Country	Programme	ICM training (months)	Total specialist training	Post-registration to ICM specialist
			(Base + ICM) (months)	(months)
Europe				
Austria	Sub: Anaesthesia	24–36	60	72
	Sub: Internal Medicine	36	60	96
	Supra	36	60	96
Belgium	Supra	24	72	72
Bulgaria	Single sub	12	48	48
Croatia	Supra	24	72	72
Czech R	Single sub	3	33	81
Estonia	Single sub	18	44	44
Finland	Supra	24	96	96
	Single sub*	30	84	84
France	Single sub	24	60	60
	Supra	24	60	60
Germany	Sub: anaesthesia [1]	18	66	66
	Sub: non-anaesthesia [6]	18	72	72
Greece	Supra	24	84	96
Hungary	Supra (p)	24 (p)	84 (p)	84 (p)
	Single sub	24	60	60
Ireland	Supra	24	84	84
	<i>Single sub pathway</i>	12	72	72
Israel	Supra	24	78	90
Italy	Single sub	18	48	48
Latvia	Single sub	18	60	60
Lithuania	Single sub	18	48	60
Netherlands	Supra	24	72	72
Poland	Single sub	24	72	72
Portugal	Supra	18	66	66
Scandinavia	Single sub*	30	84	84
Slovakia	Single sub	24	60	72
Slovenia	Supra (p)	24 (p)	96 (p)	96 (p)
Spain	Primary	60	60	60
	Sub: anaesthesia	3 – 12	48	48
Switzerland	Primary	36	72	72
	<i>Supra pathway</i>	36	72	72
Turkey	Supra	36 (p)	84 – 96 (p)	84 (anaes) (p)
UK	Supra	33	84	96
World regions				
Argentina	Supra	24	60	60
Aust. & NZ	Primary	72	72	84
	<i>Supra pathway</i>	24+	96	108
Brazil	Supra	24	-	-
Canada	Supra	24	60	60
Egypt	Sub: anaesthesia	24	60	60
	Sub: internal medicine	24	-	-
	Sub: cardiology	24	-	-
Hong Kong	Primary: anaesthesia	72	72	72
	<i>Sub-speciality pathway</i>	72	90	90
	Primary: internal medicine	72	72	72
	<i>Sub-speciality pathway</i>	72	90	90
India	Supra:isccm	24	48	60
	Supra: nbe	24	60	72
Indonesia	Supra	18–24	-	-
Ivory Coast	Emergency medicine	12	-	-
Malaysia	Supra	30	78	108
USA)	Sub: ana	12	48	60
	Sub: surg	12	60	72
	Sub: in med	24	60	60
	Sub: pulm	12	72	72

\* Shared training programme

p Proposed training programme

- no data available/not applicable

Pathways within the same training programme but which differ in duration are indicated in *italic* (one training programme)

Fifty percent reported that trainees do not receive formal protected teaching time each week. Local internet access was generally perceived as adequate.

## Content

The content of most (75%) training programmes is standardised nationally and formally documented within national ICM curricula, either explicitly (supra-speciality and primary speciality models), or as an integral part of base speciality programme curricula (single sub-speciality and multiple-sub speciality models). Each training programme follows its own curriculum, with the exception of Germany which has agreed a single national ICM curriculum for all programmes, which is then supplemented according to the requirements of the base speciality.

Detailed national curriculum documents were obtained for 11 programmes; all defined the knowledge and procedural skills to be acquired during training. Only five referred to attitude or behavioural elements. Overall, the content was similar to that published [2, 10, 11]. Common mandatory components were identified (See ESM, S3), but their duration was often variable or not specified and, apart from the common theme of adult ICM, the other components also varied according to base speciality. For example, in several supra-speciality programmes, anaesthetic trainees must undertake a period of internal medicine training, while conversely internists must undertake anaesthesia. Such complementary training (training in acute care outside the intensive care environment) is undertaken either as an integral component of ICM training (supra-speciality and primary models) or as a pre-requisite to entry to the ICM programme (sub-speciality models).

Some programmes identify progressive levels of ICM training: Australia and New Zealand distinguish between basic and advanced levels whilst the UK also includes intermediate level training. In the primary programmes of Switzerland and Hong Kong a minimum period of integral complementary training must be completed prior to any ICM training. No other restrictions on the order in which ICM training is undertaken were reported.

## Assessments and outcomes

A competency-based training programme which explicitly defines the outcomes of ICM training is available in the UK, Canada, and the USA and is in development in Spain (primary model programme). The UK programme was developed independently (refer to [www.ibticm.org](http://www.ibticm.org)) whereas the Canadian and American programmes follow national competency frameworks for specialist training (described in [15, 16]).

Assessment of ICM training is performed in all countries but the methods by which this is undertaken vary considerably. Common to all is the necessity for successful completion of a minimum period of training to a satisfactory standard determined by the trainer.

## *Assessment in the workplace*

Formal assessment during clinical work is reported to be structured and documented in nineteen (50%) countries/regions, with a further eighteen (47%) indicating that assessment is undertaken in the workplace but that the process varies according to local practice or it may not be formally documented. Assessment documents were obtained for five programmes.

## *Examination*

A national examination which can only be taken following completion of a minimum duration of ICM training (specified nationally) is a mandatory requirement of 39 (72%) programmes. Examination formats vary, and include multiple choice, short-answer questions or formal essays, review or research-based dissertations, oral (viva voce) examination, and assessment of clinical and practical skills; two or more of these formats are frequently combined. A common approach to the assessment of ICM training via the European Diploma of Intensive Care (EDIC) has been adopted by the Netherlands and Scandinavia (replacing their national examinations), and is under consideration by several others. Belgium, the Netherlands, and Switzerland require that a peer reviewed publication or presentation be made prior to certification.

Formal certification (accreditation) of ICM training is available in 33 (87%) countries or regions. In general, training programmes are accredited according to local ownership (i.e., the model) of ICM (see Appendix 2 and Table 1).

## **Discussion**

This survey demonstrates that while ICM training is available in all countries with specialist medical training programmes, a common approach to training within Europe does not yet exist. Several countries share training programmes, demonstrating that collaboration across national borders is possible. Moreover, the response to this survey as the first phase of a project to develop a common training programme indicates that collaboration is perceived as beneficial.

Although we tried to access original materials where available, it was clearly not possible in a survey of this magnitude to conduct on-site evaluations of education in

practice, or examine educational outcomes. However, data was provided through iterative contacts (including several personal meetings) with national coordinators who had the explicit support of their national training organisations. Future work would be strengthened by direct observation and analysis.

Despite the diversity of existing structures for speciality training, CBT has already been successfully incorporated in supra-speciality and sub-speciality models, and will shortly be incorporated in a primary speciality model of training. This indicates that a CBT programme could be applied across all existing ICM training programmes without significantly disturbing national formats or duration of training. Importantly, all programmes permit training to be undertaken in the workplace, a fundamental requirement of competency-based training.

Duration of training or a minimum period of clinical experience is a fundamental characteristic of all ICM training programmes. A CBT programme would shift the focus from time served to competencies achieved, without necessarily requiring alteration of minimum training times. However, if a trainee had not acquired the competencies within the minimum training period, an extension in training time would be required.

The supra-speciality model explicitly values a general grounding in a base speciality. Primary speciality models for ICM acknowledge this indirectly by allocating a substantial proportion of their total training time to experience in general and acute medicine. More problematic, in terms either of equity of access or of common curricula, are the sub-speciality models. Trainees from base specialities which are not stakeholders in ICM cannot easily gain access to or formal acknowledgement of ICM training. In these circumstances progression toward a multidisciplinary common training programme may be problematic. However, failure to agree common minimum skill sets across speciality or national borders suggests a bias towards preserving territory rather than focusing on the needs of the patient and valuing professional diversity.

In developing an outcomes-based programme, the content or curriculum will also need to be identified. Much of this has already been achieved [2, 10, 11], and we did not therefore attempt to compare the content of each programme in detail. Competencies will need to be mapped to elements within existing ICM curricula (a concept we will now explore in the next phase of CoBaTrICE), but a core curriculum would need to be made explicit, as not all elements may be included within all existing national curricula. Indeed, not all countries define and standardise the content of their programmes by means of a national curriculum. The intention would not be to impose a rigid, single European curriculum, but rather to describe internationally acceptable core elements which can be accommodated within existing programmes; these could then be supplemented where necessary to address national base speciality requirements.

Once common outcomes have been identified, the greatest impact of competency-based methods of training would be on educational processes. A common training programme would need to accommodate the learning needs of trainees with differing background skills, and provide training environments suitable for the acquisition of specific competencies. Clinical trainers would need to supplement their inherent abilities for pastoral support and evaluation of trainees with formalised educational needs assessments and workplace-based evaluation of trainees' knowledge, skills, and attitudes. Trainees would need to become responsible for self-directed learning and documentation. Adequate institutional support for ICM training would be crucial for ensuring robust outcome-focused educational processes.

The variety of current examination formats suggests that there is no ideal method of assessing educational outcomes. Countries where competency-based training has been implemented continue to use formal examination (predominantly of knowledge) as a means of enhancing the standing of the speciality and of individual practitioners. Workplace-based assessment is a familiar concept to many trainers already, but the standard and rigor of such assessments is largely unregulated: trainers will themselves need assistance with the principles and implementation of formal workplace-based assessment. Trainer workload must also be considered. However, as assessments of competence are generally made during routine clinical activities, once CBT is in place it may in fact reduce the burden on trainers.

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## Conclusion

This survey has demonstrated no serious obstacles to the development of an international competency-based training programme in ICM. CBT could be introduced with minimal disturbance to existing national training structures, as it can be applied to programmes of varying structure, duration, and format. A common training programme would need to address the learning needs of trainees from differing base specialities, and define internationally acceptable common outcomes, assessment guidelines, and a core curriculum. These are the goals of the next phases of the CoBaTrICE project.

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## Appendix 1: Characteristics of a competency-based training programme

### Components

- Clearly articulated competency statements
- Curriculum defined in terms of knowledge, skills, and attitudes
- Criterion-referenced assessment guidelines

- Supporting materials to assist workplace implementation (trainer/trainee)

#### Characteristics

- Programme is learner-centred
- Programme directed at a specific role or setting
- Competencies are verified by expert practitioners and made public in advance
- Training is based in the workplace or similar environment
- Training integrates theory and practice
- Trainees identify their learning needs with the support of the trainer; competencies which have been attained and maintained in other programmes need not be repeated
- Teaching methods and educational processes are flexible
- Guidelines for assessing competence in the workplace include assessment criteria and conditions. The standard required for competent performance is made explicit
- Trainees progress through the programme at their own rate by demonstrating the attainment of specified competencies
- Satisfactory completion of training is based on the achievement of all specified competencies

(Derived from [17, 18, 19, 20])

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### Appendix 2: Models of ICM training

#### Supra-speciality model

- Multidisciplinary access to a single common ICM programme during or after training in a range of base specialities
- Common national curriculum
- Dual specialist certification (accreditation) in a base speciality and in ICM. ICM specialist certification alone is not permitted

#### Multiple sub-speciality model

- ICM training ‘owned’ by multiple parent specialities—access limited to trainees within the respective parent discipline
- Multidisciplinary access during or after base training
- Each speciality has its own national ICM curriculum
- Dual certification or base speciality certification which includes ICM

#### Single sub-speciality model

- ICM training ‘owned’ by one parent speciality—access limited to trainees within this speciality either during or after base training
- No multidisciplinary access
- Dual certification or base speciality certification which includes ICM

#### Primary speciality

- Base speciality. Access directly after undergraduate training
- Specialist certification (accreditation in ICM only)

(Adapted from [5])

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### Appendix 3: Contributors

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On behalf of the CoBaTrICE Collaboration

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## References

- Lonbay J (2004) Reflections on education and culture in European Community law. In: Craufurd-Smith R (ed) *Culture and European Union law*. Oxford University, Oxford
- De Lange S, Van Aken H, Burchardi H (2002) European Society of Intensive Care Medicine statement: intensive care medicine in Europe—structure, organisation and training guidelines of the Multidisciplinary Joint Committee of Intensive Care Medicine (MJCICM) of the European Union of medical Specialists (UEMS). *Intensive Care Med* 28:1505–1511
- Nicholas S (1994) Mobility of doctors—the theory and the practice. In: Neale P (ed) *Facing the European challenge: the role of the professions in a wider Europe Volume 1- Creating European Professionals*. University of Leeds, Leeds
- Garcia-Barbero M, Such JC (1996) Teaching critical care in Europe: analysis of a survey. *Critical Care Med* 24:696–704
- Bion JF, Ramsay G, Roussos C, Burchardi H on behalf of the Task Force on Educational issues of the European society of intensive care medicine (1998) Intensive care training and speciality status in Europe: international comparisons. *Intensive Care Med* 24:372–377
- Wiklund L (1994) Education of specialists in anaesthesia and intensive care in Europe—a Swedish perspective. *Ann Acad Med Singapore* 23:623–629
- Clarke GM, Harrison GA (1993) The training/examination programme in Intensive Care; Australian and New Zealand College of Anaesthetists. 1. *Training Anaesth Intensive Care* 21:848–853
- Phillips GD, Willis RJ (1994) Specialist training and examinations in anaesthesia and intensive care in Australia and New Zealand. *Ann Acad Med Singapore* 6:149
- Dobb GJ (1998) Critical care medicine in the Western Pacific region. *Ann Acad Med Singapore* 27:381–386
- Vincent JL, Baltopoulos G, Bihari D, Blanch L, Burchardi H, Carrington da Costa RB, Edwards D, Iapichino G, Lamy M, Murrillo F, Raphael JC, Suter P, Takala J, Thijs LG (ESICM task force) (1994) Guidelines for training in intensive care medicine. *Intensive Care Med* 20:80–81
- Thijs LG, Baltopoulos G, Bihari D, Burchardi H, Carlet J, Chioloro R, Dragsted L, Edwards DJ, Ferdinande P, Giunta F, Kari A, Kox W, Planas M, Vincent JL, Pfenninger J, Edberg KE, Floret D, Leijala M, Tegtmeyer FK (ESICM & ESPNIC task force) (1996) Guidelines for a training programme in intensive care medicine. *Intensive Care Med* 22:166–172
- Anonymous (1997) Guidelines for advanced training for physicians in critical care. American College of Critical Care Medicine of the Society of Critical Care Medicine. *Crit Care Med* 25:1601–1607
- Dorman T, Angood PB, Angus DC, Clemmer TP, Cohen NH, Durbin CG, Falk JL, Helfaer MA, Haupt MT, Horst HM, Ivy ME, Ognibene FP, Sladen RN, Grenvik ANA, Napolitano LM (2004) Guidelines for critical care medicine training and continuing medical education. *Crit Care Med* 32:263–272
- Barrett H, Bion JF on behalf of the CoBaTrICE collaboration (2004) CoBaTrICE survey of national training programmes in intensive care medicine. *Intensive Care Med* 30[Suppl 16]:047
- The Royal College of Physicians and Surgeons of Canada CanMEDS 2000 Project (September 1996) Skills for the new millennium: report of the societal needs working group. Ontario
- Batalden P, Leach D, Swing S, Dreyfus H, Dreyfus S (2002) General competencies and accreditation in graduate medical education. *Health Affairs* 21:103–111
- Alspach JG (1984) Designing a competency-based orientation for critical care nurses. *Heart Lung* 13:655–662
- Leung W (2002) Competency based medical training: review. *BMJ* 325:693–695
- Harden RM, Crosby JR, Davis MH (1999) AMEE Guide 14: Outcome-based education: part 1—An introduction to outcome-based education. *Med Teach* 21:7–14
- Gonczi A (2000) Review of international trends and developments in competency based education and training. In: Arguëlles A, Gonczi A (eds) *Competency based education and training: a world perspective*. Conalep, Mexico