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Training Requirements for the Specialty of Anaesthesiology

European Standards of Postgraduate Medical Specialist Training

Preamble to the European Training Requirement (ETR) in Anaesthesiology, Update 2022

The constant development of specialist training and practice dictates the need for a periodic review and update of ETRs to ensure that they remain consistent with current practice and fit for purpose. First published in 2013 the ETR in Anaesthesiology is regularly updated according to the Guidelines for the Development of Union Européenne des Médecins Spécialistes (UEMS) (published 3.4.2017); the 1st update was approved by the UEMS ETRs Committee in 2018.

ETR update development

The process of the ETR 2nd update development started in February 2021 and included an extensive review of the current status in care delivery and experience regarding training requirements across European countries. Extensive internal consultation within the Standing Committee on Education and Professional Development (EPD) and the Section and European Board of Anaesthesiology (EBA) was followed by a review of overlapping areas of practice, specifically in intensive care medicine, emergency medicine and pain medicine.

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In January 2022 consensus was obtained within the EBA regarding the ETR 2nd update. Finally, the ETR 2nd update was submitted to the UEMS ETRs Committee for comments and approval.

By adding domains and competencies in clinical fields, revising competence levels, and including updated European scientific guidelines, the ETR 2nd update is of higher quality than the previous versions.

Next ETR update is planned for: 2025.

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List of abbreviations

ALAT	anaesthetic list assessment tool
APACHE	acute physiology and chronic health evaluation
ARDS	acute respiratory distress syndrome
ASA	American Society of Anesthesiologists
ATAIC	Accreditation of Training in Anaesthesiology and Intensive Care
A-CEX	anaesthetic clinical evaluation exercise
BMI	Body mass index
CBD	case based discussion
CBMET	Competency-based medical education and training
CESMA	UEMS Council of European Specialist Medical Assessments
CNS	central nervous system
CPET	cardiopulmonary exercise test
COPD	chronic obstructive pulmonary disease
CT	computer tomography
DIC	disseminated intravascular coagulation
DOPS	direct observation of procedural skills
EBA	European Section and Board of Anaesthesiology
EBM	evidence-based medicine
ECG	electrocardiogram
EPD	Standing committee on education and professional development of EBA
EDAIC	European Diploma in Anaesthesiology and Intensive Care
EPA	entrustable professional activity
ESAIC	European Society of Anaesthesiology and Intensive Care
ESP	erector spinae plane block
ESRA	European Society of Regional Anaesthesia
ETR	European training requirement
EU	European Union
FAST	focused assessment with sonography for trauma
GCS	Glasgow coma scale
HELLP	haemolysis, elevated liver enzyme levels, low platelet count - syndrome
HRO	high reliability organisation
ICU	intensive care unit
IMCU	intermediate care unit
IT	information technology
KDIGO	Kidney Disease: Improving Global Outcomes
LAST	local anaesthetic systemic toxicity
MAC	minimum alveolar concentration
MODS	multiple organ dysfunction syndrome
MRSA	methicillin-resistant staphylococcus aureus
MRI	magnetic resonance imaging
OSAS	obstructive sleep apnoea syndrome
PACU	postoperative care unit
PECS	pectoralis and serratus plane nerve block
pEEG	processed electroencephalographic monitorin
PONV	postoperative nausea and vomiting
PPE	personal protective equipment
QLB	quadratus lumborum block
RIFLE	risk, injury, failure, loss, end-stage kidney disease
SAPS	simplified acute physiology score
SETQ	System for Evaluation of Teaching Qualities
SOFA	sequential organ failure assessment
TAP	transversus abdominis plane block
TOE	transoesophageal echocardiography
TENS	transcutaneous electrical nerve stimulation
TISS	therapeutic intervention scoring system
TTE	transthoracic echocardiography
UEMS	Union Européenne des Médecins Spécialistes
VILI	ventilator associated lung injuries
VTE	venous thromboembolism

I. TRAINING REQUIREMENTS FOR TRAINEES

1. Learning outcome

Anaesthesiology as a specialty has grown from a service specialty strictly within the operating room to having responsibilities in various areas of medicine. The traditional role as a medical specialty included assessment and evaluation, maintenance of organ function as well as analgesia and amnesia for patients undergoing diagnostic, therapeutic or surgical procedures. The practice of anaesthesiology has significantly changed towards more holistic care in the perioperative period. Intensive care medicine, emergency medicine and pain medicine are, in many countries, integrated parts of the clinical specialty. Thus, training requires additional generic competencies and common principles to be defined for the European specialist.

The ETR in Anaesthesiology reflects the holistic qualifications of the European specialist. For anaesthesiology the generic roles of a physician competency framework apply: The medical expert in anaesthesiology should acquire all necessary competencies enabling him/her to fulfil the expert role in the multidisciplinary settings of perioperative medicine (including pre-, intra- and postoperative phase), intensive care medicine, critical emergency medicine, and pain medicine in all patient categories (including newborn, frail elderly, pregnant women). As a professional, leader, collaborator and communicator the specialist in anaesthesiology should assume leadership and fulfil organisation and management tasks to take place during professional activities (including medical decision making, resolution of conflicts), applying effective, empathic, and respectful communication, and considering cost-effectiveness, health economics, and sustainability. As an academic scholar and health advocate the specialist in anaesthesiology should promote his/her professional development and facilitate development of the specialty of anaesthesiology, competencies of colleagues and patients. This includes life-long learning, appraisal and implementation of updated information in perioperative medicine, intensive care medicine, critical emergency medicine and pain medicine, reflective thinking, acquisition of teaching competencies (in technical and layperson languages) and performing or at least supporting research. As an inspired humanitarian the specialist in anaesthesiology should exhibit irreproachable behaviour, fulfil duties, and accept responsibilities inherent to his/her role as a professional. This includes integrity, honesty, compassion, professionalism, recognition of personal limits and abilities, and considering ethical and medico-legal aspects of anaesthesiology practice.

2. Content of training

Competencies required of the trainee

The ETR supports a high standard of medical training which will enhance patient safety and pave the way to first class clinical care for the benefit of all European citizens. The ETR competencies in general core domains should be achievable by most national training programmes, even in the presence of considerable national variations, for example in infrastructure, resources, manpower, employment laws, financing, or tradition. Basic competence levels proposed in specific core domains may stimulate implementation of education and training plans in clinical bottleneck areas. European hospitals that do not offer training in specific core domain competencies may be able to upgrade the standard of their training by forming a training unit with another training hospital, for example. In

this way, future clinical exchange programmes between hospitals may be fostered by the ETR. The ETR may encourage the use of adult learning modalities including medical simulation.

Definition of domains

On the way to fulfilling the four generic roles of a specialist in anaesthesiology, striving to achieve excellence, the following list of domains of expertise and the competencies within these domains are to be obtained during medical training:

1. Domains of general core competencies

- 1.1 Perioperative medicine, patient assessment and risk reduction
- 1.2 General anaesthesia and sedation
- 1.3 Regional anaesthesia
- 1.4 Airway management
- 1.5 Point of care ultrasound (POCUS)
- 1.6 Postoperative care and pain management
- 1.7 Intensive care medicine
- 1.8 Critical emergency medicine (CREM)
- 1.9 Anaesthesia non-technical skills (ANTS)
- 1.10 Professionalism and ethics
- 1.11 Patient safety and health economics
- 1.12 Research, education and self-directed learning

2. Domains of specific core competencies

- 2.1 Obstetric anaesthesiology
- 2.2 Cardiothoracic anaesthesiology
- 2.3 Neuroanaesthesiology
- 2.4 Paediatric anaesthesiology
- 2.5 Multidisciplinary chronic pain management

Learning objectives in domains 1.1 to 2.5

Training includes acquisition of knowledge and expertise in managing all patient groups undergoing all contemporary elective and urgent surgical interventions including patients with critical illness and trauma.

a. Theoretical knowledge

Competencies are per definition required at level A. Wide knowledge is necessary in anaesthesiology and a high level is required for the European Diploma in Anaesthesiology and Intensive Care (EDAIC). Implementation of knowledge is a clinical skill (required at levels B, C or D) and is described below.

Knowledge already gained during undergraduate medical studies are not explicitly listed (e.g., anatomy, physiology, pathophysiology, pharmacology, toxicology, hygiene, physics, chemistry, biochemistry, psychology, statistics) but are understood as a prerequisite and requirement for

anaesthesiology-specific knowledge. During residency, basic medical knowledge must be refreshed and enlarged by anaesthesiology-specific content.

b. Practical and clinical skills

Skills uniform in all clinical settings are only described here but apply throughout the ETR:

- Basic and advanced life support, including resuscitation of the newborn D
- Infection prevention measures, including hand hygiene D
- Communication
 - effective
 - clear and unambiguous
 - closed loop
 - methods (verbal, written, consultation or referral)
 - manner (courtesy, integrity, respect)
 - with patients and their relatives, including patients with impaired capacity and language barriers
 - with other health care providers D

General skills already gained during undergraduate training are not explicitly listed (e.g., ECG monitoring and interpretation).

Skills required at various working locations (prehospital, intraoperatively in the operating theatre, postoperative in the recovery room, on the ward, in the emergency room) are listed only once upon first appearance, e.g., defibrillation, cardioversion.

Exceptions: In domain 1.7 several skills are listed to describe competencies as a complete training in intensive care medicine.

The level of skill required to complete training is noted for each competency in each domain (B, C, or D, see below).

c. Specific attitudes

Specific attitudes uniform in all clinical settings are only described here but apply throughout the ETR:

- Attain attributes in the generic roles as a professional leader, academic scholar, and inspired humanitarian, including:
 - Treating patients and their relatives with empathy, respect, courtesy and without discrimination
 - Treating other health care professionals with empathy, respect, and courtesy and without discrimination
 - Fulfilling duties and accepting responsibilities with integrity, honesty, confidentiality, selflessness, probity, and compassion

Exception: In domain 1.6 several specific attitudes are listed to describe competencies as a complete training in intensive care medicine.

The level of specific attitudes required to complete training is competence level D.

d. Competences

For each domain, learning objectives are divided into knowledge, skills, and attitudes which are deemed necessary to achieve the required level of competence, as defined by the UEMS:

- A: has knowledge of, describes, observer level
- B: performs, manages, demonstrates under direct supervision
- C: performs, manages, demonstrates under distant supervision
- D: performs, manages, demonstrates independently

The learning objectives listed in this document describe the competency required to perform skills and manage patients independently, but not all trainees have to reach level D in every domain as described above. Attaining full competencies in all domains of the broad discipline of anaesthesiology in the minimum training timeframe would be an ideal but utterly impossible demand in any European country. After completion of medical training, in-service professional development modules (PDM) will enrich both the number and level of competencies that are not core content of ETRs.

Domain 1.1: Perioperative medicine, patient assessment and risk reduction

a. Knowledge

- Preoperative risk assessment
- Airway assessment including bedside tests to assess difficult intubation, ventilation, oxygenation
- Understanding of disease processes, natural evolution, and their impact on the management during the perioperative period
- Knowledge of the effects of anaesthetic agents on the physiology of major systems such as cardiovascular, respiratory, and neurological
- Treatment of pre-existing diseases, to optimise patients and reduce risks before anaesthesia and surgery in cooperation with other specialties
- Pharmacology and interactions of drugs taken in the perioperative period
- Other medical history (personal and family history of previous anaesthesia, allergy, substance abuse, habits)
- Understanding the need for and value of preoperative testing
- Scores e.g., ASA, PONV scoring risk, OSAS, postoperative delirium, VTE, BMI
- Understanding specific perioperative risks, e.g., in the transplant patient undergoing general surgery, the elderly patient with comorbidities
- Guidelines on preoperative assessment from ESAIC
- Guidelines on preoperative fasting from ESAIC
- Guidelines on regional anaesthesia in patients on antithrombotic/antiplatelet drugs from ESAIC/ESRA
- Guidelines on severe bleeding (patient blood management) from ESAIC, including correction of pre-existing anaemia and coagulopathy
- Medico-legal aspects of patient information and informed consent, appraisal of capacity and consent

b. Clinical skills

- Patient assessment based on history and physical examination, use of appropriate diagnostic tools and laboratory tests in patients of all age groups with and without reduced functional cardiorespiratory capacity undergoing major and minor surgical routine and emergency interventions D
- Evaluation and using of risk scores including ASA physical status D
- Assessment of the airway D
- Interpretation, understanding the value and limitation of preoperative tests and monitoring including:
 - Electrocardiogram, and other methods assessing cardiovascular function (echocardiography, ergometry, myocardial scintigraphy, coronary angiography, MRI)
 - Pulmonary function test (spirometry) and arterial blood gas analysis
 - Cardiopulmonary Exercise Test (CPET)
 - Common radiological testing with special emphasis on lung ultrasound, chest X-ray and CT scan
 - Hemogram and coagulation tests
 - Liver and renal function tests
 - Endocrine function tests
 - Drug monitoring D
- Interdisciplinary patient optimisation and risk reduction, including preoperative anaemia correction, cardiopulmonary optimisation D
- Selection and planning of the individual anaesthesia technique, including rational use of monitoring, difficult airway management, allogeneic blood products administration, and providing other equipment required for the procedure D
- Patient selection for anaesthesia in day surgery D
- Preparing and managing patients with pacemakers or implanted cardiac defibrillators for surgery D
- Applying recognised principles of preoperative fasting, therapy, and premedication D
- Application of multimodal and pre-emptive analgesia (including opioid-sparing strategies) D
- Detailed recording and transferring patient information to other colleagues D
- Decision-making relating to postponement or cancellation of surgery D
- Delivering patient information including alternatives, discussion of risks, and obtaining informed consent D

c. Specific attitudes

- Listening and responding to patient concerns and preferences, promoting patient empowerment

Domain 1.2: General anaesthesia and sedation

a. Knowledge

- Physics and clinical measurement
 - Behaviour of fluids; measurement of volumes, flows, and pressures; measurement of body temperature
 - Behaviour of gases; humidification, oximetry, analysis of gases, capnography, electrical safety, fires and explosions; gases in closed body cavities
- Metabolic stress response to surgery

- Pharmacology of muscle relaxants, analgesic drugs, inhaled and intravenous anaesthetic agents
- Work-related diseases of staff and patients and their prevention
- Equipment and apparatus including equipment design, physics and standards; gas supply; anaesthesia delivery systems, including pressure valves and regulator, vaporizers and breathing systems; devices to maintain the airway such as video- and conventional laryngoscopes, endotracheal tubes, tracheotomy tubes, face masks, supraglottic airway devices; information systems
- Minimum monitoring standards and additional monitoring when appropriate (including central venous pressure, invasive arterial pressure, advanced hemodynamic monitoring (e.g., cardiac output estimation, dynamic indicators of fluid responsiveness, arterial elastance), echocardiography, neuromuscular block monitoring, processed electroencephalographic monitoring (pEEG) for cerebral function and anaesthesia titration (anaesthesia depth), coagulation tests (including viscoelastic haemostatic assays), blood gas analyses, urinary output
- Planning and physical layout of operating rooms and post-anaesthesia recovery room; lighting; safety; infection and pollution control in operating rooms; sharps policies
- Principles of safety such as lifting and positioning of the patients, safe storage of drugs.
- Management in case of intraoperative fires or burns, extravasation of drugs
- Effect of the tracheal intubation on the infectious complications (knowledge and prevention of ventilator associated pneumonia)
- Management of patients with recent or current upper respiratory tract infections
- Indication, contraindications and complications of sedation and general anaesthesia
- Management of anaesthesia-related complications and of underlying medical conditions
- Pathophysiology and genetics of inherited conditions such as malignant hyperthermia, butyrylcholinesterase deficiency
- Management of severe perioperative bleeding guidelines from ESAIC (Patient Blood Management)
- Prevention of venous thromboembolism guidelines from ESAIC
- Prevention of postoperative delirium and cognitive deficits guidelines from ESAIC
- Emergency checklist from ESAIC
- Procedural Sedation guidelines from EBA/ESAIC
- Safety Recommendations from EBA for minimum monitoring and use of capnography
- Ethical and medico-legal aspects
- Understanding the basic concept of evidence-based medicine (including levels of evidence)

b. Clinical skills

- Preparation of the workplace according to relevant checklists and environmental safety measures D
- Providing safe inhalational and intravenous induction, maintenance of, and emergence from general anaesthesia, including the choice of drugs, airway management, ventilation technique and intraoperative adverse event management D
- Defibrillation, cardioversion D
- Aseptic techniques for invasive procedures including peripheral and central vascular access, intraosseous access, arterial catheterization, arterial blood gas collection, urinary catheterization, chest drain insertion D
- Naso- and orogastric tube insertion D

- Blood salvage D
- Blood products transfusion D
- Apply and adjust the anaesthetic decision by using risk scores D
- Appropriate use of medical and technical equipment D
- Trouble-shooting basic technical malfunctions of monitors and machines D
- Regular use of recommended checklists and guidelines D
- Monitoring nerve function during brain and spine surgery D
- Appropriate perioperative patient positioning D
- Maintenance of homeostasis of organ systems throughout different surgical procedures in patients with and without pre-existing diseases D
- Diagnosis and management of intraoperative critical incidents including (appropriate use of the Crisis Checklist):
 - allergic reactions, anaphylaxis
 - laryngospasm, bronchospasm, inadequate airway
 - gas embolism, pulmonary aspiration, and pneumothorax
 - hypoxia, hypercarbia, hypocarbia, hypoventilation, hyperventilation, high ventilator peak inspiratory pressures
 - hypertension, hypotension, arrhythmias, myocardial ischemia, bradycardia, tachycardia, cardiac arrest
 - oliguria, anuria
 - hypothermia, hyperthermia, malignant hyperthermia
 - intraoperative blood gas and electrolyte disturbances
 - intraoperative awareness
 - seizure
 - adverse transfusion reaction
 - severe bleeding
 - stress and inflammatory response D
- Performing anaesthesia for laser airway surgery and interventions with a shared airway D
- Performing anaesthesia for fast-track surgery and enhanced recovery after surgery D
- Performing anaesthesia for patients in ICU D
- Performing sedation for invasive procedures D
- Performing anaesthesia and sedation outside the operating theatre, considering organisation of the site, type of procedure and patient D
- Performing anaesthesia in robotic surgery B
- Management of patient transport to and from remote locations D
- Anaesthesia in remote locations (e.g. MRI, CT, electroconvulsive therapy suite) D
- Application of principles of safety during X-ray, MRI D
- Application of discharge criteria for ambulatory anaesthesia and from PACU D
- Management of unplanned hospital admissions D
- Consideration of ethical and medico-legal aspects D
- Initial surgical intervention in burn, trauma, and traumatic injury of the upper airway D
- Management of brain death syndrome and donor management including explanation D

c. Specific attitudes

- Appraisal of medical simulation training as an effective training activity, especially for crises management of rare adverse events, situation awareness and team training

Domain 1.3: Regional anaesthesia

a. Knowledge

- Pharmacology of local anaesthetics and adjuvants
- Indications and contraindications of peripheral and central blocks, choice of techniques (including ultrasound guided)
- Risks and complications
- Recognition of local anaesthetic systemic toxicity (LAST), treatment, and resuscitation measures
- Techniques of peripheral and neuraxial blocks
- Equipment and apparatus (equipment design, physics, standards, advantages and limitations; ultrasonography; nerve stimulator; pressure monitoring)
- EBA safety recommendation on invasive procedures in pain medicine
- Emergency checklist from ESAIC
- Guidelines on regional anaesthesia in patients on antithrombotic/antiplatelet drugs from ESAIC/ESRA

b. Clinical skills

- Provide safe regional anaesthesia, including choice of drugs, techniques, timing, safety checks and monitoring D
- Procedural guidance of regional anesthesia techniques using POCUS D
- Perform neuraxial blocks such as spinal (single shot), thoracic epidural and lumbar epidural (single shot and continuous technique -catheter placement) combined spinal-epidural, caudal block D
- Perform peripheral nerve blocks of the upper extremity (single shot and continuous techniques) such as interscalene, axillary blocks D
- Perform peripheral nerve blocks of the lower extremity (single shot and continuous techniques) such as femoral, obturator, sciatic blocks D
- Perform nerve blocks of the torso such as paravertebral, intercostal blocks D
- Perform fascial plane blocks (e.g. PECS, ESP, TAP, QLB, rectus sheath) C
- Positioning of patients with specific pathological conditions D
- Management of acute and chronic pain with resource to nerve blocks B
- Diagnosis and management of intraoperative critical incidents including
 - inadequate nerve blockade
 - total spinal block
 - pneumothorax
 - local anaesthetic systemic toxicity (LAST) D
- Management of block-related nerve damage D
- Diagnosis and management of peripheral nerve injury D
- Diagnosis and management of central blocks complications (e.g. epidural haematoma, abscess, arachnoiditis, meningitis) D

c. Specific attitudes

- Attention to details of block site (e.g. left or right)
- Communication and stress mitigation techniques with awake patient having surgery under regional anaesthesia

Domain 1.4. Airway management

a. Knowledge

- Basic airway management
- Special considerations in paediatric, obstetric and obese patients
- Difficult airway management algorithms
- Maintenance of patent oral and nasal airway
- Airway complications: stridor/laryngospasm, airway obstruction
- Complications of airway manipulation and device-related injuries
- Prevention and mitigation of contamination and infection during airway management, using face shields and barrier masks, gloves, fluid-impermeable gowns
- Management of patients with recent or current upper respiratory tract infections
- Criteria for postoperative extubation
- Emergent tracheostomy/front-of-neck-access uses and techniques

b. Clinical skills

- Rapid sequence induction D
- Establishment and maintenance of an adequate airway including in patients with anticipated and unanticipated difficult airways including patients with airway trauma and including the use of different devices and techniques according to existing algorithms D
- Appropriate selection and use of different airway devices (e.g. videolaryngoscopes, fiberoptic laryngoscopes, laryngeal mask) D
- Appropriate selection of awake and asleep fiberoptic intubation, sub-mental intubation in oral and maxillofacial surgery D
- Endotracheal intubation in elective procedures and urgent situations D
- Cricothyroidotomy D (e.g. in medical simulation training)
- Management of extubation of the patient with a difficult airway and delayed extubation after airway interventions D
- Recognition and treatment of complications early and late, including dislodgement D
- Use of protective equipment in patients with infection diseases D

c. Specific attitudes

- Appraisal of medical simulation training as an effective training activity, especially of exceptional circumstances (e.g. cannot intubate, cannot ventilate; team training in difficult airway cases)

Domain 1.5: POCUS (point of care ultrasound)

a. Knowledge

- Ultrasound physics and equipment (probe selection, ultrasound interactions with tissues, artifacts, instrument functions)
- Sterility and safety using POCUS
- Clinical indications, advantages and limitations of bedside ultrasound

b. Clinical Skills

- Assessment, planning and management of perioperative and periprocedural airway management (e.g. identification of the cricothyroid membrane, confirmation of endotracheal intubation, lung sliding, nasogastric tube placement) D
 - Assessment of lung pathology (e.g. pleural fluid, pneumothorax, pulmonary contusion), diaphragmatic function D
 - Assessment of pulmonary parenchyma and identification of pleural fluid D
 - Procedural guidance in accessing central and peripheral vessels D
 - Assessment of stomach content and associated aspiration risk D
 - Assessment of fluid responsiveness for diagnosis and management of haemodynamically unstable patients, critically ill patients C
 - Assessment of cardiac function for diagnosis and management of haemodynamically unstable and/or critically ill patients, assessment of morphologic signs of valvular disease (e.g. aortic stenosis), managing cardiac arrest and diagnosing hypovolemia, pulmonary embolism, left ventricular failure and pericardial tamponade C
 - Focused assessment with sonography for trauma (FAST) examination (subcostal, right upper quadrant, left upper quadrant, pelvic views), identification of free intraperitoneal fluid C
- c. Specific attitudes
- Respecting patient's privacy when archiving images
 - Recognising the potential risk of distraction from the patient through POCUS use

Domain 1.6: Postoperative care and acute pain management

a. Knowledge

- Scoring systems for postoperative status, transfer, and discharge criteria (e.g. Aldrete Score)
- Pathophysiology and treatment of postoperative complications
- Equipment and apparatus (equipment design, physics, standards, limitations; patient-controlled analgesia pumps, non-invasive and invasive postoperative ventilation)
- Weaning from non-invasive and invasive ventilator support
- Multimodal and pre-emptive analgesia concepts
- Logistics and patient pathways

b. Clinical skills

- Providing handover in PACU including appropriate summary of relevant clinical features of the patient's care D
- Providing postoperative standard monitoring, indicating and interpreting individualised testing (e.g. ischaemia monitoring, X-ray) D
- Pain assessment in all patient groups D
- Maintenance of homeostasis of organ function after surgical procedures and anaesthesia in patients with and without pre-existing diseases D
- Diagnosis and management of postoperative critical incidents (beyond those listed in domain 1.2, 1.3 and 1.4) and postoperative adverse events including:
 - residual neuromuscular blockade
 - anaesthesia overhang
 - dental injury

- corneal abrasion
- atelectasis
- nausea and vomiting
- shivering
- pain
- post-dural puncture headache
- bleeding
- delirium, cognitive dysfunction
- discomfort
- postoperative facial and airway swelling
- central anticholinergic syndrome
- residual nerve block
- epidural haematoma and abscess
- compartment syndrome D
- Indication for re-operation and interprofessional organisation D
- Weaning from supportive therapy of vital functions D
- Use of discharge and transfer criteria to ICU D
- Use of multimodal postoperative and post-discharge analgesia D
- Making a post-anaesthesia visit for assessment of intermediate-term clinical outcomes and patients' quality of life D
- Explaining to the patient how to reduce analgesia on returning home D
- Informing the patient of any untoward incidents (e.g. difficult airway, peripheral nerve injury) and offering advice and written information on future anaesthesia D

c. Specific attitudes

- Patient education about reporting symptoms of adverse effects or complications as early as possible, especially in ambulatory surgery.

Domain 1.7: Intensive care medicine

a. Knowledge

- Anatomy, physiology, pharmacology, toxicology, hygiene, physics, chemistry, biochemistry
- Aetiology, pathophysiology, diagnosis, and treatment plans / bundles according to international standards of specific critical conditions in all patient cohorts including paediatric patients, geriatric patients, perioperative patients after elective and emergency surgery, burn and trauma patients:
 - Circulatory failure
 - Shock
 - Cardio-respiratory arrest
 - Cardiac arrhythmias
 - Ischemic heart disease
 - Cardiomyopathy
 - Valvular heart disease including endocarditis
 - Pulmonary embolism
 - Anaphylaxis
 - Respiratory failure
 - ARDS

- Pulmonary oedema
 - Airway obstruction and stenosis
 - Pneumothorax
 - Aspiration
 - Pneumonia
 - COPD and asthma
- Renal failure
 - Chronic and acute kidney injury (RIFLE, KDIGO stages)
- Gastrointestinal failure
 - Ileus
 - Peritonitis of various aetiologies (including colitis and intestinal ischemic disease)
 - Pancreatitis
 - Liver failure (acute, chronic, and acute-on-chronic)
 - Digestive fistulas
- Neurological failure
 - Delirium and coma
 - Cerebrovascular, bleeding, and thromboembolic diseases
 - Cerebral oedema
 - Increased intracranial pressure including monitoring
 - Brain stem death
 - Seizures
 - Guillain Barré syndrome and myasthenia gravis
- Trauma
 - Head/face and spine injury
 - Airway and chest injuries
 - Aortic injuries
 - Abdominal trauma
 - Pelvic and long bone injuries
 - Massive transfusion
 - Burns and electrocution
 - Near-drowning
 - Hyper- and hypothermia
- Infectious diseases
 - SIRS and sepsis including management of sepsis according to the Surviving Sepsis Campaign bundle
 - Severe community acquired infections (e.g. meningitis, SARS-CoV-2)
 - Severe nosocomial infections (e.g. MRSA)
 - Fungal infections
 - Hand hygiene & use of personal protective equipment (PPE)
 - Isolation measures
 - Management of needle stick injuries
 - Requirements for fluid, droplet and aerosol precautions in airway management using face shields and barrier masks, gloves and fluid-impermeable gowns

- Endocrine and metabolic disorders
 - Diabetes mellitus and insipidus
 - Addison's disease, Cushing and Conn syndrome
 - Thyroid disorders
 - Pheochromocytoma
 - Malnutrition
 - Carcinoid
 - Acid-base and electrolyte disturbance
 - Coagulation disorders
 - DIC
 - Heparin resistance, heparin-induced thrombocytopenia
 - Severe bleeding
 - Transfusion reaction
 - Obstetric complications
 - HELLP syndrome, Pre-eclampsia, Eclampsia
 - Septic abortion
 - amniotic fluid embolism
 - postpartum haemorrhage
 - placenta percreta/accrete
 - Intoxications
 - Organ donation
- Equipment and apparatus (equipment design, physics, standards, limitations; non-invasive and invasive postoperative ventilation, high-flow oxygenation, continuous renal replacement therapy / continuous kidney support therapies, extracorporeal membrane oxygenation) devices, non-invasive and invasive haemodynamic monitoring including TTE and TOE, intracranial Doppler monitoring, intracranial pressure monitoring)
 - Combining the knowledge from domains 1.1 to 1.6 and 1.8 to 1.12
 - Scoring systems (e.g. sedation depth, pain severity, APACHE, TISS, SAPS, SOFA)
 - Indication, contraindication, drug selection, complications: sedation, anaesthesia, analgesia, neuromuscular relaxation, nutrition in the ICU, antibiotics
 - Multimodal and pre-emptive analgesia concepts
 - Weaning and extubation criteria
 - Transfer and discharge criteria
 - Ethical and medico-legal aspects including end of life decisions, organ donation
 - Understanding the principles of determination of brain stem death
 - Familiarity with the legal aspects of brain stem death and organ donation within jurisdiction
 - Knowledge of the pathophysiological changes that occur after brain death
 - Maintenance of the brain dead organ donor
 - Principles of non-heart-beating organ donation
 - Demographics of organ donation and transplantation in Europe
 - Principles of living kidney donation
 - Familiarity with the EU directives and Council of Europe Recommendations on organ donation and transplantation
 - Organisation of ICU and IMCU

b. Clinical skills

- Applying skills from domains 1.1 to 1,6 and 1.8 to 1.12 in pre-hospital critical emergency scenarios C
- Patient assessment and physical examination including repetitive testing e.g. of peristaltic sounds, respiratory sounds, capillary refill, temperature gradient D
- Identification of signs of instability of the cervical spine D
- Sedation, general anaesthesia, multimodal analgesia D
- Neuraxial and peripheral nerve blocks for analgesia B
- Cerebrospinal fluid drainage for diagnosis and treatment D
- POCUS: lung ultrasound, vascular ultrasound, heart ultrasound D
- Airway management including intubation under emergency situations D
- Aseptic insertion of venous, central venous, arterial, intra-osseous cannulation, pleural drainage D
- Gastrointestinal tube insertion, urinary catheterization D
- Use protective equipment in patients with infection diseases D
- Disease assessment and disease management including:
 - Respiratory support including endotracheal suction, bronchoscopy (lavage, sampling), percutaneous tracheotomy, invasive and non-invasive ventilation techniques, ventilation in prone position, high-flow oxygenation, weaning
 - Haemodynamic management and stabilization including advanced cardiovascular monitoring, inotropic and vasoactive therapy, basic and advanced life support, defibrillation, cardioversion, pacing
 - Fluid substitution, volume management
 - Management of coagulopathy, patient blood management, blood product transfusion
 - Acute kidney injury and renal replacement therapy
 - Nutritional support (enteral, parenteral) including management of electrolyte, glucose, and acid-base disturbances
 - Neurological management including intracranial pressure control and maintenance of intracranial perfusion pressure
 - Infectious diseases and antibiotic therapy; antiviral therapy; development & implementation of rules for hospital hygiene
 - Identification and implications of relevant pre-existing co-morbidities
 - Prevention, recognition, and treatment of complications such as:
 - thromboembolism
 - ventilator associated lung injuries (VILI), aspiration, pneumonia
 - stress ulceration
 - renal failure
 - nosocomial infection
 - gastrointestinal paralysis
 - critically ill polyneuropathy
 - sepsis-induced adrenal insufficiency
 - drug interactions D
 - Responding to trends in physiological variables D
 - Pericardiocentesis B
- Applying EBM-based therapeutic interventions, care bundles, guidelines protocols, and organ support in single or multiple organ failure (MODS) D

- Patient transportation inter- and intra-hospital D
- Applying damage control and systematic priority-based approach in patients with severe trauma D
- Applying transfer criteria to specialised centres e.g. the critically ill child D
- Applying neuroprotection in patients with head or spinal cord trauma D
- Performing general anaesthesia for repeated surgical interventions in patients with burns B
- Applying triage and prioritisation of patients' care D
- Applying scoring systems (e.g. sedation depth, pain severity, APACHE, SAPS, TISS) D
- Performing ultrasound techniques for:
 - Ultrasound-guided vascular access placement.
 - Recognition & management of severely abnormal ventricular function (right or left ventricle; hypo- or hyperkinesia, hypovolaemia);
 - Measurement of inferior vena cava diameter and interpretation.
 - Recognition and management of pericardial, pleural, or abdominal effusion
 - Recognition and management of urinary retention (distended bladder) D
- Indicating, interpretation, considering the value and limitation of:
 - Electrocardiogram, and other methods assessing cardiovascular function
 - Pulmonary function test (spirometry) and arterial blood gas analysis
 - Cardiopulmonary Exercise Test (CPET)
 - Common radiological testing with special emphasis on lung ultrasound, chest X-ray, and CT scan
 - Coagulation tests (including viscoelastic haemostatic assays)
 - Liver and renal function tests (including indocyanine green test)
 - Endocrine function tests
 - Drug monitoring D
- Differential diagnosis, liaising with specialists from other disciplines to interpret complex data D
- Indications for physio- and occupational therapy D
- Consideration of ethical and medico-legal aspects D
- Performing regular patient visit rounds, ensuring continuity of care D
- Applying discharge criteria D
- Applying criteria to change management from curative to palliative care D
- Providing handover of a patient to the ward (appropriate summary of relevant clinical features of the patient's care) D
- Accurate and detailed record keeping D
- Performing brain stem testing B
- Management of organ donors in intensive care and during organ retrieval B
- Performing anaesthesia for transplantation C
- Performing postoperative care of a transplant patient C
- Discussion with relatives about end of life care, brain death and organ donation level B
- Performing basic and advanced life support D
- Effectively communicate with patients, treating them with respect using basic ethical principles such as autonomy, privacy, dignity, confidentiality, including discussing end of life decisions D
- Establish effective interaction with patients, including patients with impaired capacity and consent, and with their relatives D
- Effective communication with patients with language barriers D

- Effective communication with other health care providers D
 - Organisation of ICU and IMCU and evaluating ICU standards including:
 - Evaluating and taking into consideration the difficulty and complexity of the tasks in relation to resources including staff, qualifications and local organisation
 - Identifying patients who need more complex treatment than is available locally according to regional/national organisation and taking the initiative to arrange transport for these patients
 - Coordinating the multidisciplinary approach to patients and cooperating with all relevant partners, demonstrating appropriate respect for their medical competencies and roles in specific situations
 - Contributing to the holistic vision of a homogeneous team interacting effectively both with patients and peers, and providing consensual information
 - Medical auditing in intensive care D
- c. Specific attitudes
- Recognising the importance of protecting patients and personnel (e.g. in severe community acquired infections)
 - attaining attributes in the generic roles as a professional leader, academic scholar, and inspired humanitarian, including:
 - Treating patients and their relatives with empathy, respect, courtesy and without discrimination
 - Treating other health care professionals with empathy, professionalism, respect, courtesy, and without discrimination
 - Fulfilling duties and accepting responsibilities with integrity, honesty, confidentiality, probity, and compassion

Domain 1.8: Critical emergency medicine (CREM)

- a. Knowledge
- Combining the knowledge from domains 1.1 to 1.7 and 1.9 to 1.12
 - Scoring systems (e.g. GCS)
 - Rapid response systems, principles, and rules
 - Transfer criteria for pre- and inter-hospital transport
 - Helicopter rescue, safety and evacuation using an aircraft
 - Mass casualty incidents and disasters, including terrorist related with biological and chemical agents
 - Flight physiology, physiologic effects of pressure and immersion, and principles of hyperbaric treatment
 - Organisation and coordination of an emergency department, burns centre, poisoning treatment centre, prehospital emergency care including a helicopter base
 - Medical auditing in emergency medicine
 - European trauma guidelines endorsed by ESAIC
 - Ethical and medico-legal aspects including withdrawal and / or withholding therapy
 - Prehospital hygiene, patient safety, risk management

b. Clinical skills

- Applying skills from domains 1.1 to 1.7 and 1.9 to 1.12 in pre-hospital critical emergency scenarios C
- Management of life-threatening medical and surgical emergency conditions D
- Applying resuscitation algorithms and trauma guidelines D
- Assisting in rescue work C
- Performing emergency medicine in the interdisciplinary team of an emergency room D
- Performing intra-hospital resuscitation in the interdisciplinary cardiac arrest team D
- Performing echocardiography for fast differential diagnosis (FAST approach) D
- Performing multimodal analgesia in emergency care D
- Supporting the complex organisation of health care in cases of mass casualty incidents and disasters B
- Declaration of death at the scene of emergency D
- Conducting a team debrief C
- Performing team training focusing on crisis resource management D

c. Specific attitudes

- Effectively communicate with patients and relatives in exceptional circumstances
- Effectively communicate with first responders, firefighters, members of action forces, public and executive authorities, public health officers
- Appraisal of repeated training (1-2 per year) in the medical simulation centre

Domain 1.9: Anaesthesia non-technical skills (ANTS)

a. Knowledge

- Psychological aspects of team performance for successful task performance
- Crisis resource management
- Human factor research relevant to the perioperative setting
- Behavioural marker systems relevant for successful training and team working

b. Clinical skills

- Task management
 - Planning and preparing
 - Prioritising
 - Developing delivering and maintaining standards
 - Identifying and utilising resources
 - Ensuring effective task completion D
- Team working
 - Coordinating activities with team members
 - Exchanging information
 - Using authority and assertiveness appropriately
 - Assessing capabilities and optimise roles
 - Supporting others
 - Assessing team satisfaction D
- Situation Awareness
 - Gathering information
 - Recognising and understanding situation

- Anticipating D
 - Decision making and clinical reasoning
 - Identifying options: individual case plans, long-term scheduling plans under normal conditions and time-pressure crisis situations
 - Avoiding fixation errors
 - Balancing risks and selecting options
 - Re-evaluating D
 - Leadership
 - Organising tasks
 - Gathering and managing information and optimise team communication D
- c. Specific attitudes
- Listen to and encourage others
 - Speak out against unfairness
 - Appraisal of time management

Domain 1.10: Professionalism and ethics

a. Knowledge

- Principles of medical ethics: autonomy, beneficence, non-maleficence, and justice
- Legal principles and medico-legal obligations defining medical practice and the use of patient data
- Governmental regulations relevant for anaesthesia practice
- Principles of communication with patients and physician-patient “contract” including:
 - Rights and responsibilities of patients, doctors, and other medical staff
 - Informed consent
 - Patient confidentiality and privacy
 - Patient empowerment
 - Error and incident disclosure
 - Adequate record keeping considering medico-legal implications
- Personal issues including:
 - Balancing family and work, and the importance of non-professional activities
 - Depression; recognition and care plans
 - Substance abuse; recognition and access to appropriate referral
 - Mentoring and teaching
 - Fatigue; recognition, mitigation and care plans
 - Burn-out; recognition, prevention and care plans
- Leadership responsibilities and styles; team behaviours
- Stress and crisis management
- Principles underpinning conflict resolution
- Principles of role model

b. Clinical skills

- Applying principles of medical ethics to problem solving; for example in the following areas:
 - end-of-life and palliative care
 - withholding and withdrawing treatment
 - care of Jehovah’s witnesses

- o care of a patient unable to make effective judgments D
- Awareness and management according to medico-legal obligations related to medical practice D
- Applying core ethical principles and professional values such as altruism, fidelity, social justice, honour, integrity, and accountability D
- Applying rights of patients to autonomy, confidentiality, informed consent, comprehension of the risks of medical techniques (patient-centeredness) irrespective of race, culture, gender, sexual orientation and socio-economic status D
- Applying resilience strategies, including stress and crisis management D
- Reporting clinical incidents C
- Participating in clinical audits C

c. Specific attitudes

- Act according to local ethics committee and ethics board recommendations
- Appraisal of well-being, safety, and professional development of staff
- Appropriate online behaviour
- Respecting personal limits and abilities, recognising and managing stress and self-motivation
- Commitment to life-long continuing professional education, perpetual refreshment of competencies in reflective learning, and maintaining an inquisitive attitude

Domain 1.11: Patient safety and health economics

a. Knowledge

- Patient safety guidelines from EBA, Declaration of Helsinki on patient safety
- Recommendations about quality of care and patient safety from national, European, and other international authorities
- Acknowledge of carbon footprint associated with anaesthesia techniques
- Fundamentals in patient safety including:
 - Error-model, system failure
 - Swiss cheese model (James Reason), threat and error model
 - Human limitations
 - Stress, fatigue, decision making, fixation errors, prospective memory
 - The role in the team, hierarchy within the team
 - Safety culture, principles of High Reliability Organizations (HROs), the five common principles of HROs:
 - Preoccupation with failure
 - Reluctance to simplify interpretation
 - Sensitivity to operations
 - Commitment to resilience
 - Deference to expertise
- Tools for quality assurance and error management:
 - o Analysing the problem:
 - Reporting systems
 - Critical incident monitoring
 - Different methods of event-analysis
 - Root-cause analysis
 - London protocol

- Tackling the problem:
 - Main topics in safety problems
 - Medication error (prescribing: wrong drug, wrong dose)
 - Wrong side/site procedures
 - Hospital acquired infections
 - Patient-handover
 - Open disclosure communication
 - Economic aspects:
 - Demographic data and resource utilisation data relevant for anaesthesia practice
 - Basic knowledge of financial aspects of anaesthesia practice
 - Basic knowledge of organisational and budgeting aspects of anaesthesia practice (principles of business management)
- b. Clinical skills
 - Application of standards of quality of care and patient safety in daily practice including anaesthesia in remote locations D
 - Use of checklists and guidelines D
 - Providing data for both local and national data systems D
 - Cost-effective and relevant use of diagnostic, prophylactic, and therapeutic means, and measures (health economics) C
 - Contribute to reduced hospital-related waste and to conscious resource management C
 - Choice of the anaesthetic techniques that best respect the environment, reduce waste and spare resources C
- c. Specific attitudes
 - Commitment to critical incident reporting
 - Appraisal of own limitations, abilities, and areas of expertise
 - Appraisal of quality assurance programmes and quality improvement
 - Respecting legal principles
 - Effective inter-professional cooperation and team working, ensuring smooth patient care and a culture of patient safety and high quality care
 - Appraisal of local, national, and international practice guidelines and standards while complying with national healthcare policies
 - Encouraging and developing an open culture where errors are identified, discussed and learned from.

Domain 1.12: Research, education, and self-directed learning

- a. Knowledge
 - Understand the scientific approach to analysis and solving questions worthy of scientific investigation
 - Ability to search for Information and review literature
 - Proposing a hypothesis; research design, bias and appropriate methods of measurement, data collection and storage.
 - Common statistical tests and application of statistics relevant to the project; interpretation of results

- Monitoring of studies and post study surveillance
- Understanding principles of qualitative research
- Copyright and intellectual property
- Responsibilities of Institutional Review Board/independent ethics committee, and of the investigator to the ethics committee, ethical principles
- Principles of writing a scientific paper and of oral or poster presentation of a paper
- Principles of evidence-based medicine (including levels of evidence)
- The process of obtaining funding and writing a basic grant application
- Principles of adult learning
- Principles of self-directed learning

b. Clinical skills

- Conducting and appraisal of literature searches D
- Reflective reading of journal articles including the interpretation of study design, statistics, results, and conclusions C
- Appraisal of scientific fraud, data fabrication C
- Applying the principles of evidence-based medicine to clinical practice D
- Carrying out oral presentations and professional communication D
- Presenting quality improvement exercises or projects D
- Developing facilitation skills, such as tutoring in small-group learning and conducting small-group meetings C
- Tutoring under-graduate medical students in anaesthesiology C
- Identifying his/her own learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning D

c. Specific attitudes

- Valuing rigorous educational and scientific processes
- Distinguishing between practice with a sound scientific basis and that which requires further objective assessment
- Commitment to informed consent, confidentiality and all other ethical principles of research
- Appraisal of clinical developments in perioperative medicine, intensive care medicine, critical emergency medicine and pain medicine, reflective thinking, acquisition of teaching competencies (in technical and layperson languages)

Domain 2.1: Obstetric anaesthesiology

a. Knowledge

- Knowledge competencies from domains 1.1 to 1.12 in parturient
- Physiological and anatomical changes associated with normal pregnancy
- Physiology of labour and delivery
- Foetal and placental physiology and pathophysiology
 - Placental transfer
 - Materno-foetal circulation
 - The effects of pharmacologic agents and anaesthetic techniques on uterine blood flow and foetal development

- Embryology and teratogenicity
- Neonatal physiology and neonatal resuscitation
 - Foetal heart rate monitoring
 - Doppler umbilical blood flow
 - Apgar score and neuro-adaptive scores and their prognostic significance
- Anaesthetic management of non-obstetric surgery during pregnancy
- Minimum Alveolar Concentration (MAC) during pregnancy
- Obstetric management of labour (normal and abnormal)
- Management of pain in labour and pain pathways
- Tocolytic therapy, indications and contra-indications
- Local anaesthetic use in obstetrics
- Medical disease and pregnancy:
 - Pre-eclampsia/eclampsia
 - HELLP
 - Fatty liver of pregnancy and liver diseases
 - Gestational diabetes
 - Congenital & acquired heart disease
 - Neurological diseases
 - Obesity
 - Bleeding disorders
 - Thyroid diseases
 - Substance abuse
 - Immunological diseases
 - Renal diseases
- Regional anaesthetic techniques in obstetrics:
 - Neuraxial use of opioids in obstetrics
 - Fascial plane blocks
 - Peripheral nerve blocks
- Methods of analgesia during labour: indications and contraindications (psychological methods, complementary methods, systemic analgesia, epidural, combined spinal-epidural, paracervical and pudendal blocks, continuous spinal)
- Complications of regional anaesthesia in obstetrics
- General anaesthesia in obstetrics
- Airway management in the parturient
- Anaesthetic care of the high-risk obstetric patient, including trauma
- Anaesthetic management of complications:
 - Obstetric haemorrhage: Ante partum, peripartum and postpartum
 - Pulmonary embolism
 - Amniotic fluid embolism
 - Foetal death
- Cardiopulmonary resuscitation and advanced cardiac life support of the parturient
- Post-operative pain management in obstetrics
- Maternal medications and breastfeeding
- Anaesthesia for non-obstetric surgery during pregnancy
- Anaesthesia for assisted reproductive technologies and intrauterine surgery
- Maternal mortality
- Predict the likelihood of need for resuscitation of the newborn

b. Clinical skills

- Applying skills from domains 1.1 to 1.12 in parturients, including
 - Airway assessment
 - Rapid sequence induction
 - Diagnosis and management of critical incidents such as post-dural puncture headache, pulmonary aspiration D
- Positioning of parturients D
- Performing lumbar epidural catheter placement, combined spinal-anaesthesia, spinal for labour analgesia D
- Performing anaesthesia for delivery D
- Performing spinal anaesthesia (single shot and catheter techniques), combined spinal-epidural anaesthesia and lumbar epidural anaesthesia (single shot and catheter technique) for caesarean section D
- Management of pain in pregnancy and labour D
- Management of severe peri-partum haemorrhage D
- Initial management of high-risk parturient and application of transfer criteria to more specialist hospitals C
- Performing anaesthesia in pregnant and breastfeeding women D
- Performing anaesthesia and analgesia in assisted reproductive technologies and intrauterine surgery B
- Effectively communicate with patients and relatives in circumstances related to childbirth D
- Effectively communicate with interdisciplinary team including obstetrician, midwife, neonatologist, labour/delivery nurse during critical phases (e.g. peri-partum haemorrhage) D
- Applying uniform skills from part 1 of the ETR update:
 - Basic and advanced life support, including resuscitation in pregnancy and of the newborn D
- Recognise the neonate needing resuscitation C
- Initiate resuscitation of neonates C

c. Specific attitudes

- Recognising ethical issues including foetal and maternal rights
- Recognising psychological issues relevant to pregnancy and delivery

Domain 2.2: Cardiothoracic anaesthesiology

a. Knowledge

- Knowledge competencies from domains 1.1 to 1.12
- General principles of aetiology, pathophysiology and clinical presentation of cardiovascular diseases requiring cardiac surgery and of thoracic diseases requiring thoracic surgery
- Understanding the principles, applied basic sciences, and management of anaesthesia and perioperative care for
 - Thoracotomy and:
 - Lung resection, including pneumonectomy and lung reduction surgery
 - Mediastinal mass resection
 - Oesophageal surgery

- Surgery on the thoracic aorta
 - Tracheal and bronchial surgery (including use of lasers and stents)
 - Thoracoscopic procedures
 - Mediastinoscopy
- General principles of one-lung ventilation and lateral positioning, physiology and complications
- Specific intra- and postoperative complications including hypoxia and hypoventilation and permissive hypercapnia in one-lung ventilation
- Management of post thoracotomy pain and complications
- General principles of mechanical assist devices for the circulation including intra-aortic balloon pump, cardio-pulmonary bypass, extracorporeal membrane oxygenation
- Pathophysiology of extracorporeal circulation (circuits, gas and heat exchangers, anticoagulation)
- Management of temporary pacing during and post cardiac surgery
- Perioperative management of procedures in the catheter laboratory
- Complications of clamping at various levels of the aorta

b. Clinical skills

- Respiratory evaluation with regard to planned surgery (assessment of operability) B
- Performance of lung separation techniques
 - Double lumen tracheal intubation and bronchial blockers (techniques, indications and contraindications) C
 - Clinical and fiberoptic control of tube positioning D
 - Lung separation in difficult airway patients (including tube exchange devices) B
- Patient positioning, particularly in the lateral decubitus position D
- Using chest tube drainage systems and suction D
- Basic skills in the management of anaesthesia and perioperative care for cardiac operations performed on-pump and off-pump B
- Use of advanced haemodynamic monitoring C
- Use of TOE for evaluation of size and function of left and right ventricle, valves (stenosis, insufficiency, severity), diagnosis of pericardial fluid or tamponade, dilation or dissection of the aorta B
- Effectively communicate with patients and relatives in particular circumstances related to cardiac and lung diseases and surgery B
- Effectively communicate with surgical team during critical phases (e.g. lung separation, weaning from cardiopulmonary bypass) B
- Multimodal analgesia for thoracic surgery (including thoracic epidural, nerve and fascial plane blocks) B

c. Specific attitudes

- Recognise psychological issues relevant to patients scheduled for cardiac and thoracic surgery

Domain 2.3: Neuroanaesthesiology

a. Knowledge

- Knowledge competencies from domains 1.1 to 1.12
- General principles of aetiology, pathophysiology and clinical presentation of central nervous diseases requiring neurosurgery
- Neurological examination
- Basic neuroimaging
- Understanding the principles, applied basic sciences, and management of anaesthesia and perioperative care for:
 - Supra-tentorial surgery
 - Posterior fossa surgery
 - Pituitary fossa and skull base surgery
 - Epilepsy surgery
 - Awake craniotomy
 - Craniofacial and craniobasal surgery
 - Spinal surgery, including emergency cord decompression
 - Paediatric neurosurgery
 - Ventriculo-peritoneal shunts, neuro-endoscopy
 - Imaging and interventional radiological procedures
 - Functional surgery and deep brain stimulation
 - Vascular neurosurgery
 - Diagnostic and interventional neuroradiology
 - Electroconvulsive therapy
 - Routine diagnostic procedures (e.g. MRI, CT)
- General principles, indications, limitations and complications of advanced neurophysiological monitoring

b. Clinical skills

- Specific evaluation with regard to planned surgery (assessment of operability) B
- Patient positioning, particularly in the sitting position D
- Management of specific complications including air embolism, intracranial hypertension, seizures D
- Basic skills in the management of anaesthesia and perioperative care for intracranial operations, including induced hypotension, induced hypothermia B
- Apply principles of neuroprotection D
- Use and interpretation of advanced neuromonitoring (e.g. evoked potentials, cerebral oxygenation, blood flow, metabolism) B
- Perform scalp block B
- Management of cardiac arrest in the prone position D

c. Specific attitudes

- Recognise psychological issues relevant to patients scheduled for neurosurgery

Domain 2.4: Paediatric anaesthesiology

a. Knowledge

- Knowledge competencies from domains 1.1 to 1.12
- Anatomic features of the neonatal, infant, pediatric and adolescent airway
- Physiologic characteristics of the different childhood periods including cardiovascular, respiratory, renal, neurologic and neuromuscular
- Sufficient knowledge of behavioural and emotional developmental changes in children
- General principles of common comorbidities including congenital diseases, syndromes related to difficult airway, cerebral palsy and seizures, respiratory susceptibility, and typical differences in children < 1 year compared to adults in terms of anatomy, physiology, and pharmacology
- General principles of aetiology, pathophysiology and clinical presentation of diseases in early childhood requiring surgery
- Understanding the principles, applied basic sciences, and management of anaesthesia and perioperative care in surgery for
 - Congenital cardiac disease (e.g. tetralogy of Fallot, septum defects)
 - Prematurity and its complications
 - Neonatal emergencies (e.g. trachea-oesophageal fistula, abdominal wall defects)

b. Clinical skills

- Apply skills from domains 1.1 to 1.12 in paediatric patients >1 year of age C
- Perform vascular access in young children < 1 year with and without ultrasound B
- Perform airway management in young children <1 year B
- Perform general anaesthesia in young children <1 year B
- Recognise the correct size of equipment for all ages of children D
- Perform neuraxial regional blocks including caudal anaesthesia in young children <1 year B
- Perform peripheral regional blocks in young children <1 year with and without ultrasound B
- Perform postoperative care and pain management D
- Perform general intensive care in young children <1 year B
- Perform cardiorespiratory resuscitation in children and neonates D
- Effectively communicate with patients and relatives B
- Recognise patients that should be transferred to a higher competence facility and safely transfer them D

c. Specific attitudes

- Recognise neurobehavioral changes associated with anaesthesia
- Awareness of pain issues and their effect on the patient and family

Domain 2.5: Multidisciplinary chronic pain management

a. Knowledge

Anatomy and Physiology

- Pain transmission and modulation, development of the pain systems
 - Pain sensitization: Progression from acute to chronic pain
- Types of pain: classification

- Mechanisms to block or impede pain transmission and induce analgesia
- The placebo effect

Assessment

- Pain history, physical examination, request and interpret tests
- Socioeconomic factors: work, compensation, family, personal
- Pain evaluation including scales, questionnaires, and quantitative sensory testing
- Distinguish between nociceptive and neuropathic pain
- Clinical nerve functional studies and imaging
- Follow-up: patient pain diary

Epidemiology, Psychology and Research

- Pain management as a fundamental human right
- Epidemiology of pain, including genetic differences, psychosocial and cultural aspects
- Designing, performing, and reporting clinical trials on pain and analgesia
- Comprehend the preclinical models of pain as essential tools to improve pain management in humans
- Ethical standards in pain management and research

Pain Management: Drugs

- Comprehensive knowledge on the mechanisms, therapeutic effects, clinical use, routes (non-invasive and invasive), doses, side effects and complications, drug interactions, of following drugs and adjuvants:
 - Nonsteroidal anti-inflammatory drugs (NSAIDs) and related agents (paracetamol/acetaminophen, metamizole, cyclooxygenase (COX)-2 selective inhibitors)
 - Opioids and related agents (e.g. tramadol, tapentadol)
 - Local anaesthetics
 - N-methyl-D-aspartic acid (NMDA) receptor antagonists (e.g. ketamine, dextromethorphan)
 - Antiepileptic drugs used in pain medicine
 - Antidepressants used in pain medicine
 - Glucocorticoids
 - Muscle relaxing / antispastic agents (e.g. baclofen)
 - Gabapentinoids (e.g. gabapentin, pregabalin)
 - Alpha-2 adrenergic agonists (e.g. clonidine, dexmedetomidine)
 - Bisphosphonates
 - Cannabinoids
 - Botulinum toxin
 - Inhalational agents (e.g. nitrous oxide, methoxyflurane)
 - Multimodal or balanced analgesia
 - Patient controlled analgesia
 - Preventive measures of frequent and typical analgesic drug-induced side effects (e.g. obstipation prophylaxis)
 - Implantable intrathecal devices for drug administration
 - Substance abuse, addiction and detoxification of analgesic drugs

Pain Management: Non-Pharmacological methods

- Understanding the mechanisms, limitations and the risk/benefit of methods in order to recommend and enforce their use whenever appropriate:
 - Interventional procedures including nerve blocks, neurolysis, and radiofrequency
 - Neuromodulation and neurostimulation (TENS, peripheral, central)
 - Radiofrequency
 - Surgical procedures
 - Physical and Rehabilitation Medicine, vocational rehabilitation
 - Psychological: Cognitive and behavioural interventions and psychiatric treatment
 - Complementary therapies including acupuncture
- Basic knowledge of patient management in palliative care

Clinical states

- Somatic pain
 - Acute pain: procedural, postoperative, emergency / transport
 - Chronic post-surgical pain
 - Musculoskeletal pains: Cervical, lumbar
 - Muscle, tendon and myofascial pains
- Visceral pain
 - Urogenital pain
 - Pelvic pain
 - Chronic gastrointestinal pain
 - Pancreatic pain
 - Thoracic pain (cardiac and non-cardiac), post-thoracotomy pain.
 - Referred pain and visceral hyperalgesia
- Neuropathic and mixed pains
 - Radicular pain: lumbar, cervical
 - Post-laminectomy pain
 - Peripheral neuropathies
 - Central pain
 - Post-amputation pain
 - Complex regional pain syndromes
- Cancer pain
- Headache, oral and facial pain
- Pain in special situations:
 - Pain in infants, children and adolescents
 - Pain in older adults
 - Pain relief in patients with cognitive impairment
 - Pain relief in substance abusers
 - Pain relief in areas of deprivation and conflict

Multidisciplinary Pain Clinics

Organisation of a pain clinic, referrals, patient flow

Role of the different medical specialties and healthcare professionals in pain clinics

b. Clinical skills

- Evaluation of patients with chronic pain: history, physical examination and requesting and interpretation of additional tests considering the bio-psycho-social model B
- Applying pain scales and validated questionnaires D

- Explaining treatment options and clinical goals B
- Initial multimodal treatment of patients with chronic cancer and non-cancer pain B
- Procedural guidance in invasive pain management techniques using POCUS B
- Effectively communicate with patients and relatives in particular circumstances related to chronic pain, including informing about best treatment option, risk/benefit of the treatments, obtain informed consent and written agreement B
- Effective interactions with the multidisciplinary team of health professionals working in the pain clinic B
- Effectively communicate with the primary care physician discussing treatment options and the follow-up of the patient B
- Prevention, diagnosis and management of adverse effects of pain therapy B
- Accurate record keeping (logbook), including treatments and procedures. Documentation of pain evolution B

c. Specific attitudes

- Appraisal of patients right to be heard, believed, and informed, regarding their pain and its management
- Recognise the principle of minimum intervention, using the simplest and safest techniques likely to be effective to achieve the clinical goal
- Become skilled at discerning pain from simulation, often related to drug abuse or worker's compensation

3. Organisation of training

a. Schedule of training

According to the UEMS basic principles, specialist training is competency-based (CBMET) and not numbers- or time-based. Scientific anaesthesia societies of EU countries may define minimum numbers required for imparting and internalising clinical skill at a recommended competence level in the specific local / national training setting.

The process of training, attaining defined competencies and applying them safely and efficiently in clinical practice requires time so that trainees can become proficient.

Minimum training duration is 5 years, of which at least 1 year (continuously or not) is to be dedicated in an intensive care unit.

Competency-based medical education and training (CBMET) is recommended in the consensus statement of the European Society of Anaesthesiology and Intensive Care (ESAIC) and the EBA (Eur J Anaesthesiol 2020; 37(6):421-434). According, no minimum counts are defined.

b. Curriculum of training

The UEMS ETR does not aim to override established national curricula (if prepared under consideration of the United Nations declaration on Human Rights and World Medical Assembly International Code of Medical Ethics) but may complement them by offering a comprehensive and

robust overall training framework created by medical specialists and based on assembled EU-wide educational and training experience. The advantage of specialists trained according to the competency-based UEMS ETR is professional mobility across Europe; qualifications will automatically be recognised in other EU countries as established by EU law (Directive 2005/36).

ETR-based training may include a variety of learning opportunities and training methods including operative procedures, interventional procedures, ward rounds, medical simulation training, multidisciplinary meetings, clinical research, and attendance at training courses. Training activities are not uniform throughout Europe and depend on the national structures and processes. However, the common goal of specialist training should always be the development of professional competency in the fields of generic competencies and roles as described above.

c. Assessment and evaluation

For assessing the status of the competencies acquired a combination of assessment modalities is recommended:

- formative assessments
- summative assessments

Formative in-training assessment should take place throughout the training period. Workplace-based assessment should use direct observation of procedural skills (DOPS) to assess performance in a practical skill, anaesthetic clinical evaluation exercise (A-CEX) to assess performance in a case, anaesthetic list assessment tool (ALAT) to assess performance of a series of cases, case based discussion (CBD) for discussing a case in retrospect. Workplace-based assessment includes regular feedback on skills, knowledge and attitudes during regular clinical performance. An entrustable professional activity (EPA) assesses the performance of whole procedure as a summary of competencies, to identify entrustment level for practice at a certain level of supervision. The EBA recommends the preparation of a hospital-internal EPA unit list as an integral part of the training portfolio (e-portfolio).

Knowledge should be assessed with multiple choice questions or viva voce (written and / or oral examinations according to the regulatory requirements of each country) during the training period.

Transparency of training programmes means that all training activities are recorded. The EBA recommends for documentation:

- logbook
- portfolio (e-portfolio)

Logbooks document all clinical procedures and cases (count and variety of experience).

Portfolio continuously monitors progress and acquisition of competencies, interventions at the specific competence level, instruction from the trainer, self-reflection on the management of the case and the value for progress in the training programme. Regular meetings of the trainer with the trainee permit provision of guidance and planning further learning for progress.

Assessment of logbooks and portfolios allow quality control of the training institution.

The EPD endorses the EDAIC exams as a label of excellence for specialist practice in anaesthesiology. EDAIC examination covers relevant basic sciences and clinical topics appropriate for a specialist anaesthesiologist. An increasing number of European countries have officially adopted the EDAIC as

their national examination. The existence of a supra-national examination in anaesthesiology provides an incentive for the development and improvement of departmental, university, national and European training programs. EDAIC examination achieve a uniformly high standard of knowledge throughout Europe as judged by an independent Board of Examiners. More than one summative assessment is recommended to be performed at predefined time points of the training period.

- Early during training (e.g. after the first year) compulsory appraisal of the trainee is recommended in order to identify residents unfit for training in anaesthesiology, who may be encouraged to change to another specialty.
- After 3 years of training, part I of the exam for the EDAIC may be completed.
- Towards the end of training, national diploma or part II of EDAIC may be completed.

II. TRAINING REQUIREMENTS FOR TRAINERS

High quality training can only be provided by high quality trainers and must be assessed in a meaningful and robust way.

1. Process for recognition as trainer

a. Requested qualification and experience

Teaching is not part of under-graduate and post-graduate training in anaesthesiology. Current practice in most European countries is “learning teaching by doing”. Furthermore, current practice in most European countries is count-based assessment of trainees by trainers. Expertise in competency-based teaching and assessment are still limited and should be encouraged.

Faculty should be prepared to take on the academic challenges of instruction, along with the challenges of information delivery and active learning across all curricular phases.

- The handbook on competence-based teaching: A guide for trainers published by the EBA (<https://sites.google.com/view/eba-uems/eba-standing-committees/epd>; appendix) may facilitate the preparation of hospital-internal guidelines on how to perform competency-based teaching.
- The EPD recommends “teach the teachers” programs throughout European countries which should implement learning technology and learning models focused on conceptual learning and behavioural practice.

The EPD further proposes scientific research comparing the effectiveness between teaching methods and professional development courses on lecturing, enhanced learning and effective communication. Commitment and competence of training staff in science and research is supportive for effective training but not a prerequisite. However, training will stimulate clinical questions with an impact on future research.

b. Core competencies for trainers

Training staff must have competence level D in the assigned area of training.

Training staff must have sufficient time allocated for the training assignment.

Training staff must have good knowledge of the UEMS ETR.

Training staff must have a positive attitude towards clinical training and expertise in didactic teaching, a clear commitment to theoretical teaching and practical instruction of trainees within the full range of clinical practice.

2. Quality management for trainers

According to the System for Evaluation of Teaching Qualities (SETQ), core competencies for teachers and trainers include 1) creating a positive learning climate, 2) professional attitude towards residents, 3) communication of learning goals, 4) evaluation of residents, 5) feedback to residents. SETQ recommends validated questionnaires completed by residents and faculty as tools for assessing teaching performance. Both questionnaires evaluate the 5 teaching qualities listed above.

The UEMS Council of European Specialist Medical Assessments (CESMA) have defined recommendations on the development and organisation of assessment of the trainers, but also their selection and training.

III. TRAINING REQUIREMENTS FOR TRAINING INSTITUTIONS

High quality training can only be provided in high quality training centres and must be assessed in a meaningful and robust way.

1. Process for recognition as training centre

a. Requirement on staff and clinical activities

Training requirements and standards for training institutions vary in the different European countries. The conditions for accreditation of training centres depend on national regulatory bodies. At the European level, based on the EU Directive on Professional Qualifications and the UEMS Charta 1997, visiting programmes and appraisal, which includes recommendations on the quality criteria of training centres have been established: the Accreditation of Training in Anaesthesiology and Intensive Care (ATAIC) is a Joint Committee of the ESAIC and the EBA. Together with the European Diploma in Anaesthesiology and Intensive Care (EDAIC) Committee, the ATAIC aims to improve and harmonise training in anaesthesiology throughout Europe by ensuring that the accredited centres meet the prerequisites of training as set out in this UEMS ETR.

EPD recommends the preparation of a written document describing the teaching programme in the specific training centre/unit including departmental guidelines and standard procedures for anaesthetic practice, considering the UEMS ETR.

Clinical teaching options applied by trainers include bed-side teaching, in-theatre, at the scene workplace-based training during daytime working hours and on duty, individualised supervision and information, help, advice, assistance appropriate for the competence level of the trainee.

EPD encourages educational innovations which promote skill development. Medical simulation is an effective training support option applied by trainers with specific training.

b. Requirement on equipment, accommodation

Requirement on clinical activities: The training hospital as the training centre or the training unit consisting of more than one training hospital (with rotation of the trainees) must offer all relevant specialties and subspecialties such as general, orthopaedic, head and neck (ear nose throat, eye, oral and maxillofacial surgery), paediatric, neonatal, ambulatory surgery, urology, gynaecology, obstetrics, trauma, pain clinics, general intensive care as well as subspecialties (neurosurgery, cardiothoracic and transplant surgery). The training centre must offer training in the pre-hospital environment and critical emergency medicine.

Requirement on infrastructure and process: All relevant clinical activities must be available to the anaesthesiologists so that the clinical skills and attitudes listed in the UEMS ETR, including expertise in regional anaesthesia, invasive techniques, monitoring technologies and diagnostic methods can be learned.

Faculty, teachers, trainers, consultants and tutors must be available in sufficient numbers for the trainer-trainee ratio to support efficient training. Manpower planning is under the jurisdiction of each member state.

Adequacy of departmental accommodation and facilities for trainees is expected for both regular hours and when on-duty, including resting areas.

Accredited training centres/units must provide medical-technical equipment, including simulation equipment, as needed to fulfil skill-training according to the UEMS ETR. Access to a library (books, online, journals) and other learning aid facilities are a prerequisite.

Training centres/units may offer access to research facilities, support in IT and statistics.

2. Quality Management within Training institutions

Accreditation of training centres is highly encouraged by UEMS EBA. Accreditation by ATAIC includes inspection of the training centre/unit, interviews with trainers and trainees, reviews of anaesthesia records, logbooks, audit reports, written guidelines and local protocols. The inspection by ATAIC for accreditation of the training centre/unit focuses on infrastructure as well as processes.

Good training conditions require standards: Assessment of infrastructure by ATAIC addresses resources such as medical staff, director of studies, facilities, trainee-trainer ratio, qualification of trainers, library, technical equipment, existence and transparency of written training programmes and guidelines, access to medical service and opportunities for research and development, faculty publication record, faculty lecturing and academic activities.

The process refers to the “educational climate” and the way existing educational resources are used, how professional guidance is organised including trainee’ assessment by the trainers, appraisal and supervision. EPD recommends a continuous assessment of trainees’ progress (formative assessment) and a competency-based evaluation system (e.g. training portfolio) should be in place. During ATAIC accreditation the structure and coordination of training, standard of clinical care and patient safety, medico-legal aspects, work environment including compliancy with the European Working Time Directive are assessed.

Once accredited and certified these training centres/units will, as centres of excellence, serve as references for national visiting programmes, and hopefully also take on a mentoring role for other European departments seeking accreditation. This will also promote rotation of trainers and trainees which will further contribute to future quality of care and patient safety in acute and perioperative health care in line with the intentions of patient safety declarations.

EPD recommends that medical simulation centres and their methodological training techniques be assessed and accredited by professional simulation societies. On a national level, accreditation of such training institutions has already been implemented.

Appendix

Handbook on competence-based teaching: A guide for trainers

prepared by the task force of the Standing Committee of Education & Professional Development (EPD) of the European Board of Anaesthesiology (EBA) in 2020 (alphabetical order):

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In most European countries medical training is time-based and/or count-based. This means that trainees get their certification after a predefined number of years in training and/or performance of a predefined number of interventions. The European Union of Medical Specialists (UEMS) proposes European Training Requirements (ETR) in order to guarantee clinical standards and to harmonise medical training as a prerequisite for mobility of doctors throughout Europe (1). ETRs are outcome-oriented: neither the number of attempts, nor the time spent at a training institution determine the progression of a trainee to a “good clinician”, but rather the competencies acquired during residency. In a recent consensus statement the European Board of Anaesthesiology (EBA) and European Society of Anaesthesiology and Intensive Care (ESAIC) give a recommendation for competence-based medical education and training (CBMET) (2). Competence is defined in this context as the ability/capability to do something well, while competency is a skill needed to do the job. Without doubt is competence the relevant outcome parameter for a specialist after training. Despite the obvious advantages of CBMET (2), obstacles in their implementation exist, such as lack of knowledge and experience in competence-based teaching and training. Today’s trainers have been educated and trained in a time- or count-based environment and should now create training environments and teaching programs for CBMET. To succeed, CBMET is dependent on competent and committed trainers in an institutional milieu supporting quality of training. This guide for trainers has been prepared to facilitate the transition to contemporary CBMET by briefly describing teaching, assessment, and feedback methods.

1. Role of a trainer

The role of a trainer is to supervise and support trainees while working through their training programme. A clinical supervisor is a consultant (senior doctor) present in the workplace (e.g. theatre, intensive care unit) with the resident or junior doctor undergoing training (trainee). Trainers are certified specialists in Anaesthesiology. All trainers must also have good knowledge of the UEMS ETR in Anaesthesiology (3). Trainers must have sufficient time assigned and commitment for the role and a high level of competence to teach knowledge, skills and behaviours in classroom and clinical situations. Details on the role, competencies and standards required from a trainer are set out in Part 3 of the ETR for anaesthesiology (3).

2. Training in a competence-based education & training (CBMET) format

The European Training Requirements (ETR) in Anaesthesiology 2018 (3) describes a competence-based training programme from novice to independent practitioner. A list of domains of expertise

(areas of practice) and competencies within these domains have been identified. Throughout the course of their training, trainees will progressively achieve the required level of competence in every domain. Although training is competence and not time-based, a minimum of five years is required to complete the programme (3), at least in the hybrid phase of transition from a conventional time-based training to a CBMET.

The levels of expertise required for each competence are defined as

A: has knowledge of, describes (observer)

B: performs, manages, demonstrates under direct supervision

C: performs, manages, demonstrates under indirect supervision

D: performs, manages, demonstrates independently

For each domain of expertise there is a list of learning objectives. These learning objectives are broken down into knowledge, clinical skills and specific attitudes necessary to achieve the required competencies in each domain.

The trainee is responsible and in command for his/her own progress through the training programme. The task of the trainer is to assist trainees as they progress to the required competence level for each domain. This implies assessment of competence levels, signposting the next tasks and most importantly giving regular feedback to support learning.

3. Trainer task in CBMET

3.1 Feedback to the trainee

Effective and constructive feedback is an essential element of teaching. If delivered well it will motivate the trainee to develop their knowledge, skills and professional attitudes. The basic principles of providing effective feedback are:

- appropriate place and participants (possibly away from others in private when reasonable)
- based on direct observation
- descriptive (no evaluation)
- emphasise positive aspects
- supports trainee's self-reflection
- listening and discussion
- clearly delivered advice for development, improvement and corrective measures

The following types of feedback are recommended to be combined during training:

One to one between trainer and trainee, both must be actively engaged in the conversation. Free and interactive conversations are encouraged. To be sure that the feedback has been understood it is sensible to ask the trainee to summarise at the end of the conversation. The trainer may discuss aspects of this summary and may discuss and correct by giving feedback.

This may be the optimal time to answer the questions: what the next task is, how to progress with training, what are the learning points and actions after the feedback, what are the goals.

Multi-consultant feedback refers to feedback gathered from a group of senior trainers (consultants), generally working in one domain, who give feedback on that particular area of practice. This is then summarised and presented to the trainee at a meeting with the trainer. This could be done after a period in an area of practice or at the end of training in a domain. It may be more helpful to complete this type of feedback during the period of training to allow time for the trainee to be offered support to change in response to criticism while working with the same trainers.

Multi-source feedback can be gathered from a group of colleagues (e.g. senior doctors, peers, non-medical staff) within the specialty or multidisciplinary. Standardized questions are answered by a group of people who work with the trainee, responses are anonymised and summarised to be delivered back to the trainee at a meeting with their supervisor. This is a good way of looking at attitudes and generic skills.

A 360 offers a broader review. A wider group of colleagues are asked to provide feedback including peers, seniors, technicians, nurses, surgeons, junior doctors, with whom the trainee has worked. The feedback is collated and fed back to the trainee by a supervisor. This method offers a more general view of the trainee's cooperation, skills and ability to work in multi-disciplinary groups in the hospital. Feedback from patients and their relatives (especially in paediatric anaesthesia and in critical illness) could supplement feedback on the trainee's communication skills.

3.2 Assessing the trainee

Formative assessment is an assessment with feedback and advice to support learning and progress. Summative assessment is an assessment to test whether a certain level has been achieved at the conclusion of a defined instructional period.

Assessment of progress through the programme is made by trainers using a variety of tools including attendance at teaching sessions, courses, knowledge tests, workplace-based assessments and entrustable professional activities (4).

Workplace-based assessment (WBA)

Direct Observation of Procedural Skills [DOPS] – performance in a practical skill

Anaesthetic Clinical Evaluation Exercise [A-CEX] – performance in a case

Anaesthetic List Assessment Tool [ALMAT] – perform a series of cases

Case Based Discussion [CBD] – discuss a case in retrospect

WBAs are generally formative assessments FOR learning. The trainer will make comments and ask questions of the trainee as the case proceeds (5). At the end of the theatre session there must be a period of reflection and review. The trainee reflects on his/her practice and the trainer gives constructive feedback on the trainee's performance. This is the most important part of the process. A record of the assessment and the level of expertise/supervision reached is made. A plan for future learning is then agreed.

Towards the end of training in a domain of practice, the trainer will make a summative assessment. This is an assessment OF learning, so that the trainee can demonstrate skills at the level expected to complete that section of the programme. It can be passed or failed.

The decision to do a WBA (DOPS, A-CEX, ALMAT) should be made in advance; a CBD is done after the case, outside the operating theatre. All WBAs and their outcomes must be logged in the trainee's record.

Direct Observation of Procedural Skills [DOPS] is a workplace-based assessment of practical procedures. The trainee is observed throughout the procedure, from preparation to completion. The first assessments will be formative with feedback to the trainee on how to improve or extend the skill. The trainer decides at what level the skill could be performed next time, for example under indirect supervision.

Anaesthetic Clinical Evaluation Exercise [A-CEX] is a workplace-based assessment where the trainee's clinical skills during a clinical encounter are observed, for example during a case on a theatre list. In this example the assessor observes the trainee doing the case from start to finish, including pre-operative preparation and post-operative care. They may ask questions of the trainee at any time to find out why the trainee has made certain choices in patient care. Formative assessments result in advice and suggestions for progress. A summative A-CEX can be used to show competence in anaesthetising a particular group of patients, for example ASA 1 or those having a specific procedure.

Anaesthetic List Assessment Tool [ALMAT] is used to assess the trainee undertaking a whole series of actions such as

- scheduled theatre day list
- an on-call period
- an obstetrical anaesthesia services or other specific area services
- managing all patients presenting at a pre-anaesthesia clinic
- managing a critical care area for a day.

It is most useful for a senior trainee who already has the individual skills required, now putting them together to run a list or care unit (5). It is an observational assessment made by the trainer who considers the generic skills as well as practical ones. For example, a trainer may review the trainee's ability to communicate with patients and staff, work with a team, maintain safety, be efficient and effective.

Case Based Discussion [CBD] is performed away from the clinical area, generally in an office or classroom. The trainee brings an anaesthetic chart or notes from a case they have undertaken for review with the assessor. The trainee reflects on their practice. The trainer asks more in-depth questions about the decisions made by the trainee. For example, in a CBD on a theatre case the questions may cover the pre-operative assessment, theatre and post-operative care delivered. This will facilitate discussion and assessment of diagnostic skills, planning, case management and

knowledge. The outcome of the meeting is a plan for future learning and practice. Documentation is important but must not identify the patient.

Entrustable professional activity [EPA]

An EPA is a clinical activity which a trainee can be trusted to complete with a certain level of supervision after they have demonstrated the competence to do so (7). An EPA assesses the performance of whole procedure as a summary of competencies, to identify entrustment level for practice. For example, the trainee completes a general surgery domain and now does a theatre list as an ALMAT. The assessment is passed. The assessor agrees that the trainee can do the next similar list under indirect supervision.

A standardized European lists of EPA has not been validated yet. Based on previous publications (8-10) examples of EPAs adapted to the ETR (3) could be proposed:

EPA 1: Providing perioperative anaesthetic management in adult patients with ASA < 3 for laparoscopic abdominal surgery (ETR domain 1.1-1.6)

EPA 2: Providing labour analgesia for healthy parturients with uncomplicated pregnancy (ETR domain 2.1)

EPA 3: Providing anaesthetic care in paediatric patients over the age of 5 for non-complex ear-nose-throat surgery (ETR domain 2.4)

EPA 4: Indication and performance of point-of-care ultrasound diagnostic (e.g. FAST) in emergency care, including plans for therapeutic consequences (ETR domain 1.1, 1.5-1.8)

EPA 5: Providing anaesthetic care in adult patients undergoing spinal surgery (ETR domain 2.3)

EPA 6: Assessing the indication and providing patient blood management in severe bleeding (ETR domain 1.1-1.3)

EPA 7: Providing anaesthetic care in adult patients undergoing procedures outside the OR environment (ETR domain 1.2)

EPA 8: Assessing, investigating, optimizing and formulating management plans in chronic low back pain (ETR domain 2.5)

EPA 9: Providing comprehensive management in critically ill patients with sepsis and multi-organ failure in an intensive care setting (ETR domain 1.7)

EPA 10: Managing goals of care discussion with critically ill patients and families (ETR domain 1.7, 1.10)

3.3 Progress review

It is possible for a trainee to have all WBAs signed off but not successfully complete a domain because non-technical skills or professional attitudes are not demonstrated by WBA alone. One by one feedback and multi-source feedback will cover attitudes and behaviours. Logbook review will show range and depth of experience. Certificates of success in appropriate courses, tests or examinations may also be required for a domain to be signed off by a trainer as completed.

Documentation of all assessments is good practice. It allows progress to be demonstrated and observable competences to be recorded.

In order to monitor and record progress through the training programme it is necessary to review the trainee regularly. This can be done at the end of each domain or level of expertise or at the end of each year in the programme. The process must be clear to trainers and trainees as well as fair. It will include review of

- WBAs
- EPAs
- Feedback
- Logbook
- Courses
- Examinations

Although the trainee's educational supervisor will know most about them, and should be involved in the process, it is important that the annual review is made by those with an overview of training as they are familiar with standards across the wider region. If a general coordinator of training in a region or country is in place he/she may also be involved in checking that the trainee is making progress as expected and is being well supported.

If the end of year progress is not satisfactory an extra period of training might be allocated for the trainee to complete a section of the programme or pass an examination.

Example: The Head of School of Anaesthesia for a region may lead the review panels for all the trainees in their school. Panels are run during the year and a list of trainees are reviewed at each one. Each trainee has one main review a year. Their record of training (portfolio) is inspected by the School team, and the trainee then talks to the programme director about the plan for the next semester or year.

4. Training for trainers

Prerequisite of training staff is competence level D in the assigned area of training. A positive attitude towards clinical training and expertise in didactic teaching and clear commitment to theoretical teaching and practical instruction of trainees within the full range of clinical practice are mandatory. Trainers need knowledge and skills for their role, as well as appropriate support and resources including time (11). Acting as role models for their trainees, they are obliged to engage in continuous professional development. All these competences as a trainer could be understood as competence level E for professional development.

Learning from others, reading and courses can provide learning opportunities on many aspects of training and assessment in CBMET. To date only a few train-the-trainer (train-the-teacher) courses exist and have a local, regional, or national focus. These courses may empower not only internal but also external trainers in assessments, giving feedback and progress reviewing.

Training simulation scenarios could be used for providing competencies in the role as instructors in the skills of observing, assessment of trainees, and providing effective feedback.

To reach the required level of competence to deliver the CBMET programme, time is required. To date there is no definition of time and other requirements for education in train-the-trainers technique for trainers.

5. Assessment of trainers

According to the System for Evaluation of Teaching Qualities (SETQ), core competencies for tutors and trainers include 1) creating a positive learning climate, 2) professional attitude towards residents, 3) communication of learning goals, 4) evaluation of residents, 5) feedback to residents. SETQ recommends validated questionnaires (evaluating these 5 teaching qualities) completed by trainees and faculty as tools for assessing teaching performance (12).

The UEMS Council of European Specialist Medical Assessments (CESMA) defined recommendations on the development and organisation of assessment, selection, and training of trainers (13).

Commitment and competence of training staff in science and research is supportive for effective training but not a prerequisite; training, however, will stimulate clinical questions with an impact on future research, also on trainers' competence assessment tools.

Beyond the assessment of individual trainers, assessment of faculty and hospitals in delivering training is required. To date, the ratio of trainers to trainees required for CBMET will vary depending on the stage of training and domain but has not yet been defined.

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