

Comparing postgraduate anaesthesia education in India and abroad: Strengths and scope

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ABSTRACT

The quality of training is a major contributor to workforce proficiency in healthcare, and there is a definite need to achieve a uniform level of knowledge and skill in medical education programmes. There is a paucity of literature comparing postgraduate anaesthesia medical education training structure and requirements across the globe. In a zeal to achieve uniform competencies and technical skills, the strengths and scope of training programmes need to be identified. In this article, we describe the core elements of postgraduate training in various countries while proposing an amalgamation of strengths of each programme and providing a roadmap to evolve further the competency-based comprehensive curriculum proposed by the National Medical Commission of India.

Key words: Anaesthesia, clinical competence, curriculum, education, teaching

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INTRODUCTION

The raging pandemic has made it crucial for nations to upgrade their healthcare infrastructure and workforce for effective health care delivery within their own country and across borders. One of the major contributors to workforce proficiency is the quality of training received during the postgraduate (PG) training programme. Anaesthesiologists have been catapulted to the forefront of all medical specialities in recent times, thus making it imperative for us to enhance the quality and uniformity of knowledge and skill development in medical education programmes.

Scientific literature comparing PG anaesthesia medical education training structure and requirements across the globe is scant, and it is indeed time to define the strengths and scope of PG training programmes to move towards uniform competencies and technical skills acquisition. Apart from core anaesthesiology

technical skills, a lot of emphasis has been given to the inclusion of non-technical skills like team-work and communication into the curriculum.^[1] The objective of writing this article is to compare various aspects of anaesthesiology PG education training structure between India as proposed by the National Medical Commission (NMC) of India and other major countries, so as to assist policymakers in adopting the strengths of anaesthesia training programmes across the globe, thereby empowering the Indian anaesthesia PG to deliver services efficiently anywhere across the world.

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PG TRAINING CURRICULUM AND TEACHING METHODOLOGY

India

The latest guiding principles from NMC focus on a competency-based PG training programme in Anaesthesiology with specific learning objectives in theoretical knowledge, skill and attitude development.^[2] NMC mandates that the training is well planned, supervised and delivered by well-trained teachers. The PG student learns the basic principles of safe and effective anaesthesia, to prevent and treat pain as well as the overall care of the surgical patient during a period of three years in which the first six months are for training in the management of uncomplicated cases and the selection of thesis topic with submission of the requisite protocol. During the next 18 months, the clinical experience broadens as the student learns the skills of performing and maintaining general as well as regional anaesthesia for the American Society of Anesthesiologists (ASA) grade I to V patients. In the last 12 months, thesis submission is mandatory at least six months before the final examination. Super speciality postings like cardiothoracic and vascular surgery, etc., should be covered, and there should be at least four months of intensive care unit (ICU) posting. Our PG training should expand to include extensive training in ICU and trauma triage units. The trainees also need to grasp management and organisation during pandemics.^[3] Apart from the description of clinical rotations and goals of learning year-wise, a detailed syllabus covering the three domains has been proposed.

Cognitive domain: It pertains to the ability to demonstrate the knowledge of relevant anatomy, physiology, biochemistry, principles of physics, gas laws, pre-anaesthetic assessment, anaesthesia techniques, basic and advanced life support, neonatal resuscitation and trauma life support as per the latest guidelines. The student must learn about the history of anaesthesia; management of an unconscious patient; and understand the principles of ventilation, shock management, oxygen therapy, etc. Post-operative care, acute and chronic pain management, research methodology and basics of statistics, arterial blood gas analysis, rational use of blood and its components, tenets of sterilisation and infection control are also included. Principles and techniques of various anaesthetic procedures; care of terminally ill; the concept of auditing; reporting of critical incidents along with clinical trial and ethics; design of operation

theatre (OT), ICU and hospital, etc., are also to be imparted.

Affective domain: The trainee needs to learn methods of effective communication with colleagues, patients, their families and other health personnel.

Psychomotor domain: This includes skill development in broad areas and the competence of the student to demonstrate the abilities of a perioperative physician, including pre-operative equipment check, monitoring, failed intubation drills, etc. Proficiency in most performed anaesthesia procedures is expected, along with skills in emergency anaesthesia, trauma and resuscitation. At this point, the student can demonstrate the practice of regional anaesthesia, thoracic and cardiovascular anaesthesia, paediatric anaesthesia, transplant anaesthesia, neuro anaesthesia apart from anaesthetic considerations in surgical procedures like rhinootolaryngological, orthopaedic, obstetrics and gynaecology, replacement surgeries, urosurgery, vascular, plastic, dental, non-operating room location anaesthesia, etc.

There are a variety of teaching methods [Table 1]. Emphasis is given to safety, communication skills, behaviour, attitude, ethics, audit and management. Students acquire hands-on training in performing various procedures, including exposure to newer modalities.^[2] A logbook pertaining to these activities is required to be maintained.

The competency-based medical education in India has also incorporated self-directed learning (SDL), which is a process in which the onus of learning is with the trainees as they themselves decide their goals of learning, take initiatives to diagnose their needs, look for resources and also, evaluate the outcomes.^[4] A PG student must read one paper at a national/state conference, present one poster and one research paper. The research paper should be published or be sent for publication during the period of training, which then makes them eligible to appear for the PG degree examination.^[5] Good quality research can be encouraged by promoting research methodology and scientific paper writing workshops.^[6]

Apart from Doctor of Medicine (MD) Anaesthesia (3 years) and Diploma in Anaesthesia (2 years), the Diplomate of National Board (DNB) offers PG anaesthesiology courses (2–3 years) in India. The

Table 1: Post Graduate (PG) anaesthesiology curriculum, teaching and assessment methodology: A comparison across countries

Country	PG curriculum	Teaching Methods	Assessment
INDIA	National Medical Commission focus on competency-based PG training programme Duration: Three years (MD); Two years (DA); Two-three years (DNB) At least four months ICU rotation Research (Thesis) mandatory Domains: cognitive, affective, psychomotor	Tutorials, case discussions, seminars, symposia, journal clubs, clinical demonstrations, grand rounds and research presentations Hands-on training on models and performance under supervision Simulators for events of high importance	Formative assessment (Quarterly) Summative assessment at the end of the training Logbook of activities The final examination consists of three parts: 1) Thesis 2) Theory evaluation 3) Practical/Clinical and viva voce
EUROPE	European Training Requirement (ETR) Five years, at least one year ICU Competencies: Expert clinician, Professional leader, Academic scholar, Inspired humanitarian Domains: General and Specific core competencies	Workplace-based, supervised experiential learning Independent, self-directed learning Small group sessions with peers Formal education sessions, including case presentations, journal clubs, audit and quality improvement projects, joint speciality meetings Simulation training	Formative assessments throughout based on the Mini-CEX or direct observations and simulation-based In-training evaluations [Multiple-choice questions (MCQs) or viva] Logbook of activities A "tutor" or "mentor" for follow-up and feedback Nine European countries have officially adopted the EDAIC as National examination. In some, EDAIC is the official exit examination.
CANADA	Competency-based medical education (CBME) Five years Four stages with milestones Stage 1: Transition to Discipline, two months Stage 2: 16 Entrustable Professional Activities (EPA), 22 months Stage 3: Core, 30 months Stage 4: Transition to Practice, 6-12 months	Clinical rounds, resident educational retreats, simulation training, journal club POCUS Boot camps, block rotations, longitudinal educational sessions, portfolio sessions, research training, senior revision tutorial	EPA to be attained at the end of the stage Assessment strategies to be linked to each EPA for assessments and feedback Each EPA comprises milestones that outline the progression and span the seven CanMeds domains
UK	14 domains Seven years Three stages Stage 1: 3 years, low to moderate risk patients Stage 2: 2 years, specialist areas of anaesthetic practice Stage 3: 2 years, Bridge from training to consultant practice	Lectures, tutorials, e-learning Scenario-based immersive simulation training Outcome-based learning Focus on excellence than competence alone	Initial Assessment of Competence Primary FRCA in Stage 1: Summative assessment Objective Structure Clinical Examination (OSCE): summative assessment of a candidate's clinical communication skills and applied technical knowledge. Structured Oral Examination (SOE): Summative assessment of basic sciences Final FRCA: Written examination, gateway to the Final FRCA SOE Final FRCA SOE: the last component of the FRCA examination
USA	Accreditation Council for Graduate Medical Education (ACGME) curriculum 36 or 48 months Six core competencies: Professionalism, Patient care and procedural skills, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, systems-based practice	Didactic teaching, grand rounds, case discussions, courses, conferences, simulations and drills, critical appraisal of evidence	Formative assessment Summative assessment. Written Examinations. (MCQs) OSCE

EDAIC: European Diploma in Anaesthesiology and Intensive Care; FRCA: Fellowship of the Royal College of Anaesthesiologists; ICU: Intensive care unit; MD: Doctor of Medicine; DNB: Diplomate of National Board; PG: Postgraduate; POCUS: Point of Care Ultrasound; UK: United Kingdom; USA: United States of America

completion of training prepares the trainee to work as a specialist in the community and as a medical teacher and researcher in the field.^[7]

Europe

The European Training Requirement (ETR) in anaesthesiology guidelines emphasise

competency-based specialist training over a minimum duration of five years, including one year of training at an intensive care unit (ICU). Four generic competencies and roles have been identified.^[8]

Expert clinician: This includes the domain of perioperative medicine, intensive care medicine, resuscitation of critically ill patients and acute and chronic pain management.

Professional leader: The competencies in communication, and human interactions, must be developed, enabling the specialist in Anaesthesiology to effectively organise and manage tasks during professional activities.

Academic scholar: This role enables the specialist to be able to contribute to the development of new medical knowledge through research and implementation thereof. They also acquire basic tools for teaching and education presentations.

Inspired humanitarian: This aspect defines the role as a professional with high empathy, integrity, compassion and honesty. This also includes the ethical aspects in patient care and decision-making along with medico-legal concerns pertaining to the practice of Anaesthesiology.

To fulfil these four roles, there is a list of domains of competencies which have been divided as general core competencies (general anaesthesia, regional anaesthesia, airway management, perioperative care, acute pain management, intensive care and emergency medicine, patient safety, non-technical skills, ethics and professionalism, health economics, self-directed learning and research) and specific core competencies (obstetric, cardiothoracic, neuro and paediatric anaesthesiology, chronic pain management).

For each domain, the learning objectives have been categorised as knowledge, skills and attitudes to finally achieve the required level of competency, defined as:

- A. Observer level
- B. Performs, manages, demonstrates under direct supervision
- C. Performs, manages, demonstrates under distant supervision
- D. Performs, manages, demonstrates independently

Also included are various clinical guidelines, standards of quality care and medical simulation training.

Canada

There is a focus on competency-based medical education (CBME) and the duration of training is five years. Since July 2017, Anaesthesiology programmes have been structured according to the Competency by Design (CBD), an initiative by the Royal College of Physicians and Surgeons of Canada. Anaesthesia trainees are trained in four stages and each stage has a predetermined milestone to achieve.^[9]

Stage 1, the introductory stage, named Transition to Discipline (TTD), is of two months duration which includes courses like Advanced Trauma Life Support (ATLS), Basic Life Support (BLS), Transthoracic Echocardiography and Ultrasound. During this stage, hands-on operating room experience is ensured along with didactic and simulation-based teaching.

Stage 2 is of 22 months duration, and it includes 16 Entrustable Professional Activities (EPA). The trainee is initially rotated in internal medicine, paediatrics, emergency medicine, cardiology and respiratory medicine before proceeding to advanced rotations in general anaesthesia and ICU.

In stage 3, which is the core and lasts for 30 months, the trainee is rotated in advanced sub-specialities in anaesthesia such as neuro-anaesthesia, cardiac, paediatrics and ICUs and near the end of the core, they write the written portion of the Royal College examination.

Stage 4 is the Transition to Practice with a duration of 6 to 12 months. The trainee is trained vigorously to be independent in delivering advanced consultant-level anaesthetic care.

United Kingdom (UK)

The goal of the curriculum for anaesthesia training in the UK is similar to that in Canada. They aim to achieve 14 domains of learning ranging from professional behaviour, communication, management, requirements (both professional and regulatory), teamwork, safety and quality improvement, education and training, perioperative medicine, general anaesthesia, regional anaesthesia, resuscitation and transfer, research and data management, procedural sedation, intensive care and pain management. The training has been divided into three stages over seven years.^[10] Each stage has a specific critical point to enable the trainee to move on to the next stage and final recommendation for Certification of Completion of Training (CCT).^[11]

Stage 1 (three years): Trainee anaesthetists are introduced to elective as well as emergency practices along with perioperative care. Duration of training is spent for gaining clinical experience in low to moderate risk patients. During this stage of training, anaesthetists will complete the primary Fellowship of the Royal College of Anaesthetists (FRCA) examination.

Stage 2 (two years): Trainees are introduced to broader areas of anaesthesia so that they consolidate skills gained in Stage 1 while learning specialist areas of anaesthetic practice. Thus, they get trained for generalist practice with more autonomy while learning management of high-risk patients. During this stage, they complete the final FRCA examination.

Stage 3 (two years): This level is a bridge from training to consultant practice where anaesthetists mature in their clinical skills for conducting safe practice. At the end of this stage, they will have the requisite expertise for complex clinical situations and also manage any organisational issues.

The anaesthetic training is more outcome-based than time-based. The four competencies defined are medical expert, leader, scholar and professional. As a medical expert, the anaesthetist should know anaesthetic and medical technology, principles of general medicine pertaining to methods in diagnosis and therapy based on a thorough knowledge of applied physiology, pharmacology, respiratory, circulatory and nervous systems.

As a leader, the important competence considered is effectiveness in communication. As a scholar, there should be professional competency as well as capability to promote development in Anaesthesiology. Lastly, as a professional, the anaesthesia specialist should have impeccable behaviour and be thorough about duties and responsibilities acceptable as a professional. To fulfil these four identified professional roles, there is a list of domains of expertise and their related competencies.^[12]

United States of America (USA): Accreditation council for graduate medical education (ACGME) curriculum

The programme duration ranges from 36 months to 48 months; the 48 months programme includes additional 12 months of training in basic clinical skills in medicine. At least six months of fundamental training should incorporate family medicine,

neurology, internal medicine, paediatrics, gynaecology and obstetrics, surgery or any surgical speciality. At least a month in critical care and emergency medicine is mandatory. The remaining 36 months of training is about perioperative medicine with the distribution of clinical experience in surgical anaesthesia, critical care medicine and pain medicine. Two weeks each for pre-operative medicine and post-anaesthesia care is a must. In critical care, at least four 1-month rotations should be there wherein the trainee participates as an integrated member of critical care teams. Further, two 1-month rotations are suggested for obstetric anaesthesia, paediatric anaesthesia, neuro anaesthesia and cardiothoracic anaesthesia. A minimum of 3 months in pain medicine and two weeks in anaesthesia for patients undergoing procedures outside operating rooms is planned. Certification in Advanced Cardiac Life Support (ACLS) is mandatory, at least once during residency, as is at least one simulated clinical experience each year.

Along with the educational curriculum, importance is given to the availability of basic facilities to the trainees, like food and refrigeration facilities, rest areas, availability of reference materials, etc. The roles of programme director, core faculty and programme coordinator are explicitly narrated. Also, the core didactic academic activities are defined for which the time is protected.

There are six core competencies of ACGME.^[13]

1. **Professionalism:** It includes the demonstration of compassion, integrity and respectful behaviour. There should be responsiveness to patient needs, consideration for patient privacy as well as autonomy. The resident should be able to manage personal and professional well-being and disclose and address conflict of interest appropriately.
2. **Patient Care and Procedural skills:** The residents should provide appropriate, compassionate and effective patient care. Along with fundamental skills of medicine, they must be able to demonstrate competence in anaesthesia management. This includes objectively defined competency skills, like the care of 100 patients less than 12 years of age, including 20 children less than five years and five under three months of age; 20 patients for pain evaluation; anaesthesia care for 40 patients undergoing vaginal delivery, 20 undergoing caesarean section, 20 patients undergoing

cardiac surgery, including 10 with the use of cardiopulmonary bypass and so on.

3. **Medical knowledge:** This includes knowledge of current and upcoming biomedical, clinical, epidemiological and social-behavioural science and their application in patient care.
4. **Practice-based learning and improvement:** They should be able to demonstrate investigation ability with which they can evaluate patients, and assimilate this knowledge and evidence to improve the care of patients.
5. **Interpersonal and communication skills:** There is a focus on the development of soft skills so that there is effective communication and good collaboration with all the patients and other health professionals.
6. **Systems-based practice:** The trainee must understand the system of health care, including social factors determining health and should develop the ability to use resources appropriately to provide the best possible health care.

Topics such as professional liability, billing arrangements, health care finance have also been given due importance. Competence in the identification of one's own deficiencies, strengths and expertise is emphasised. The importance of utilising feedback and evaluation into daily practice, concluding evidence from scientific literature and the use of information technology is encouraged. The structure of training must ensure sufficient length of rotations for optimal learning, relationship with faculty and assessment and feedback.^[13]

A recent review compared similarities and differences in competencies in anaesthesiology residency for the European Union (ETR), United States (ACGME Milestones), and Canada (CBD). The authors found that about 93% of competencies were common, and the difference between the three repositories was in terms of emphasis. While ETR emphasised non-technical skills in anaesthesia, CBD highlighted finely detailed competencies within specific anaesthesiology situations, and ACGME Milestones emphasised behavioural practices and professionalism.^[14]

South East (SE) Asia

Anaesthesia education in SE Asia is quite diverse. Singapore follows the American model with a 5-year residency program.^[15] The training programme is an outcome-based modular training programme

with structured objectives and goals stipulated in accordance with the requirements of the ACGME. The Philippines and Malaysia model is similar to India with a 3-year basic residency programme.

ASSESSMENT METHODOLOGY

The assessment methodologies followed across the globe are varied [Table 1]. In India, according to PG Medical Education Regulations, 2000 of NMC, a combination of both formative and summative assessment is vital for the successful completion of the PG programme. Formative assessment should be done continuously to assess knowledge about anaesthesia, patient care and procedural skills. There should also be an ongoing assessment for professionalism, SDL and interpersonal skills. Frequent internal assessment should include all learning domains and provide feedback as well. The quarterly assessments should include recent advances, skill-based learning, SDL, interdepartmental learning activity and external activities.^[2] The formative assessment is being carried out in many institutes in the form of exams at fixed intervals.^[16]

To be eligible for the final assessment, the candidate has to submit a dissertation on a relevant topic under the direct supervision of the guide. As a part of the final assessment, candidates have to undergo theory and practical examinations. Theory examinations consist of four papers and detailed practical examinations include case-based discussions, assessment of knowledge in anaesthesia equipment, drugs, objective structured clinical examination (OSCE), and communication skills. The student has to score eligibility marks (above 50%) in both theory and practical examinations. OSCE, as a formative or summative examination, is being used increasingly for objectivity and reliability both by teachers and students. The preset standards of competence and checklists rule out any biases while covering a large number of topics.^[17]

In addition to the above, the assessment of procedural skills should be made essential. Direct Observation of Procedural Skills (DOPS) is one such tool developed by the Royal College of Physicians in 2007.^[18] Yet another tool, the Objective Structured Assessment of Technical Skill (OSATS) includes a global rating scale and a task-specific checklist. OSATS has been considered superior to other methods of assessing clinical competencies. However, a robust rating scale to improve performance using OSATS is still lacking.^[19]

Anaesthesiologists desiring to practice overseas following completion of training in India need to appear for the licensing examination; United States Medical Licensing Examination (USMLE) (USA), Professional and Linguistic Assessments Board (PLAB) (UK) and European Diploma in Anaesthesiology and Intensive Care (EDAIC) (Europe).

Whilst enlisting and comparing the strengths and scope of various PG anaesthesia training programmes across the globe, we propose an amalgamation of the strengths of each programme, especially in regard to technical and non-technical competencies with an aim to be able to develop a critically thinking perioperative physician, compassionate professional leader, and a scholar with research capabilities. The programmes followed by Canada, the USA and perhaps European countries need to be adapted to our unique geographical needs and logistical conditions. We need to incorporate simulation technology not only in training but also as part of an ongoing formative and summative assessment. The aim should be to inculcate critical thinking in an empathetic, ethical and logical manner.

SUMMARY

In summary, it is indeed time to upgrade our PG training programme and its duration uniformly across the country and across the globe. We also need to think about the feasibility of a uniform competency-based exit exam, akin to the final FRCA exam in the UK. Physician exchange programmes, not only for the student but also for teachers with the best across the globe, should aim at constant quality improvement initiatives. We should be ambassadors for a radical change in our systems to be able to produce lifelong empathetic, ethical learners equipped to adapt to varying clinical environments with an aim to enhance patient safety and quality of perioperative care across the length and breadth of our country.

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