

Training of Postgraduates in Anatomy

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ABSTRACT

It is recognized that training methods differ among the various medical colleges; however, trained specialists should be competent to discharge their duties independently in any part of the country. Therefore, to maintain uniform standards of education, there is a need to harmonize postgraduate training in anatomy. It is proposed that a structured training programme should be drawn up and monitored regularly at specified intervals, spelling out some clearly defined targets that need to be achieved. The ultimate goal of the postgraduate training programme should be to produce anatomists with sufficient knowledge and practical skills to undertake undergraduate teaching and evaluation in all branches of anatomy, as well as to pursue research independently.

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INTRODUCTION

The science of anatomy introduces an aspiring doctor to the language of medicine and forms the basis of all surgical knowledge.^{1,2} Its scope encompasses the rudiments of all diagnostic and therapeutic branches of medicine as also of allied health sciences;³ thus, a streamlined system for imparting sound knowledge in the subject assumes immense importance. The past few years have witnessed a sharp decline in the number of students pursuing a career in anatomy, leading planners to propose remedies for replenishing the dwindling number of anatomy teachers.⁴ One of the ways to make the subject more attractive for medical graduates is to impart skills during training that enable anatomists to successfully network with clinicians and researchers.

Preclinical undergraduate teaching and basic research remain the thrust areas of anatomy departments worldwide,⁵ with more recent forays into diagnosis and intervention vis-à-vis rapid advances in developmental anatomy and genetics. The ever-expanding purview of anatomy has created a need for standardizing a training schedule that produces competent professionals in this subject. Uniform standards for postgraduate medical education are important because degree candidates are equated when they face competitive jobs, despite interinstitutional differences in quality of teaching and infrastructure.⁶ A broad-based curriculum is also required during postgraduate training to discourage subject-specific tunnel vision among trainees.⁷

OBJECTIVES

The training programme for anatomy postgraduates in all the medical institutions of the country should be designed to fulfil the following *basic goals*:

1. Ensure that at the end of the training they attain standards of knowledge and specialist skills adequate to permit them to undertake independent practice.
2. Encourage acquisition as well as application of information and techniques to improve their teaching and research skills.
3. Inculcate self-learning and instil the desire to continuously update the knowledge and skills acquired as a result of such training and education.

These long term goals may be realized only by setting well-defined and achievable targets that clearly spell out the course of action. These should be:

1. Define the *content* of the training syllabus, which should be reviewed regularly.
2. Define the *abilities and skills* that should be acquired.
3. Ensure that a designated consultant in each training unit *supervises* the training programme.
4. Ensure *access to facilities* for postgraduate training.
5. Arrange *regular journal clubs* and meetings for critical review of new scientific developments.
6. Organize *assessment throughout the training period* and ensure that it reflects new developments in the specialty.
7. Publicize *new developments* in the specialty through workshops, symposia and conferences.

It must be made mandatory for all postgraduates to participate in the full range of activities.⁸ The number of procedures (guidelines only, not mandatory) to be performed should indicate the amount of experience required in individual areas of training. If training in certain techniques is not possible at a training centre, that centre should either substitute the technique with another one or arrange that component of training at another recognized centre.

ORGANIZATION

1. Postgraduate training implies a certain degree of proficiency in the *theoretical course* of study and *practical skills of teaching and research*.
2. The student must be regularly *assessed* to motivate both knowledge and skill acquisition.
3. The *duties of the trainer* need to be clearly defined in this regard, to avoid errors of omission and/or commission.

THE COURSE

The training programme must include the following essential components:

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|------------------------------------|------------------------------------|
| 1. Theoretical syllabus | 4. Computer techniques |
| 2. Practical skills | 5. Statistical methods of analysis |
| 3. Dissertation or research thesis | 6. Journal clubs |

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Theoretical syllabus

The postgraduates *must participate* in both undergraduate and postgraduate teaching programmes. They *should attend* all undergraduate lectures and regularly *conduct* demonstrations and problem-based learning exercises.

In addition to the baseline knowledge so acquired, the trainees must *attend and prepare materials* under the guidance of the trainer for group discussions, seminars on topics of higher knowledge domain and problem-based learning. These must cover the following areas:

1. Functional human anatomy
2. Reproductive biology
3. Developmental biology
4. Functional cellular ultrastructure
5. Neurobiology
6. Applied and clinical anatomy
7. Genetics
8. Immune mechanisms

At the end of three years of the training programme, the student *should be able to define* most anatomical terms and *have a detailed understanding* of the regional and systemic anatomy, histology, embryology and neuroanatomy. The student must also *acquire comprehensive knowledge* of common congenital defects or malformations, and the anatomical basis of a variety of common clinical problems.

A *basic understanding* is required about the principles of inheritance of chromosome and genetic disorders, common inherited disorders, normal and abnormal karyotypes and the genetic basis of infertility and early abortion. The student must also be *aware* of various immune mechanisms.

The ability to *identify and interpret* histological sections of various tissues and organs, embryological and neuroanatomical slides, electron micrographs, cross-sectional anatomy of various regions, plain and special radiographs (CT, MRI and contrast studies), ultrasonograms as well as photographs of endoscopic views depicting normal regional anatomy, *should be mastered*. The student must possess a *working knowledge* of statistical techniques of data collection, analysis and interpretation. It is also desirable that they acquire skills in quantitative image analysis and stereology. The student must also know *how to formulate* questions and *assess* answers.

Practical skills

The study of anatomy provides access to a wide range of skills, mastery over some of which may be acquired with experience by choosing a particular area of research. However, a trained anatomist *must be reasonably competent in certain essential skills* so as to be able to teach and conduct research. Some of these skills include:

1. *dissect* a specimen
2. *make* a cast
3. *process and cut* histological sections using the rotary microtome, cryostat and ultramicrotome (if available)
4. *perform* staining techniques on histological sections
5. *perform* an embalming procedure
6. *prepare and interpret* a normal karyotype and preferably *culture* blood cells for cytogenetic evaluation
7. *conduct* demonstrations, tutorials and problem-based modules for undergraduates
8. *learn* to construct multiple choice questions
9. *learn* to use a computer and be able to *access* the internet and use three-dimensional learning materials.

Research thesis

The student *must undergo* training in research methodology under the guidance of supervisors, while working for the thesis. This training entails acquisition of skills to (i) write a protocol, (ii) gather and review literature, (iii) design experiments to perform systematic research, and (iv) observe, document as well as interpret the results in the light of existing literature. In place of repetitive research and dissertations, creative thinking and innovative research methods should be encouraged. This could be achieved by research protocols transcending departmental barriers. Also, the student should *present* at least one oral or poster communication at a scientific meeting and *publish* one scientific paper in a peer-reviewed journal.

Computer techniques

The *knowledge and use* of computers in the present times is virtually inescapable as these are an integral part of most modern instruments. Computers are also useful for presenting data, acquiring information and referencing. Various learning materials, both 2-D and 3-D, are available that make teaching and learning through computers an enjoyable experience.

Statistical methods

Sound knowledge of basic statistical principles is a must for meaningful scientific research. It is mandatory for writing a good scientific paper or critically analysing published data. Therefore, the study of statistical methods should be an *important component* of training.

Journal club

The student should hone communication skills and regularly update knowledge by participating and presenting at journal clubs organized for review and discussion of recent advances in medicine. The value of journal clubs as a means of acquiring critical appraisal skills is well documented.^{9,10}

ASSESSMENT OF TRAINING

All intending anatomists should be *formally evaluated at regular intervals*. Progress during training should be recorded in a log book, listing skills acquired and participation in teaching programmes.

Self-assessment. Trainees should record in the log book their confidence in performing learnt skills and their opinion of their interactions with trainers.

Formative assessment. At regular intervals, trainers should record their assessment of the trainees' competence in performing various tasks.

Summative assessment. The trainer should perform an intermediate assessment at the end of one year so as to identify the shortcomings which need corrective action. Emphasis should be given to 'evaluation during training' rather than 'at the end'. The institution or medical school should also evaluate the training programme.

Duties of trainers

1. Make sure that training encompasses all the contents of the syllabus.
2. Supervise trainees in their acquisition of skills, detect difficulties and promote corrections.
3. Provide guidance on research projects.
4. Coordinate educational planning and training.
5. Be accountable and responsible for training, equipment and organization.
6. Arrange regular meetings and multidisciplinary discussions in which trainees can participate actively.
7. Ensure that the trainee is regularly assessed.

PROVISION OF TEACHING MATERIALS

In addition to the teaching and learning aids for undergraduates, certain other facilities that need to be made available to the postgraduates include:

1. Reference books and relevant anatomical journals in the library
2. Proper instruments for dissection, preparation of casts, cross-sections and embalming
3. Rotary microtome, knives, L moulds, trays, incubator, oven, cryostat, refrigerators
4. Necessary chemicals for processing and staining of histological sections
5. Sets of histology, embryology and neuroanatomy slides and models
6. Binocular microscopes with teaching attachments
7. Overhead and slide projectors
8. CT scans, MRI scans, ultrasonograms, X-rays (plain and contrast studies), endoscopy photographs, electron micrographs and karyograms. If possible, the student should visit the radiology and clinical departments to see how these are performed
9. 2-D and 3-D computer learning materials
10. Computer with internet access
11. Image analysis system (desirable)
12. Set-up for culturing blood cells (desirable)

CONCLUSION

An attempt has been made to highlight some essential requisites that should be considered while framing a comprehensive curriculum for postgraduate students of anatomy. The training programme outlined above is aimed at equipping a trainee to become a good teacher/resource person and to meet future challenges in a personal quest for knowledge.

REFERENCES

- 1 Cottam WW. Adequacy of medical school gross anatomy education as perceived by certain postgraduate residency programs and anatomy course directors. *Clin Anat* 1999;12:55-65.
- 2 Crisp AH. The relevance of anatomy and morbid anatomy for medical practice and hence for postgraduate and continuing medical education of doctors. *Postgrad Med J* 1989;65:221-3.
- 3 Latman NS, Lanier R. Gross anatomy course content and teaching methodology in allied health: Clinicians' experiences and recommendations. *Clin Anat* 2001;14:152-7.
- 4 Malamed S, Seiden D. The future of gross anatomy teaching. *Clin Anat* 1995;8:294-6.
- 5 Jones DG. Anatomy departments and anatomy education: Reflections and myths. *Clin Anat* 1997;10:34-40.
- 6 Sen S. Postgraduate medical education. *J Assoc Physicians India* 1985;33:621-3.
- 7 Shadaksharappa KS. Medical education in the next millennium. *Ann Natl Acad Med Sci (India)* 1999;35:61-8.
- 8 Medical Council of India. Professional education—recommendations of the Medical Council of India on medical education. *J Indian Med Assoc* 1972;59:263-70.
- 9 Alguire PC. A review of journal clubs in postgraduate medical education. *J Gen Intern Med* 1998;13:347-53.
- 10 Sandifer QD, Su VL, Crompton G. Evaluation of a journal club as a forum to practise critical appraisal skills. *J R Coll Physicians Lond* 1996;30:520-2.

Obituaries

Many doctors in India practise medicine in difficult areas under trying circumstances and resist the attraction of better prospects in western countries and in the Middle East. They die without their contributions to our country being acknowledged.

The National Medical Journal of India wishes to recognize the efforts of these doctors. We invite short accounts of the life and work of a recently deceased colleague by a friend, student or relative. The account in about 500 to 1000 words should describe his or her education and training and highlight the achievements as well as disappointments. A photograph should accompany the obituary.

—Editor