

Guidelines
for
Competency Based Training Programme
In
DNB – Anatomy
2021



NATIONAL BOARD OF EXAMINATIONS IN MEDICAL SCIENCES
Medical Enclave, Ansari Nagar, New Delhi-110029, INDIA
Email: mail@natboard.edu.in Phone: 011 45593000



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I Objectives

The following document has been prepared as per guide lines given by NMC 2020.

The Goal of DNB Anatomy is to train a doctor to become a competent teacher and Researcher in Anatomy who:

- Is aware of contemporary advances and developments in the field of Anatomy.
- Has acquired the competencies pertaining to the subject of Anatomy that are required to be practiced at all levels of health system.
- Is able to discharge responsibilities and participate in National Health Education Program.
- Is oriented to the principles of research methodology.
Has acquired skills in educating medical and paramedical professionals.
- Has acquired skills in effectively communicating with the students and colleagues from various medical and paramedical fields.
- Has acquired skills of integrating anatomy with other disciplines as and when needed.
- Has acquired qualities of a good teacher capable of innovations in teaching methodology.
- Has been able to demonstrate adequate management skills to function as an effective leader of the team engaged in teaching and research.

After completing the three year course in DNB Anatomy, the student should have achieved competence in the following:

1. Knowledge of Anatomy

- Acquire competencies in gross and systemic anatomy, surface anatomy, neuroanatomy, embryology, genetics, histology, radiological anatomy, applied aspects and recent advances of the above mentioned branches of anatomy to clinical practice. These are given in detail in subsequent sections.

2. Practical and Procedural skills

- Acquire mastery in dissection skills, embalming, plastination, tissue preparation & staining, and museum specimen preparation & maintenance.

3. Training skill in Research Methodology

- Acquire skills in teaching, research methodology, use of appropriate statistical tools epidemiology & basic information technology.
- Acquire knowledge in the basic aspects of Biostatistics and research methodology.
- Has knowledge to plan the protocol of a thesis, carry out review of literature, execution of research project and preparation of report.



- Has ability to use computer applications Microsoft office (Microsoft word, excel, power point), Internet, Searching scientific databases (e.g. PubMed, Medline, Cochrane reviews).
- Acquire skills in paper & poster preparation, writing research papers and Thesis.

4. Professionalism, attitude and communication skills:

- Develop honest work ethics and empathetic behavior with students and colleagues.
- Acquire capacity of not letting his/her personal beliefs, prejudices, and limitations come in the way of duty.
- Acquire attitude and communication skills to interact with colleagues, teachers and students.

5. Teaching Anatomy

- Practicing different methods of teaching-learning including use of different audiovisual aids.
- Making presentations of the subject topics and research outputs.

6. Problem Solving

- Demonstrate the ability to identify applied implications of the knowledge of anatomy and discuss information relevant to the problem, using consultation, texts, archival literature and electronic media.
- Demonstrate the ability to correlate the clinical conditions to the anatomical/ embryological/hereditary factors.
- Demonstrate the ability to evaluate scientific/clinical information and critically analyze conflicting data and hypothesis.



II Subject Specific Competencies

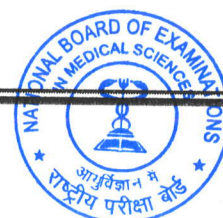
At the end of the course, the student should have acquired following competencies:

1. Cognitive Domain

- Describe gross anatomy of entire body including upper limb, lower limb, thorax, abdomen, pelvis, perineum, head and neck, brain and spinal cord.
- Explain the normal disposition of gross structure, and their interrelationship in the human body. She/He should be able to analyze the integrated functions of organs systems and locate the site of gross lesions according to deficits encountered. Learn cross sectional anatomy of the whole body in order to interpret MRI and CT scan
- Describe the process of gametogenesis, fertilization, implantation and placenta formation in early human embryonic development along with its variation and applied anatomy.
- Demonstrate knowledge about the sequential development of organs and systems along with its clinical anatomy, recognize critical stages of development and effects of common teratogens, genetic mutations and environmental hazards. She/He should be able to explain developmental and genetic/molecular basis of variations and congenital anomalies.
- Explain the principles of light, transmission and scanning, compound, electron, fluorescent, confocal, and virtual microscopy.
- Describe the microscopic structure of various tissues & organs and correlate structure with functions as a prerequisite for understanding the altered state in various disease processes.
- Demonstrate knowledge about cell and its components, cell cycle, cellular differentiation and proliferation.
- Describe structure, number, classification, abnormalities and syndromes related to human chromosomes.
- Describe important procedures in cytogenetics and molecular genetics with their application.
- Demonstrate knowledge about patterns of mendelian inheritance, intermediate pattern and multiple alleles, mutations, non-mendelian inheritance, mitochondrial inheritance, genome imprinting and uniparental disomy/isodisomy.
- Describe multifactorial pattern of inheritance, teratology, structure gene, molecular screening, cancer genetics and pharmacogenetics.
- Demonstrate knowledge about reproductive genetics, assisted reproduction, prenatal diagnosis, genetic counseling and ethics in genetics.

Describe epigenetics and its clinical significance.

- Explain principles of gene therapy and its applied knowledge.
- Describe immune system and cell types involved in defense mechanisms of the



- body. Also explain gross features, cytoarchitecture, functions, development and histogenesis of various primary and secondary lymphoid organs in the body.
- Demonstrate applications of knowledge of structure & development of tissue organ system to comprehend deviations from normal.
 - Demonstrate knowledge about recent advances in medical sciences which facilitate comprehension of structure function correlations and applications in clinical problem solving.
 - Explain collection, maintenance and application of stem cells, cryobanking and principles of organ donation from recently procured cadaver. Demonstrate knowledge about surface marking of all regions of the body.
 - Able to interpret various radiographs of the body, normal CT Scan, ultrasound and MRI.
 - Demonstrate knowledge about different anthropological traits and use of related instruments.
 - Demonstrate knowledge about outline of comparative anatomy of whole body and basic human evolution.
 - Demonstrate knowledge about identification of human bones, determination of sex, age, and height for medico legal application of anatomy

2. Affective Domain

- Demonstrate self-awareness and personal development in routine conduct. (Self awareness)
- Communicate effectively with peers, students and teachers in various teaching learning activities. (Communication)
- Demonstrate
 - i. Due respect in handling human body parts & cadavers during dissection. (Ethics & Professionalism)
 - ii. Humane touch while demonstrating living surface marking in subject/patient. (Ethics & Professionalism)
- Acquire capacity of not letting his/her personal beliefs, prejudices and limitations come in the way of duty.
- Appreciate the issues of equity and social accountability while exposing students to early clinical exposure. (Equity and social accountability)

3. Psychomotor Domain

At the end of the course the student should be able to:

- Identify, locate and demonstrate surface marking of clinically important structures in the cadaver and correlate it with living anatomy.
- Acquire mastery in dissection skills, embalming, tissue preparation, staining and



museum preparation.

- Locate and identify clinically relevant structures in dissected cadavers.
- Locate and identify cells & tissues under the microscope.
- Identify important structures visualized by imaging techniques, specifically radiographs, computerized tomography (CT) scans, MRI and ultrasonography.
- Demonstrate various movements at the important joints and actions of various groups of muscles in the human body.
- Demonstrate anatomical basis of common clinical procedures expected to be performed by a basic medical doctor.
- Demonstrate different methods of teaching-learning and make presentations of the subject topics and research outputs.

4. Specific practice based competencies:

A. Gross anatomy:

- Procurement, Embalming and Preservation of human cadavers for teaching and transport purposes. Knowledge and practice of plastination and awareness about body donation procurement
- Preparation of tanks for preserving bodies
- Dissection of cadaver
- Window dissection of important regions
- Preparation of specimens for museum with display
 - i. soft parts
 - ii. models
 - iii. charts
- Preparation and preservation of human bones / skeleton as assigned by the Faculty

B. Histology

- Preparation of common fixatives embalming fluid 10% formalin, Bouin's fluid etc
- Making paraffin blocks and section cutting (rotary microtome) and mounting
- Preparation of staining set for H and E staining and staining paraffin sections with the stain
- Making celloidin, araldite, gelatin blocks and their section cutting(*optional*)
- Processing hard tissues, decalcification of bones, block making and sectioning, preparation of ground sections of calcified bones.
- Knowledge about Frozen section cutting on freezing microtome and cryostat
- Honing and Stropping of microtome knives, including sharpening by automatic knife sharpener
- Histology file in which LM and EM pictures of all the organs and tissues of the body should be drawn and a small description of salient features written



Log Book - maintain log book-journal clubs or presentation weekly of latest research papers in the field of

- Number of embalming observed conducted to be noted.
- Conference attended and paper/poster presented
- Extra ordinary achievements

C. Histochemical Methods

- Practical classes for staining of glycogen, mucopolysaccharides, alkaline phosphatase acid phosphatase, and calcium, (e.g. PAS, Masson's trichrome, Nissl's,)

D. Cytogenetics

- Preparation of media, different solutions, stains etc.
- Human chromosome preparation from peripheral blood and karyotyping.
- Banding techniques (G 4.4 Making of Pedigree charts for study of patterns of inheritance.
- Chromosomal Analysis.

E. Neuroanatomy:

- Dissection of brain and spinal cord for teaching and learning purpose
- Preparation of brain and spinal cord macroscopic and microscopic sections and identification of different parts in them.
- Discussions on clinical problems related to neurological disorders and anatomical explanation for the same.

OR Draw diagrams in Neuroanatomy gross journal



III Syllabus

A post graduate student, after three years of training in DNB (Anatomy) should have acquired knowledge in the following aspects of anatomy:

1. Section – 1 (Gross Anatomy)

- Gross Anatomy of entire body including upper limb, lower limb, thorax, abdomen, pelvis, perineum, head and neck, brain and spinal cord

2. Section – 2 (Developmental anatomy/embryology)

- General embryology: gametogenesis, fertilization, implantation and placenta, early human embryonic development.
- Systemic embryology: development of organ systems and associated common congenital abnormalities with teratogenesis.
- Physiological and molecular regulation of development correlations of congenital anomalies.

3. Section - 3 (Histology and histochemistry)

A. Cell Biology:

- Cytoplasm - cytoplasmic matrix, cell membrane, cell organelles, cytoskeleton, cell inclusions, cilia and flagella.
- Nucleus - nuclear envelope, nuclear matrix, DNA and other components of chromatin, protein synthesis, nucleolus, nuclear changes indicating cell death.
- Cell cycle - mitosis, meiosis, cell renewal.
- Cellular differentiation and proliferation.

B. Microscopic structure of the body:

- Principles of light, transmission and scanning, electron, fluorescent, confocal and virtual microscopy.
- The systems/organs of body - Cellular organization, light and electron microscopic features, structure - function correlations, and cellular organization.

4. Section – 4 (Neuroanatomy)

- Brain and its environment, Development of the nervous system, Neuron and Neuroglia, Somatic sensory system, Olfactory and optic pathways, Cochleovestibular and gustatory pathways, Motor pathways, Central autonomic pathways, Hypothalamo-hypophyseal system, Limbic system, Basal ganglia, Reticular system, Cross Sectional anatomy of brain and spinal cord.



- Detailed structure of the central nervous system and its applied aspect.

5. Section – 5 (Genetics)

- Human Chromosomes - Structure, number and classification, methods of chromosome preparation banding patterns. Chromosome abnormalities, Autosomal and Sex chromosomal abnormalities syndromes, Molecular and Cytogenetics.
- Single gene pattern inheritance: Autosomal and Sex chromosomal pattern of inheritance, Intermediate pattern and multiple alleles, Mutations, Non-
- Mendelian inheritance, Mitochondrial inheritance, Genome imprinting,
- Multifactorial pattern of inheritance: Criteria for multifactorial inheritance,
- Teratology, Structure gene, Molecular Screening, Cancer Genetics -
- Reproduction Genetics, Assisted reproduction, Pre implantation genetics, Prenatal diagnosis, Genetic Counseling.
- Principles of Gene therapy and its applied aspects.

6. Section – 6 (Immunology)

- Immune system and the cell types involved in defense mechanisms of the body. Gross features, cytoarchitecture, functions, development and histogenesis of various primary and secondary lymphoid organs in the body.
- Biological and clinical significance of the major histocompatibility complex of man including its role in transplantation, disease susceptibility/resistance and genetic control of the immune response.

7. Section – 7 (Applied anatomy and recent advances)

- Clinical correlations of structure and functions of human body. Anatomical basis and explanations for clinical problems.
- Training of students to demonstrate certain investigative procedures e.g. Lumbar puncture, Pleural pericardial and ascitic tap.etc.
- Applications of knowledge of development, structural (microscopy), neuro anatomy to comprehend deviations from normal.
- Recent advances in medical sciences which facilitate comprehension of structure function correlations and applications in clinical problem solving.
- Collection, maintenance and application of stem cells, cryobanking and principles of organ donation from recently dead bodies.



8. Section – 8 (Surface Marking and Radiology)

- Surface marking of all regions of the body. Interpretation of normal radiographs of the body including special contrast procedures including barium studies, cholecystography, pyelography, salpingography, HSG, Normal CT Scan, MRI and Ultrasound.

9. Section – 9 (Anthropology)

- Different anthropological traits, Identification and use of Anthropological Instruments.
- Outline of comparative anatomy of the whole body and basic human Evolution

