NATIONAL MEDICAL COMMISSION

Postgraduate Medical Education Board

D 11011/1/22/AC/Guidelines/13 **Date: 05-08-2022**

GUIDELINES FOR COMPETENCY BASED POSTGRADUATE TRAINING PROGRAMME FOR MD IN PHYSIOLOGY

GUIDELINES FOR COMPETENCY BASED POSTGRADUATE TRAINING PROGRAMME FOR MD IN PHYSIOLOGY

Preamble

The purpose of postgraduate medical education in Physiology is to produce experts with necessary knowledge, skills and attitude to function as competent physiologists who actively contribute towards growth of the subject through research and intellectual contribution, participate in the training of budding health professionals, participate meaningfully in patient care and lifestyle disorders, stay abreast with the advancements in the field and serve the community at large. Physiology being the basis of entire practice of Medicine, a postgraduate in Physiology needs to acquire all necessary competencies that would enable him or her to function efficiently in domains of preclinical, para- clinical and clinical sciences.

The purpose of this document is to provide teachers and learners illustrative guidelines to achieve defined outcomes. The Expert group of the National Medical Commission has endeavored to render uniformity without compromise to purpose and content of this document. The revision within the document are mainly aimed to introduce competencies that ensure application of Physiology beyond preclinical boundaries and thereby improve health outcomes, embrace research and pedagogy as a vital part of training and reduce redundancy of contents. This document envisions a competent Physiologist who performs the roles of a Medical Teacher, Researcher, Member of Health Care Team (Clinical Physiologist), Administrator and Life Long learner with equal zeal and efficiency.

SUBJECT SPECIFIC LEARNING OBJECTIVES

Goal:

The goal is to have uniform standards in the teaching of Physiology at the postgraduate level throughout the country. The guidelines will help in achieving such standards which will ensure availability of competent physiologists equipped with required skills for teaching, patient care (diagnostic, therapeutic and rehabilitative) and applied research.

Learning Objectives

A postgraduate student having qualified for the MD (Physiology) examination should be able to:

1. Achieve comprehensive knowledge of general, systemic and applied Physiology.
2. Teach effectively the basic physiological mechanisms of human body in the context of pathophysiological basis of evolution, clinical presentation and management of disease states to undergraduate and postgraduate medical, dental and paramedical courses.
3. Acquire in-depth knowledge of physiology while catering to the learning needs of specific courses such as sports physiology, speech pathology etc.
4. Understand general principles of medical education (use of appropriate teaching techniques and resources) and apply theoretical frameworks in pedagogy.
5. Interpret and evaluate research publications critically.
6. Conduct research in core physiology, applied physiology and Education which may have significant application towards improving health, patient care and student learning.
7. Generate credible evidence towards advancement of Physiology and its application in basic and applied significance.
8. Acquire skills in conducting collaborative research in the field of physiology with allied sciences, clinical sciences and biomedical engineering.
9. Explain how the knowledge of physiology can be effectively applied in diagnostic and therapeutic clinical settings.
10. Integrate physiology with Diagnostic, Therapeutic, Preventive and Rehabilitative Medicine.
11. Interact with the allied departments and render services in advanced laboratory investigations.
12. Interact effectively with other paraclinical, clinical and allied health sciences departments to develop integrated modules in basic sciences and teach competencies related to the same.
13. Acquire administrative skills to set up concerned department / laboratories and initiate purchase procedures and procure necessary items for running such laboratories.

14. Be an efficient Leader and member of academic, research and health care team.
15. Participate actively in various workshops/seminars/journal clubs of allied subjects to acquire various skills for collaborative research.

SUBJECT SPECIFIC COMPETENCIES

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

A. Predominant in Cognitive Domain

1. Demonstrate in-depth understanding of basic physiological concepts, their clinical applications and physiological demands in special circumstances such as sports, environmental changes, yoga, meditation etc.
2. Demonstrate comprehensive knowledge of physiology of specific organ systems to cater to the learning needs of specialized courses such as speech pathology, kinesiology, aerospace physiology etc.
3. Impart knowledge about the basic physiological mechanisms of human body with reference to their implications in the pathophysiology of disease and the physiologic basis of their management to undergraduate medical and paramedical students.
4. Demonstrate knowledge of integrated study of basic sciences as per the needs of current CBME.
5. Demonstrate higher order thinking and problem-solving skills to exhibit interactive teaching techniques and facilitate contextual study of physiology in various teaching learning sessions.
6. Demonstrate knowledge and ability to participate in the present student centric TL strategies of CBME such as ECE, SDL, AETCOM and AITo (Aligned and Integrated Topic).
7. Demonstrate knowledge of the current assessment practices in undergraduate CBME such as DOAP.
8. Demonstrate knowledge of research methodologies and statistics.
9. Conduct such clinical and experimental research, as would have a significant bearing on human health and patient care.
10. Incubate ideas and contribute towards generation of patents and copyrights related to the subject.

11. Interact with other departments by rendering services in advanced laboratory investigations and relevant expert opinion.
12. Participate actively in various workshops/seminars/journal clubs/demonstration in the allied departments, to acquire various skills for collaborative research.
13. Contribute to society by imparting physiological understanding of health problems. Disseminate knowledge of human physiology, the clinical applications and research as per the needs or specific demands of the society at large.
14. Outline the components of a basic physiology curriculum, demonstrate ability to develop or implement the same in future academic career.
15. Serve as interface with society at large.

B Predominant in Affective domain

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

1. Demonstrate responsibility, professionalism and ethical conduct in all professional undertakings.
2. Demonstrate ethical conduct in biomedical or animal research.
3. Follow ethical guidelines with regards to research and publications.
4. Demonstrate appropriate behavior of not letting his/her personal beliefs, prejudices and limitations come in the way of duty.
5. Display principles of integrity and social accountability as a teacher.
6. Appreciate the issues of equity and social accountability while exposing students to early clinical exposure (Equity and social accountability).
7. Mentor/ counsel students to facilitate their holistic development.
8. Communicate effectively with peers, students and teachers in various curricular [teaching-learning, research] activities.
9. Function effectively as a member of the department, professional bodies and maintain professional conduct in interactions with students, peers, patient and staff.
10. Demonstrate the ability to give effective student feedback to undergraduate students.
11. Demonstrate the ability to receive feedback from teachers and peers.

12. Develop the capacity to reflect on own academic progress, develop self-directed learning skills and assess own learning needs.

C. Predominant in Psychomotor Domain

The postgraduate student should acquire practical competencies in the following tasks:

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

1. Demonstrate physiological concepts of various organ systems by performing amphibian experiments using simulated models.
2. Demonstrate physiological concepts of specific organ systems by performing mammalian experiments using simulated models.
3. Perform and interpret a complete hematological profile.
4. Perform clinical examination of various organ systems.
5. Perform human experiments pertaining to specific organ systems and interpret results of the same.
6. Perform human experiments related to physiological challenges such as exercise, yoga and meditation.
7. Perform studies in stimulated environment - microgravity; high altitude; hot and cold environment.

Syllabus

Course contents:

A: Cognitive domain

Paper-I: ***General and Cellular Physiology including Genetic Basis and Historical perspectives:***

1. Physiology of cell, various cellular mechanisms and genetic control mechanisms.
2. Various principles of Physics and Physical Chemistry involved in physiological phenomenon e.g. haemo-dynamics, bio-electrical potentials, body fluids, methods of measurements.
3. History of Physiology, Noebl laurates and discoveries.
4. Biostatistics, Biophysics, Biochemistry, Micro-anatomy.
5. Growth and Development including aging.

6. Excretion, pH, water and electrolyte balance.
7. Comparative Animal Physiology

Paper-II: ***Systemic Physiology (system providing transport, nutrition and energy) including comparative Physiology.***

1. Blood and Immunity.
2. Cardiovascular System.
3. Respiratory System.
4. Gastro- Intestinal Tract (GIT) and dietary requirements.

Paper-III: ***Systemic Physiology (system concerned with procreation, regulation and neural control)***

1. Nerve-Muscle Physiology including muscle mechanics
2. Endocrine Physiology
3. Nervous System (Central, peripheral and autonomic)
4. Special Senses
5. Reproduction & family planning/fetal & neonatal Physiology

Paper-IV: ***Applied Physiology including recent advances***

1. Recent advances relevant to Physiology
2. Patho-physiology pertaining to systemic Physiology
3. Physiological basis of various clinical investigation tests
4. Interaction of human body in ambient environment- high altitude, space and deep sea
5. Exercise & Sports physiology
6. Transgender Physiology
7. Integrated Physiology
8. Yoga and Meditation
9. Social responsibilities of physiologists
10. Application of Artificial Intelligence in Physiology

B: Psychomotor domain:

A. The postgraduate student during the training period must PERFORM independently the following procedures:

i. Hematological profile

1. Estimation of hemoglobin
2. Determination of Total Erythrocyte (RBC) Count and RBC Indices (Blood Standards)
3. Determination of Total Leucocytes (WBC) Count : TLC
4. Preparation of a peripheral Blood Smear and Determination of Differential Leucocyte Count: DLC
5. Determination of Arneth Count
6. Determination of Bleeding Time (BT) and Clotting Time (CT)
7. Determination of Blood groups (A, B,O and Rh system)
8. Determination of Erythrocyte Sedimentation Rate (ESR) and Packed cell volume (PCV)
9. Determination of Osmotic Fragility of Red Blood Cells
10. Determination of Platelet Count
11. Determination of Reticulocyte Count

ii. Human Physiology

a. Clinical Physiology

1. Detailed clinical examination of various systems.

b. **Nerve muscle physiology**

1. Ergography and hand grip spring dynamography and study of human fatigue.
2. Recording of electromyography (EMG) and its application.
3. Recording of nerve conduction.

c. Cardiovascular system (CVS)

1. Clinical examination of CVS
2. Examination of arterial & venous pulses
3. Measurements of arterial blood pressure and effect of head-up/head-down tilt
4. Recording of 12 lead Electrocardiography (ECG) and its interpretation
5. Measurement of blood flow

6. Heart rate variability
7. Ambulatory Blood pressure monitoring

d. Respiratory system

1. Clinical examination of respiratory system.
2. Stethography – study of respiratory movements and effect of various factors.
3. Assessment of respiratory functions (spirometry, vitalography, and gas analysis).
5. Measurement of BMR.
6. Cardio pulmonary resuscitation (CPR) and Artificial respiration.

e. Gastrointestinal system:

1. Clinical examination of abdomen.

f. Integrative Physiology / Excretory system

1. Recording of body temperature/effect of exposure to cold and hot environment

g. Reproductive system

1. Determination of ovulation time by basal body temperature chart and pregnancy diagnostic test - Immunological Tests.
2. Semen analysis: sperm count, motility and sperm morphology.

h. Nervous System including Special senses

1. Clinical examination of the nervous system and its physiological basis.
2. Examination of higher mental functions.
3. Examination of cranial nerves.
4. Examination of sensory system.
5. Examination of motor system including reflexes.
6. Clinical examination of special senses:
    (i) Smell and Taste
    (ii) Test for hearing to differentiate deafness
    (iii) Physiology of eye:
        (a) Clinical examination of the eye and pupillary reflex
        (b) Visual acuity
        (c) Perimetery – mapping out of visual field and blind spot
        (d) Accommodation
        (e) Fundoscopy
        (f) Colour vision and colour blindness
7. Reaction (visual and auditory) and reflex time.

8. Electroencephalography (EEG) and Polysomnography
9. Autonomic Nervous System (ANS) Testing.
10. **Neuro-electrodiagnostic techniques:** Nerve conduction study, Visual evoked potential (VEP), Brainstem auditory evoked potential (B.A.E.P), Somato-sensory evoked potential (SEP), Motor evoked potential (MEP).
11. Use of various test batteries for psychological evaluation of subject.

i. Sports Physiology

Tests for physical fitness: Cardio – respiratory responses to steady state exercise using:

(i) Body Composition
(ii) Conducting the Clinical Exercise Test
(iii) Harvard step test
(iv) Bicycle Ergometry
(v) Treadmill test for determination of VO_2 max

j. Yoga and Meditation Physiology

i. Physical, Mental and Emotional well being
ii. Effect of yoga and pranayama on physiological parameters
iii. Mindfulness
iv. Concentration, anxiety and stress
v. Counseling in health and diseases

k. Others

1. Construction of dietary chart for growing children, pregnant woman, elderly individuals, hypertensive patients, & diabetes mellitus patients.
2. Basic Life Support and Cardiac Life Support
3. Effective Digital presentation, medical photography, Good Clinical Practice, Humanities and Bioethics.

iii. Amphibian (Frog) Experiments

All animal experiments must be compliant with Govenment of India Regulations, notified from time to time). Experiments in Amphibian/Dog/Cat should be conducted by computer assisted simulation models/ facilities. Other experiments should be performed as permissible by CPCSEA guidelines.

1. Effect of temperature on simple muscle twitch.
2. Effect of two successive stimuli (of same strength) on skeletal muscle.
3. Effect of increasing strength of stimuli on skeletal muscle.
4. Effect of increasing frequency of stimuli on skeletal muscle (genesis of tetanus).
5. Effect of free load and after load on skeletal muscle.
6. Effect of repeated stimuli on skeletal muscle (study of phenomenon of Fatigue).
7. Study of isometric contraction in skeletal muscle.
8. Determination of conduction velocity of sciatic nerve and effect of variables on it.
9. Properties of cardiac muscle – Refractory period, All-or-None Law, extra-systole and compensatory pause, beneficial effect.
10. Regulation of Heart, Vagus dissection and effect of Vagal and WCL stimulation.
11. Effect of physiological and pharmacological variables on intact frog's heart.
12. Perfusion of isolated frog's heart-role of sodium, potassium, calcium ions and drugs.

B. The postgraduate student during the training period must ASSIST in the following procedures:

Human Physiology

i. **Cardiovascular system (CVS)**

- Cardiac TMT Holter Monitoring
- Collection and Assessment of Arterial blood gas

ii. Nervous System including Special senses

- Intra operative neuro monitoring (IONM)

C. The postgraduate student during the training period must OBSERVE the following procedures:

i. Hematological profile

- Determination of Absolute Eosinophil Count
- Study of Haemopoietic Cells present in the Bone Marrow

- Other high end hematological investigations (specify): Flow cytometry, Platelet functions, D Dimers, coagulation profile etc.

ii. Human Physiology

- **Cardiovascular system (CVS)**
  - Echocardiography
  - Central venous line insertion, CVP monitoring
- **Respiratory system**
  - Introduction to working of continuous positive airway pressure and Bilevel positive airway pressure (CPAP & BiPAP) Therapy
    - Ventilator setting
- **Gastrointestinal system:**
  - GI Manometry
- **Reproductive system**
  - Ovulation study by using ultrasonography
- **Integrative Physiology / Excretory system**
  - Pressure and PH studies in esophagus, stomach, intestine and rectum
- **Others**
  - Genetic testing and introduction to procedural skills for clinical genetics/ prenatal diagnosis/ adult genetics - birth defects, genetic hematology, dysmorphology, skeletal dysplasia, neurological and muscular disorders, primary immunodeficiency diseases, autoimmune and multi-factorial disorders, biology and genetics of cancer.
  - Interaction of human body in ambient environment - high altitude, space and deep sea
  - Exercise & Sports physiology
  - Integrated Physiology
  - Yoga and Meditation
  - Social responsibilities of physiologists
  - Application of Artificial Intelligence in Physiology

iii. Mammalian Experiments (Dog/Rabbit/Guinea pig/Rat/Mice)

- General management of mammalian experiments.

- Recording of heart rate, blood pressure and respiration and study the effects of various factors; drugs; asphyxia; occlusion of common carotid artery.
- Effect of stimulation of central and peripheral end of vagus on arterial blood pressure and respiration after vagotomy.
- Effect of stimulation and distension of carotid sinus on blood pressure and respiration.
- Effect of stimulation of splanchnic nerve.
- Effect of stimulation of peripheral somatic nerve (sciatic nerve).
- Study of hypovolemic shock and its reversal.
- Perfusion of isolated mammalian heart and study the effects of drugs and ions.
- Recording of Isolated Intestinal movement and tone and studying the effect of drugs and ions.
- Study of various stages of menstrual cycle, cervical smear and vaginal smear.

Departmental resources

It is to be mandatory for the department to establish and develop the following laboratories. In addition to teaching, these laboratories should be involved in active research and in patient care services in one or more well defined fields.

1. Clinical Neurophysiology Laboratory

The department should generate liaison with clinical department and provide routine services for health monitoring and diagnostics (disease).

(i) Electroencephalography
(ii) Evoked potential recording
(iii) Electromyography
(iv) Nerve conduction studies
(v) Autonomic nervous system (ANS) testing
(vi) Any other newer technology like Functional Near infrared spectroscopy (fNIRS), Intra operative neuro monitoring (IONM), polysomnography
(vii) Diabetic neuropathy assessment kit

(viii) Reaction time apparatus

(ix) Electroretinography

2. Cardio-Respiratory Laboratory

The department should generate liaison with clinical department and provide routine services for health monitoring and diagnostics (disease).

(i) Electrocardiography

(ii) Blood-gas Analysis

(iii) Computerized multifunctional spirometry

(iv) Laboratory for measuring pulmonary diffusion capacity and functional residual capacity (FRC)

(v) Whole-body plethysmography

(vi) Laboratory for Blood flow measurements (Impedance plethysmograph/Laser flow meter/ Doppler flow meter)

(vii) Ankle brachial pressure index/ Vascular Doppler

3. Exercise Physiology Laboratory

The department should generate liaison with sports authorities and clinical departments to provide services for testing and grading exercise and physical efficiency for health monitoring and diagnostics (disease). This should be done by using the following techniques:

(i) Two step test exerciser

(ii) Bicycle Ergometry

(iii) Tread mill

(iv) Respiratory gas analysis and measurement of basal metabolic rate (BMR)

4. Metabolic/Endocrinology/Reproductive Bio-medicine laboratory

This laboratory should perform various tests pertaining to gastrointestinal, renal, metabolic, endocrinal and reproductive bio-medicine. The department should generate liaison with clinical departments and provide routine services for health monitoring and diagnostics (disease).

1. Body Fat Analysis
2. Spectrophotometer
3. pH meter
4. Elisa Reader/Washer

5. Luminometer
6. Semi-autoanalyzer
7. Artificial reproductive techniques/ semen laboratory/ infertility laboratory

Post graduate students should be posted in the above laboratories and extend the required services on routine basis.

The Department should be equipped with general facilities like PG resource room with internet access and a departmental library with books especially those related to pertinent higher studies in Physiology and field of research. The college/department should make important journals available (at least four Indian journals and two international journals – Online/Offline).

TEACHING AND LEARNING METHODS

General principles

Acquisition of competencies being the keystone of doctoral medical education, such training should be skills oriented. Learning in the program, essentially autonomous and self-directed, and emanating from academic and clinical work, shall also include assisted learning. The formal sessions are meant to supplement this core effort.

All students joining the postgraduate (PG) courses shall work as full-time (junior) residents during the period of training, attending not less than 80% of the training activity during the calendar year, and participating in all assignments and facets of the educational process. They shall maintain a log book for recording the training they have undergone, and details of the procedures done during laboratory and clinical postings in real time.

Teaching-Learning methods

This should include a judicious mix of demonstrations, symposia, journal clubs, clinical meetings, seminars, small group discussion, bed-side teaching, case-based learning, simulation-based teaching, self-directed learning, integrated learning, interdepartmental meetings and any other collaborative activity with the allied departments. Methods with exposure to the applied aspects of the subject relevant to

basic/clinical sciences should also be used. **The suggested examples of teaching-learning methods are given below but are not limited to these. The frequency of various below mentioned teaching-learning methods can vary based on the subject's requirements, competencies, work load and overall working schedule in the concerned subject.**

A. Lectures: Didactic lectures should be used sparingly. A minimum of 10 lectures per year in the concerned PG department is suggested. Topics to be selected as per subject requirements All postgraduate trainees will be required to attend these lectures. Lectures can cover topics such as:

1. Subject related important topics as per specialty requirement
2. Recent advances
3. Research methodology and biostatistics
4. **Salient features of** Undergraduate/Postgraduate medical curriculum
5. Teaching and assessment methodology.

Topic numbers 3, 4, 5 can be done during research methodology/biostatistics and medical education workshops in the institute.

B. Journal club: Minimum of once in 1-2 weeks is suggested.

Topics will include presentation and critical appraisal of original research papers published in peer reviewed indexed journals. The presenter(s) shall be assessed by faculty and grades recorded in the logbook.

C. Student Seminar: Minimum of once every 1-2 weeks is suggested.

Important topics should be selected as per subject requirements and allotted for in-depth study by a postgraduate student. A teacher should be allocated for each seminar as faculty moderator to help the student prepare the topic well. It should aim at comprehensive evidence-based review of the topic. The student should be graded by the faculty and peers.

D. Student Symposium: Minimum of once every 3 months.

A broad topic of significance should be selected, and each part shall be dealt by one postgraduate student. A teacher moderator should be allocated for each symposium and moderator should track the growth of students. The symposium should aim at an evidence-based exhaustive review of the topic. All participating postgraduates should be graded by the faculty and peers.

E. Laboratory work / Bedside clinics: Minimum - once every 1-2 weeks.

Laboratory work/Clinics/bedside teaching should be coordinated and guided by faculty from the department. Various methods like DOAP (Demonstrate, Observe, Assist, Perform), simulations in skill lab, and case-based discussions etc. are to be used. Faculty from the department should participate in moderating the teaching-learning sessions during clinical rounds.

F. Interdepartmental colloquium

Faculty and students must attend monthly meetings between the main Department and other department/s on topics of current/common interest or clinical cases.

G. a. Rotational clinical / community / institutional postings

- Depending on local institutional policy and the subject specialty needs, postgraduate trainees may be posted in relevant departments/ units/ institutions including Medical Education Unit (MEU) or Department of Medical Education (DOME). The aim would be to acquire more in-depth knowledge as applicable to the concerned specialty. Postings would be rotated between various units/departments and details to be included in the specialty-based Guidelines.
- **Clinical Postings:** Compulsory clinical postings in following departments must be undertaken as per specified number of days in table 1 depicted below:

Table 1: Plan of Clinical postings for MD Physiology

Prof Year	Department	Period of posting	Focus areas
1st year	Biochemistry	15 days	1. Auto & Semi auto Analyzer, Electrophoresis, Chromatography, RIA, Study of serum chemistry (proteins, Lipid, glucose, electrolytes, enzymes etc.) – 8 days 2. Constituents of normal and abnormal urine, liver function tests, Renal function tests, Gastric function tests – 7 days
I st year	Pharmacology	20 days	1. Animal House (to learn technique of Animal Handling, Blood sampling, anesthesia, Euthanasia, effective Analgesia and infection control after

			surgery. Study of Animal behavior like eating, drinking, locomotion, sexual activity etc.) 2. Experimental Pharmacology lab to study ongoing animal experimental procedures including dissection for rat phrenic nerve hemidiaphragm and others – 10 days 2. Study various guidelines related to ethical use of animals in experiments. To study preparation of different animal models and various tests to study physiological parameters. – 15 days
I st year	Pathology	30 days	1. Blood bank - Cross matching, blood Storage, Immunohistochemistry, Immunological tests – 15 days 2. Central Lab. - Tests for bleeding & clotting disorders, study of Haemopoietic Cells present in the Bone Marrow – 10 days 3. Semen analysis, determination of ovulation time by basal body temperature chart and pregnancy diagnostic tests – 5 days
I st year	Microbiology	10 days	1. Fluorescent microscopy, use of Elisa reader & Washer – 5 days 2. Immuno-physiology and other facilities available in the dept. – 5 days
IInd year	Ophthalmology	15 days	1. Direct and indirect Ophthalmoscopy, Retinoscopy – 8 days 2. Slit lamp microscopy, Tonometry, Pachymetry, Study of corneal topology, Optometry, Auto-refractometer – 7 days
IInd year	Tuberculosis & Chest Disease (Pulmonary Medicine)	15 days	1. Whole body plethysmography – 8 days 2. Bronchoscopy & other facilities available in the dept. – 7 days
IInd year	ENT	15 days	1. Audiometry – 7 days

			2. Oto-rhino-laryngoscopy, direct and Indirect Laryngoscopy, BERA, BSAEP – 8 days
IIIrd year	General Medicine	20 days	1. TMT, Holter analysis, ABG, ECG – 10 days 2. EMG, NCV – 10 days
IIIrd year	Psychiatry	10 days	1. EEG 2. Biofeedback
IIIrd year	Casualty	15 Days	1. To know basics of how to handle emergency 2. Minor procedures

Every posting should have its defined learning objectives. It is recommended that the departments draw up objectives and guidelines for every posting offered in conjunction with the collaborating department/s or unit/s. This will ensure that students acquire expected competencies and are not considered as an additional helping hand for the department / unit in which they are posted. The PG student must be tagged along with those of other relevant departments for bedside case discussion/basic science exercises as needed, under the guidance of an assigned faculty.

G b. Posting under "District Residency Programme" (DRP):

All postgraduate students pursuing MD/MS in broad specialities in all Medical Colleges/Institutions shall undergo a compulsory rotation of three months in District Hospitals/District Health System as a part of the course curriculum, as per the Postgraduate Medical Education (Amendment) Regulations (2020). Such rotation shall take place in the 3rd or 4th or 5th semester of the postgraduate programme and the rotation shall be termed as "District Residency Programme" and the PG medical student undergoing training shall be termed as "District Resident".

Opportunities to present and discuss infectious disease cases through bedside discussion and ward/grand rounds with specialists / clinicians in different hospital settings must be scheduled to address antimicrobial resistance issues and strategies to deal with it.

I. Teaching research skills

Writing a thesis should be used for inculcating research knowledge and skills. All postgraduate students shall conduct a research project of sufficient depth to be presented to the University as a postgraduate thesis under the supervision of an eligible faculty member of the department as guide and one or more co-guides who may be from the same or other departments.

In addition to the thesis project, every postgraduate trainee shall participate in at least one additional research project that may be started or already ongoing in the department. It is preferable that this project will be in an area different from the thesis work. For instance, if a clinical research project is taken up as thesis work, the additional project may deal with community/field/laboratory work. Diversity of knowledge and skills can thereby be reinforced.

J. Training in teaching skills

MEU/DOME should train PG students in education methodologies and assessment techniques. The PG students shall conduct UG classes in various courses and a faculty shall observe and provide feedback on the teaching skills of the student.

K. Log book

During the training period, the postgraduate student should maintain a Log Book indicating the duration of the postings/work done in Wards, OPDs, Casualty and other areas of posting (as specified in table 1) . This should indicate the procedures assisted and performed and the teaching sessions attended. The log book entries must be done in real time. The log book is thus a record of various activities by the student like: (1) Overall participation & performance, (2) attendance, (3) participation in sessions, (4) record of completion of pre-determined activities, and (5) acquisition of selected competencies.

The purpose of the Log Book is to:

a) help maintain a record of the work done during training,
b) enable Faculty/Consultants to have direct information about the work done and intervene, if necessary,
c) provide feedback and assess the progress of learning with experience gained periodically.

The Log Book should be used in the internal assessment of the student, should be checked and assessed periodically by the faculty members imparting the training. The PG students will be required to produce completed log book in original at the time of final practical examination. It should be signed by the Head of the Department. A proficiency certificate from the Head of Department regarding the clinical competence and skillful performance of procedures by the student will be submitted by the PG student at the time of the examination.

The PG students shall be trained to reflect and record their reflections in log book particularly of the critical incidents. Components of good teaching practices must be assessed in all academic activity conducted by the PG student and at least two sessions dedicated for assessment of teaching skills must be conducted every year of the PG program. The teaching faculty are referred to the MCI Logbook Guidelines uploaded on the Website.

L. **Course in Research Methodology**: All postgraduate students shall complete an online course in Research Methodology within six months of the commencement of the batch and generate the online certificate on successful completion of the course.

Other aspects

- The postgraduate trainees must participate in the teaching and training program of undergraduate students and interns attending the department.
- Trainees shall attend accredited scientific meetings (CME, symposia, and conferences) at least once a year.
- Department shall encourage e-learning activities.
- The postgraduate trainees should undergo training in Basic Cardiac Life Support (BCLS) and Advanced Cardiac Life Support (ACLS).
- The postgraduate trainees must undergo training in information technology and use of computers.

During the training program, patient safety is of paramount importance; therefore, relevant clinical skills are to be learnt initially on the models, later to be performed under supervision followed by independent performance. For this purpose, provision of skills laboratories in medical colleges is mandatory.

ASSESSMENT

FORMATIVE ASSESSMENT, i.e. assessment to improve learning

Formative assessment should be continual and should assess medical knowledge, patient care, procedural & academic skills, interpersonal skills, professionalism, self-directed learning and ability to practice in the system.

General Principles

Internal Assessment should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills.

The Internal Assessment should be conducted in theory and practical/clinical examination, should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills.

Quarterly assessment during the MD training should be based on:

- Case presentation, case work up, case handling/management : once a week
- Laboratory performance : twice a week
- Journal club : once a week
- Seminar : once a fortnight
- Case discussions : once a fortnight/month
- Interdepartmental case or seminar : once a month

Note: These sessions may be organized and recorded as an institutional activity for all postgraduates.

- Attendance at Scientific meetings, CME programs (at least 02 each)

The student to be assessed periodically as per categories listed in appropriate (non-clinical/clinical) postgraduate student appraisal form (Annexure I).

SUMMATIVE ASSESSMENT, ie., assessment at the end of training

Essential pre-requisites for appearing for examination include:

1. **Log book** of work done during the training period including rotation postings, departmental presentations, and internal assessment reports should be submitted.

2. At least **two presentations** at national level conference. One research paper should be published / accepted in an indexed journal**. (It is suggested that the local or University Review committee assess the work sent for publication).**

The summative examination would be carried out as per the Rules given in the latest POSTGRADUATE MEDICAL EDUCATION REGULATIONS. The theory examination shall be held in advance before the Clinical and Practical examination, so that the answer books can be assessed and evaluated before the commencement of the clinical/Practical and Oral examination**.**

The postgraduate examination shall be in three parts**:**

1. **Thesis**

   Thesis shall be submitted at least six months before the Theory and Clinical / Practical examination. The thesis shall be examined by a minimum of three examiners; one internal and two external examiners, who shall not be the examiners for Theory and Clinical examination. A postgraduate student in broad specialty shall be allowed to appear for the Theory and Practical/Clinical examination only after the acceptance of the Thesis by the examiners**.**

2. **Theory examination**

   The examinations shall be organized on the basis of 'Grading' or 'Marking system' to evaluate and to certify postgraduate student's level of knowledge, skill and competence at the end of the training, as given in the latest POSTGRADUATE MEDICAL EDUCATION REGULATIONS. Obtaining a minimum of 50% marks in 'Theory' as well as 'Practical' separately shall be mandatory for passing examination as a whole. The examination for M.D./ M.S shall be held at the end of 3rd academic year.

   There shall be four theory papers (as per PG Regulations).

   Paper I: Basic sciences as applied to the subject (General and Cellular Physiology including Genetic basis and historical perspectives)

Paper II: Systemic Physiology (system providing transport, nutrition and energy) including comparative Physiology

Paper III: Systemic Physiology (system concerned with regulation, neural control and procreation)

Paper IV: Recent advances in the subject (including applied Physiology)

3. Practical/clinical and Oral/viva voce examination

Practical examination

Practical examination should be spread over **two** days and include various major components of the syllabus focusing mainly on the psychomotor domain.

Oral/Viva voce examination on defined areas should be conducted by each examiner separately. Oral examination shall be comprehensive enough to test the postgraduate student's overall knowledge of the subject focusing on psychomotor and affective domain.

The practical examination should include:

- Case presentation pertaining to major systems
- Stations for clinical, procedural and communication skills
- Log Book Records and reports of day-to-day observation during the training
- It is emphasized that Oral/viva voce examination shall be comprehensive enough to test the postgraduate student's overall knowledge of the subject

Recommended Reading:

Books (latest edition)

1. A.C. Guyton – Text book of Medical Physiology
2. W.F. Ganong – Review of Medical Physiology
3. William's Textbook of Endocrinology
4. J.E. Cotes- Respiratory Physiology
5. D.T. Harris – Experimental Physiology
6. Wintrobe's – Clinical Hematology
7. **P**rinciples of medical physiology by Sircar
8. Brown B.L. – Cell signaling, Biology and medicine of signal transudation
9. Berne and Levy- Medical Physiology

10. Textbook of Medicine by Harrison
11. Principles of Neural sciences edited by E. R. Kandel, J. H. schwartz and T. M. Jessell
12. Williams Hematology edi. by M.A. Lichtman, E. Beutter, K. Kaushansxy, T.J. Kipps, U. Seligsohn, J. Prachal
13. Medical Physiology: by W. F. Boron and E. L. Boulpep
14. Medicat Physiology: by A. Rhodes and G. A. Tanner
15. Neuroscience : by Dale Purves

Practical Books:

1. Hutchison's Clinical Methods: An Integrated Approach to Ctinical Practice.
2. Macleod's clinical Examination
3. Textbook of Practical Physiology: by Dr. G. K. Pal and Dr. Pravati Pal
4. Textbook of Practical Physiology: by Dr. C. L. Ghai
5. Textbook of Practical Physiology: by Dr. Ranade
6. Textbook of Practical Physiology: by Dr. A. K. Jain

Journals:

03-05 International Journals and 02 National (all indexed) journals

Annexure 1

Student appraisal form for MD in Physiology

	Elements	Less than Satisfactory			Satisfactory			More than satisfactory			Comments
		1	2	3	4	5	6	7	8	9	
1	**Scholastic aptitude and learning**										
1.1	Has knowledge appropriate for level of training										
1.2	Participation and contribution to learning activity (e.g., Journal Club, Seminars, CME etc)										
1.3	Conduct of research and other scholarly activity assigned (e.g Posters, publications etc.)										
1.4	Documentation of acquisition of competence (eg Log book)										
1.5	Performance in work based assessments										
1.6	Self-directed Learning										
2	**Work related to training**										
2.1	Practical skills that are appropriate for the level of training										
2.2	Respect for processes and procedures in the work space										
2.3	Ability to work with other members of the team										
2.4	Participation and compliance with the quality improvement process at the work environment										
2.5	Ability to record and document work accurately and appropriate for level of training										

3	**Professional attributes**										
3.1	Responsibility and accountability										
3.2	Contribution to growth of learning of the team										
3.3	Conduct that is ethically appropriate and respectful at all times										
4	**Space for additional comments**										
5	**Disposition**										
	Has this assessment pattern been discussed with the trainee?	Yes	No								
	If not explain.										
	Name and Signature of the assesse										
	Name and Signature of the assessor										
	Date										

Subject Expert Group members for preparation of REVISED Guidelines for competency based postgraduate training programme for MD in Physiology

1. **Dr Tripti Srivastava,** **Convener**
   Professor in Physiology,
   Jawaharlal Nehru Medical College,
   Sawangi (M), Wardha.

2. **Dr Dilara Kamaldeen,**
   Professor in Physiology,
   Sri Ramachandra Institute of Higher Education and Research,
   Chennai.

3. **Dr Prashant Patil,**
   Professor in Physiology,
   AIIMS, Rishikesh.

4. **Dr Chinmay Shah,**
   Associate Professor in Physiology,
   Government Medical College,
   Bhavnagar, Gujrat.

5. **Dr. B. Girija**
   Professor & Head, Department of Physiology,
   Bangalore Medical College & Research Institute
   Bangalore, Karnataka.

6. **Dr. Mario Vaz**
   Professor in Physiology,
   International Medical School
   (Gokula Education Foundation - Medical)
   Bangalore - Ramaiah Campus
   M.S. Ramaiah Nagar
   Bangalore 560054.