

**Guidelines**  
**For**  
**Competency Based Training Programme**  
**In**  
**Diploma - Radio Diagnosis (DRD)**  
**2021**



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



## Table of Content

| Sr. No. | Content                            | Page no. |
|---------|------------------------------------|----------|
| I.      | Objectives of the programme        | 3 – 4    |
| II.     | Teaching and Training Activities   | 5        |
| III.    | Syllabus                           | 6 - 7    |
| IV.     | competencies                       | 8 - 9    |
| V.      | Posting                            | 10 - 11  |
| VI.     | Log Book                           | 12       |
| VII.    | Recommended Textbooks and Journals | 13       |



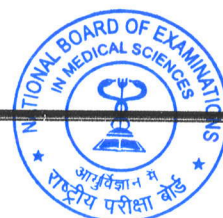
## **I. Objectives Of The Programme**

### **1. Programme Goal**

- To make the trainee understand & implement the knowledge regarding the role of various imaging modalities, helpful in the management of different clinical conditions. At the end of his/her training, he/she should be capable of provide high quality health care and take up a career in radiology at a diagnostic centre, district hospitals, etc.
- Aimed at imparting training in both conventional radiology and modern imaging techniques so that the candidate is fully competent to practice, in the broad discipline of radiology including ultrasound, and Computed Tomography. Candidate should be well versed with medical ethics, consumer protection act and the Pre Conception and Prenatal Diagnostic Technique (PC-PNDT) Act.
- To orient and train student in various aspects of diagnosis.
- Ultimate goal will be to provide quality education for the post graduates and quality diagnostic care for different sections of the society.

### **2. Programme Objectives**

- Demonstrate understanding of basic sciences relevant to Radiology.
- Acquire basic knowledge in the various sub-specialties of Radiology such as Chest Radiology, Neuro-Radiology, GI-Radiology, GU-radiology, obstetric and Gynaecological cardio-vascular- Radiology, musculoskeletal, Interventional Radiology, emergency Radiology, and Paediatric Radiology.
- Independently conduct and interpret all routine and special radiologic procedures and imaging investigations.
- Provide radiological services in acute emergency and trauma including its medico- legal aspects.
- Understand indications, diagnostic features and limitations of applications of conventional radiology, ultrasound and computed tomography for management of common problems including emergencies, in adults and children.
- Recognize conditions that may be outside the area of specialty/competence and to refer them to proper specialist or ask for help.
- Update oneself by self-study and by attending courses, seminars, conferences and workshop which are relevant to the field of Radio-Diagnosis.
- Provide basic lifesaving support service in emergency situations.
- Undertake complete patient monitoring including the care of the patient.
- Interact with other specialists for the maximum patient benefit
- Capable of undertaking further sub-specialization in the field of Radiology
- To conduct teaching program for undergraduate medical students, paramedical and technical staff.
- Should be able to understand proper cost effective algorithm of various imaging techniques in a given problem setting.
- To develop communication skills to write report and professional opinion as well as to interact with patient, care giver, peers and paramedical staff.



- Adopt ethical principles in all aspects of his/her practice. Professional honesty and integrity to be fostered.
- Be humble and accept the limitations of his/her knowledge and skills and to ask for help from colleagues/ seniors when needed.
- Respect patient rights and privileges including patient's right to information and right to seek a second opinion.



## II. Teaching and Training Activities

In addition to conducting and reporting of routine and special investigation in the area of posting under direct supervision, formal teaching sessions to be held on working days. These include seminars in physics and general radiology, journal clubs, case presentations; Interdepartmental meets, Film reading sessions etc.

The suggested departmental teaching schedule is as follows:

- Film Reading
- Case presentation
- Journal club
- Inter department meet
- Seminars
- Statistical meetings: Weekly/ monthly
- Mortality meetings

Note:

- All sessions will be co-ordinated by the faculty members.
- All the teaching sessions to be assessed by the consultants at the end of session and graded
- Attendance of the Residents at various sessions should be at least 75%

The training program would focus on knowledge, skills and attitudes (behaviour) and essential components of education. It is being divided into theory, clinical and practical in all aspects of the delivery of health care.



### III. Syllabus

#### 1. Physics related to Radio diagnosis

- Introduction to general properties of radiation and matter. Fundamental of nuclear physics and radioactivity.
- Production of x-ray
- X-ray generators
- Interaction of x-rays and gamma rays with matter and their effects on irradiated materials.
- Measurement of x and gamma rays
- Interaction of x-rays with the patients
- Radiographic image
- The image receptor
- Radiation protection & Radiation hazard
- Picture archiving and communication system (PACS) and Radiology Information system (RIS)
- Image quality and quality assurance Screen film radiography
- Screen Film Radiography
- Computed Radiography, Digital Radiography.
- Computed tomography
- Principles of diagnostic ultrasound and Doppler
- Contrast media & contrast reactions - Contrast media, their type, formulation, mechanisms of action, dose schedule, routes of administration, adverse reactions, their management and recent developments.
- Quality Assurance
- MRI principles and physics,

#### 2. Radiography and Processing techniques

- Dark room technique
- Radiography of the Musculoskeletal system and extremities
- Radiography of the spine, abdomen, pelvic girdle and thorax
- Radiography of the skull, orbit and sinuses.
- Contrast techniques of GI tract, biliary tract.
- Contrast techniques and interpretation of the genito-urinary system including Gynaecology.
- Paediatric Radiography including bone age
- Dental, portable and emergency radiography

#### 3. Anatomy

- Gross and cross sectional anatomy of all the body systems.

#### 4. Pathology

- Gross morphology of pathologies condition of systemic disease



## **5. Principle and Practice of Radio Diagnosis**

Imaging of various diseases involving the following systems with conventional radiology, Ultrasound, Computed Tomography and Magnetic Resonance Imaging.

- Musculoskeletal System
- Respiratory System
- Cardio-vascular system
- Gastro-intestinal tract including Hepatobiliary system
- Urogenital tract.
- C.N.S. including spine
- Radiology of obstetrics and Gynaecology
- E.N.T, EYES, Teeth, soft tissue, Breast.
- Endocrine Glands
- Emergency radiology and trauma

Recent advances as applicable to Radiology

Clinical Epidemiology

Ethics in Medical Practice

Medico legal aspects relevant to Radiology including PC-PNDT Act.

Health Policy issues as may be applicable to the discipline

## **6. Practicals**

### **Physics**

- Effectiveness of Lead Apron and other protective Devices
- Quality control of X-rays and Imaging equipments
- Evaluation of performance of a film processing unit



#### IV. Competencies:

1. Interpretation of images
2. Skill in performing a procedure.

##### 1. Interpretation of images:

The student should be able to interpret images on all imaging modalities of diseases of following organs:

- Musculoskeletal System - Interpretation of diseases of muscles, soft tissue, bones and joints including congenital, inflammatory, traumatic, endocrine and metabolic, neoplastic and miscellaneous conditions.
- Respiratory System - Interpretation of diseases of the chest wall, diaphragm, pleura and airway; pulmonary infections, pulmonary vasculature; pulmonary neoplasm; diffuse lung disease; mediastinal disease, chest trauma; post-operative lung and X-ray in intensive care.
- Cardiovascular System - Interpretation of diseases and disorders of cardiovascular system (congenital and acquired conditions including ischemic heart diseases).
- Gastro-intestinal tract and hepato-biliary pancreatic system - Interpretation of diseases and disorders of mouth, pharynx, salivary glands, oesophagus, stomach, small intestine, large intestine, diseases of omentum, peritoneum and mesentery: acute abdomen, abdominal trauma. Diseases and disorders of liver, biliary system and pancreas.
- Urogenital System - Interpretation of various diseases and disorders of genitorurinary system. These include: congenital, inflammatory, traumatic, neoplastic, calculus disease and miscellaneous conditions.
- Central Nervous System (C.N.S.) - Interpretation of diseases and disorders of the head, neck and spine covering, congenital, infective, vascular, traumatic neoplastic degeneration metabolic and miscellaneous condition.
- Imaging in Obstetrics and Gynaecology.
- Imaging of Breast
- ENT, EYE and Dental Imaging.
- Imaging of endocrine glands and those involved with metabolic diseases.
- Paediatric Radiology.
- Imaging in Emergency Medicine.

##### 2. Skills in performing a procedure:

The student should be able to perform the following procedures:

- **Radiography:** should be able to independently perform radiography of common and some important uncommon views of different body parts. This includes positioning, centring of X ray beam, setting of exposure parameters, exposing and developing the films. The student should be familiar with conventional radiography and also with CR and DR systems.
- **GIT contrast studies:** Barium studies (swallow, upper GI, Follow through, enema); fistulogram, sialogram, cologram/ileostogram,
- **GU:** Excretory urography, MCU, RGU, nephrostogram, genitogram



- **Ultrasound:** The student should be able to perform and interpret all Ultrasound studies. These studies include: abdomen, pelvis, small parts, neonatal head, breast, Colour Doppler imaging (arterial and venous studies), obstetrics/gynaecology and intervention procedures using ultrasound guidance.
- **CT Scan:**
  - i. Select CT protocol according to the clinical diagnosis.
  - ii. Do reconstruction of images, perform triple phase study, perform & interpret advanced applications like CT enterography, CT angiography etc.
  - iii. Demonstrate knowledge of the CT finding of the common pathological conditions.
  - iv. Interpret conventional and modified body CT examinations.
  - v. Know limitations of CT in the diagnosis of certain diseases.
  - vi. Perform CT guided simple interventions (under supervision)
- **Interventional Radiology:** The student should be able to perform simple, common non-vascular procedures under ultrasound and fluoroscopy guidance e.g. FNAC, FNAB, abscess drainage, drainage catheter placement, nephrostomy, biliary drainage etc.



## V. Posting

The postgraduate student should be posted in all sections (Conventional radiology, U/S, CT, etc.) so that there is adequate exposure to all modalities. The proposed duration of postings is as under.

- Conventional Radiology 6months
- Ultrasound ,Colour Doppler & US guided interventions 6months
- CT & CT guided interventions 6months
- Special. Investigations & contrast studies 2 months
- Emergency Radiology 2 months
- Elective posting 2 months

Institutions where MRI is available, candidate will work in MRI for two months elective posting.

Institutions where MRI is not available, it is desired that candidate may be sent other institute for MRI, mammography and Interventional radiology training in place of 2 months elective posting.

### 1. SCHEDULE FOR ROTATION OF RESIDENTS

|                         |   |   |                   |   |                                     |                         |
|-------------------------|---|---|-------------------|---|-------------------------------------|-------------------------|
| 1 <sup>st</sup><br>Year | Conventional<br>Chest and<br>abdomen                  | Conventional<br>skull, spine,<br>musculo-<br>skeletal etc | US and<br>Doppler | Contrast studies<br>GIT and<br>other fluoroscopic<br>investigations | Contrast<br>studies -<br>G.U. tract | US and<br>Doppler       |
|                         | US and<br>interventions                               | Conventional<br>skull, spine ,<br>musculoskeletal<br>etc. | CT                | US and<br>interventions   | Emergency                           | CT                      |
| 2 <sup>nd</sup><br>Year | Conventional:<br>Chest and<br>abdomen                 | Elective  | CT                | US and Doppler  | Emergency                           | CT and<br>Interventions |
|                         | Conventional:<br>Musculo-<br>skeletal,<br>mammography | Conventional<br>Chest and<br>abdomen                      | elective          | CT &<br>Interventions   | CT &<br>Interventions               | US and<br>Interventions |

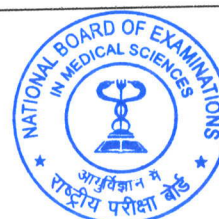


**2. Radiological Procedure which the candidates must know**

| S No. | Name of Procedure                                     | As Observer | As first assistant | Independently under supervision |
|-------|---|-------------|--------------------|---------------------------------|
| 1     | Dark room(each step)                                  | 10          | 10                 | 20                              |
| 2     | CXR, PA, AP & Lateral view<br>Apicogram, Decubitus    | 20          | 20                 | 50                              |
| 3     | Extremities & spine                                   | 30          | 30                 | 50                              |
| 4     | Skull& PNS  | 30          | 30                 | 50                              |
| 5     | Fluroscopy  | 20          | 20                 | 20                              |
| 6     | Barium Studies – Swallow, UGI<br>BMFT & B enema       | 10          | 10                 | 50                              |
| 7     | IVP, MCU, RGU, HSG                                    | 10          | 10                 | 50                              |
| 8     | Drainage procedures                                   | 10          | 10                 | 50                              |
| 9     | Biopsy / FNAC   | 10          | 10                 | 50                              |
| 10    | Doppler Examinations (obstetric<br>and non obstretic) | 50          | 100                | 100                             |
| 11    | TRUS, TVS   | 50          | 50                 | 100                             |
| 12    | Obstetric Ultrasound                                  | 50          | 50                 | 200                             |
| 13    | Non obstetric ultrasound                              | 50          | 50                 | 400                             |
| 14    | Neonatal cranial USG                                  | 10          | 20                 | 20                              |
| 15    | CT SCAN   | 20          | 20                 | 200                             |
| 16    | CT guided procedures                                  | 20          | 20                 | -                               |

**3. Radiological procedures which the candidates may know/desirable**

|   |
|---|
| CT enteroclysis   |
| Barium Enteroclysis   |
| CT Angiography  |
| Sonourethrography   |
| Bowel Ultrasound, Musculoskeletal ultrasound  |
| USG contrast  |
| Tube based procedures- Nephrostogram, T tube Cholangiogram, Sinogram, Fistulogram                       |
| ERCP, PTC, Arterigraphy/Venography, CT cistenography, CT Myelography, Myelogram, CT Angiogram/ Venogram |



## VI. Log Book

A candidate shall maintain a log book of operations (assisted / performed) during the training period, certified by the concerned post graduate teacher / Head of the department / senior consultant.

This log book shall be made available to the board of examiners for their perusal at the time of the final examination.

The log book should show evidence that the before mentioned subjects were covered (with dates and the name of teacher(s)) The candidate will maintain the record of all academic activities undertaken by him/her in log book .

- Personal profile of the candidate
- Educational qualification/Professional data
- Record of case histories
- Procedures learnt
- Record of case Demonstration/Presentations
- Every candidate, at the time of practical examination, will be required to produce performance record (log book) containing details of the work done by him/her during the entire period of training as per requirements of the logbook. It should be duly certified by the supervisor as work done by the candidate and countersigned by the administrative Head of the Institution.
- In the absence of production of log book, the result will not be declared.



## VII. Recommended Textbooks and Journals

### 1. Must Read

- Text Book of Radiology and imaging - David sutton
- Grainger & Allison's Text book of Diagnostic Radiology (Churchill Livingstone)
- AIIMS-MAMC-PGI's Comprehensive Textbook of Diagnostic Radiology, Volumes 1, 2, 3
- Diagnostic ultrasound - Carol C. Rumack
- Callen: Ultrasonography in obstetrics and gynaecology
- CT and MRI of the whole body- John R. Haaga

### 2. Reference Books

- Textbook of Gastrointestinal Radiology- Gore and Levine (Saunders)
- Caffey's Paediatric Radiology
- Diagnosis of Diseases of the Chest -Fraser
- Diagnostic Imaging Series: (Amirsys, Elsevier)
- Margulis: Alimentary tract radiology volume I & II
- Davidson's: Radiology of the kidney and Genito-urinary tract
- Clark: Positioning in radiology Dahnert: Radiology Review Manual
- Webb: High Resolution CT of the lung
- Som and Curtin: Head and neck imaging

### 3. Journals

- Indian Journal of Radiology and Imaging
- Radiological Clinics of North America
- Seminars in U/S, CT and MRI
- American Journal of Neuro-Radiology
- Clinical Radiology
- Radiology
- Radiographics
- Neuro Radiology
- American Journal of Roentagenology
- Seminars in Roentgenology

