CURRICULUM FOR COMPETENCY BASED

POSTGRADUATE TRAINING PROGRAMME

FOR

DM IN NEONATOLOGY

(3-YEARS PROGRAMME)

1. GOAL

The goal of this course is to produce competent Neonatologists who are capable of demonstrating commensurate expertise in the field. The training programme will focus on to develop an aptitude to care for neonates with specific knowledge, skills and attitudes in the specialty of Neonatology. It will help him/her to function as a safe neonatologist, an independent clinical consultant, a medical teacher and conduct research studies in this field.

2. PROGRAM OUTCOMES

Upon completion of the DM neonatology program, the trainee shall be able to acquire certain subject specific competencies in the cognitive, psychomotor and affective domain.

1. Cognitive Domain	
Sr. No.	Competencies
1.1	Acquire comprehensive knowledge of the basics of neonatology including all allied specialties related to neonatology like Embryology, Genetics, Perinatology, Basic Anatomy, Physiology, Biochemistry, Pharmacology, microbiology and Pathology.
1.2	Possess knowledge of the commonly used radio-imaging techniques like Plain X-ray, Ultrasound, CT and MRI
1.3	To get acquainted with the diagnosis and management of common and complex neonatal problems and neonatal transport
1.4	To learn the principles of perinatal care as applicable to neonatal practice.
1.5	To learn about research methodology and biostatistics and to participate in clinical and experimental research studies
1.6	Possess knowledge about recent advances in the subject of neonatology and all its allied specialties.
1.7	Working knowledge of the sophisticated and routine equipment, consumables used in neonatology

2. Psychomotor domain	
2.1	Diagnose and management of majority of the conditions in the speciality of neonatology on the basis of clinical assessment and appropriate investigations.
2.2	Able to apply sound clinical judgment and rationale cost effective investigations for the diagnosis and management of neonatal problems, in birthing centre, postnatal wards, Emergency Room and neonatal Intensive care unit.
2.3	Acquire skills in routine ward procedures (e.g essential newborn care, positioning, neurodevelopmental supportive care, family centred care, KMC, point of care ultrasound etc.).
2.4	Acquire skills in the performance and interpretation of such as cranial Ultrasound, functional 2D ECHO
2.5.	Acquire advanced expertise in neonatal resuscitation of preterm and term newborns.
2.6	Managing and monitoring sick preterm and term newborns in neonatal intensive care setting.
2.7	Acquire proficiency in advanced neonatal respiratory support including neonatal high frequency ventilation initially under supervision then independently
2.8	Acquire skills in invasive procedures central and peripheral vascular access, intubation and ventilation of ELBW, VLBW and LBW newborns
2.9	Acquire exposure in management of neonatal surgical cases and congenital problems
2.10	Provide and teach Advanced Life Support services in emergencies e.g. NALS,PALS.
3. Affective Domain	
3.1	Develop and practice effective communication skills including consent taking. Providing tele/ virtual support to manage neonatal transport. Providing Telemedicine services to cater to needs of peripheral SNCU's
3.2	Professionally interact and obtain relevant specialist/ancillary services'

	consultation where appropriate.
3.3	Develop an ability to work in team
3.4	Inculcate ethical principles in all aspects of neonatal practice/research like professional honesty and integrity, humility, moderation, informed consent, counselling, awareness of patients' rights and privileges, etc.
3.5	Teach interns and Postgraduate Students
3.6	Organize specific teaching and training programmes including basic and advanced NRP for paramedical staff, associated professionals and patient education programmes. Learn, perform and organise neonatal simulation programs
3.7	Perform Clinical and Investigative studies and to present in Seminars, meetings and conferences etc.
3.8	Acquire managerial skills to set up a completely new NICU

3. ELIGIBILITY

MD or DNB Pediatrics from INI/NMC recognized Institute. from recognised institute shall be the minimum qualification.

4. SELECTION OF CANDIDATES

The selection shall be through the entrance test conducted by the competent authority.

5. DURATION OF TRAINING

The training shall be of 3 years. During these years, the candidate shall be a senior resident who will perform clinical, teaching and research activities as prescribed in curriculum. After 6 months of training, incremental administrative responsibilities will be given to the candidates as they progress in the training program.

6. SYLLABUS

6.1 BASIC SCIENCES

- Basic genetics
- Fetal and neonatal immunology
- Mechanism of disease
- Applied anatomy and embryology
- Feto-placental physiology
- Neonatal adaptation
- Development and maturation of lungs, respiratory control, lung functions, ventilation, gas exchange, ventilation perfusion

- Physiology and development of cardiovascular system, developmental defects, physiology and hemodynamics of congenital heart disease
- Fetal and intrauterine growth.
- Development and maturation of nervous system, cerebral blood flow, blood brain barrier.
- Fetal and neonatal endocrine physiology
- Developmental pharmacology
- Developmental hematology, bilirubin metabolism
- Renal physiology
- Physiology of gastrointestinal tract, digestion, absorption.
- Electrolyte balance
- Metabolic pathways pertaining to glucose, calcium and magnesium
- Biochemical basis of inborn errors of metabolism

6.2 General Topics

- Research methodology
- Biostatistics
- Ethics in perinatology/neonatology
- Principles of education (objectives, curriculum, assessment and use of media)
- Computer, information technology, internet

6.3 Perinatology

- Perinatal and neonatal mortality, morbidity, epidemiology
- High risk pregnancy: detection, monitoring and management
- Fetal monitoring, clinical, electronic; invasive, and non-invasive
- Intrapartum monitoring and procedures
- Assessment of fetal risk, and decision for termination of pregnancy
- Diagnosis and management of fetal diseases
- Medical diseases affecting pregnancy and fetus, psychological and ethical considerations
- Fetal interventions
- Fetal origin of adult disease

6.4 Neonatal Resuscitation And Neonatal Ventilation

6.5 Blood Gas And Acid Base Disorders

6.6 Neonatal Assessment And Follow Up

- Assessment of gestation, neonatal behaviour, neonatal reflexes
- Developmental assessment, detection of neuromotor delay, stimulation techniques
- Immunization

6.7 Body Systems

6.7.1 Respiratory System

- Neonatal airways: physiology, pathology; management
- Pulmonary diseases: Hyaline membrane disease, transient tachypnea, aspiration pneumonia, pulmonary air leak sysndromes, pulmonary hemorrhage, developmental defects
- Oxygen therapy and its monitoring
- Pulmonary infections
- Miscellaneous pulmonary disorders

6.7.2 *Cardiovascular system*

- Fetal circulation, transition from fetal to neonatal physiology
- Examination and interpretation of cardiovascular signs and symptoms
- Special tests and procedures (Echocardiography, angiography)
- Diagnosis and management of congenital heart diseases
- Rhythm disturbances
- Hypertension in neonates
- Shock: pathophysiology, monitoring, management.

6.7.3 *Gastrointestinal system*

- Disorders of liver and biliary system.
- Bilirubin metabolism
- Neonatal jaundice: diagnosis, monitoring, management, phototherapy, exchange transfusion
- Prolonged hyperbilirubinemia
- Kernicterus
- Congenital malformations
- Necrotising enterocolitis

6.7.4 Nutrition

- Fetal nutrition
- Physiology of lactation
- Breast feeding
- Lactation management, breast milk banking, maternal medications and nursing
- Parenteral nutrition
- Vitamins and micronutrients in newborn health

6.7.5 Renal system

- Developmental disorders
- Renal functions
- Fluid and electrolyte management
- Acute renal failure (diagnosis, monitoring, management)

6.7.6 Endocrine and metabolism

- Glucose metabolism, hypoglycemia, hyperglycemia
- Calcium disorders
- Magnesium disorders
- Thyroid disorders
- Adernal disorders
- Ambiguous genitalia
- Inborn errors of metabolism

6.7.7 Hematology

- Physiology
- Anemia
- Polycythemia
- Bleeding and coagulation disorders
- Rh hemolytic disease

6.7.8 Neurology

- Clinical neurological assessment
- EEG, ultrasonography, CT scan
- Neonatal seizures
- Intracranial hemorrhage
- Brain imaging
- Hypoxic ischemic encephalopathy
- Neuro-muscular disorders
- Degenerative diseases
- CNS malformation

6.7.9 Surgery and orthopaedics

- Diagnosis of neonatal surgical conditions
- Pre and post operative care
- Neonatal anesthesia
- Metabolic changes during anesthesia and surgery
- Orthopedic problems

6.7.10 Neonatal infections

- Intrauterine infections
- Superficial infections
- Diarrhea
- Septicemia
- Meningitis
- Osteomyelitis and arthritis

- Pneumonias
- Perinatal HIV
- Miscellaneous infective disorders including HBV and condidemia

6.7.11 Neonatal imaging

- X-rays, ultrasound, MRI, CT Scan etc.

6.7.12 Neonatal ophthalmology

- Developmental aspects
- Retinopathy of prematurity
- Sequelae of perinatal infections

6.7.13 Neonatal dermatology

6.8 Transport Of Neonates And Neonatal Procedures

6.9 Developmental Assessment And Follow Up

6.10 Organization of neonatal care

- Community neonatology
- Vital statistics, health system;
- Causes of neonatal, perinatal death
- Neonatal care priorities
- Care at secondary level of care
- Care at primary health centre
- Role of different health functionaries
- National programmes
- National Neonatology Forum

7. Skills

7.1 Clinical

- Neonatal examination, anthropometery and developmental assessment
- Neonatal resuscitation
- Neonatal ventilation : CPAP, IMV; newer modes of ventilation
- Blood sampling : Capillary, venous, arterial
- Insertion of peripheral venous, umbilical venous and umbilical arterial catheters
- Monitoring : invasive, non-invasive
- Enteral feeding (katori-spoon, gavage, breast)
- Lactation management
- Parenteral nutrition
- Lumbar puncture and ventricular tap
- Placing of ‘chest tube’

- Exchange transfusion
- Bed side tests : shake test, sepsis screen, hematocrit, urine examination, CSF examination, Kleihauer technique, Apt test, Point of care ultrasound etc
- Neonatal drug therapy
- Nursery housekeeping routines and asepsis procedures
- Universal precautions
- Handling, effective utilization and troubleshooting of neonatal equipment.

7.2 Communication

- Communication with parents, families, communities and colleagues from allied specialities. Providing tele/ virtual support to manage neonatal transport. Providing Telemedicine services to cater to needs of peripheral SNCU's

7.3 Education/Training

- Teaching skills: lectures, tutorials
- Participatory and small group learning skill
- Principles of educational objectives, assessment and media
- Preparing learning resource material
- Neonatal simulation

7.4 Self-Directed Learning

- Learning needs assessment, literature search, evaluating evidence

7.5 Research Method

- Framing of research question, designing and conducting study, analysing and interpreting data and writing a paper.

7.6 setting up a new NICU (level, I, II, and III)

8 Attitudes and Values

8.1 Communication skills, patient counselling and consent taking: Effective communication with the patient/caretakers regarding the nature and extent of disease, treatment options available and realistic outcome following optimal management is essential.

8.2 Group /Team approach: function as a part of a team, co-operate with colleagues, and interact with the patient to provide the optimal medical care.

8.3 Ethical practice: Abide by ethical principles in medical practice, maintain proper etiquette in dealings with patients, caretakers and other health personnel including due attention to the patient's right to information, consent and second opinion.

8.4 Maintain professional integrity while dealing with patients, colleagues, seniors, pharmaceutical companies and equipment manufacturers.

8.5 Preparation of oral presentation, medical documents, professional opinion in interaction with patients, caretakers, peers and paramedical staff – both for clinical care and medical teaching.

9. Teaching- Learning Methods:

9.1 Seminars/Webinars: To be held once a month and presented by the trainee under supervision of teaching faculty.

9.2 Journal Review: To be held once every fortnight under supervision of teaching faculty. It will include discussion on recent articles, which relate to various topics in Neonatology and allied disciplines.

9.3 Clinical Case presentation: Representative clinical cases shall be presented and discussed in detail in presence of faculty once a week.

9.4 Invasive procedures planning and discussion: This session aims at discussing common invasive procedures and practical details once a week.

9.5 Clinical grand rounds: A clinical grand round, involving presentation of unusual and difficult cases will be done by a post graduate student, once a week, in the presence of all the clinical staff belonging to the department of Neonatology. The exercise is to develop the clinical acumen of the trainee.

9.6 Neonatal Radiology meet: will be held once every month in which the radiological investigations of various cases are discussed in consultation with the faculty of Radiology

9.7 Fetal medicine meet: will be held once every two months in which the high risk pregnancies are discussed in consultation with the faculty of OBGY and pediatric surgery

9.8 Didactic Lectures by faculty

9.9 Mortality and Morbidity meets: Mortality and morbidity meets will be arranged every 3 months to discuss complications and deaths occurring during patients' management to identify the areas for improvement.

9.10 Dissertation review: It will be planned every 6 months to assess the progress of trainee and to take necessary corrective steps if there are any lacunae.

9.11 Attendance and presentation at academic meets: The student must attend accredited scientific meetings (CME, symposia, and conferences) once a year. He will present at least one poster or read one paper at State/National / International neonatology or pediatric conferences during the second / third year of the training period

9.12 Research Publication (Research skills): The candidate has to undertake one dissertation. He will preferably publish one clinical research paper in indexed journal with significant impact factor.

10. DISSERTATION

Every student registered as post graduate shall carry out research project under the guidance of a recognized post graduate teacher, the result of which shall be written up and submitted in the form of a dissertation. Work for writing the dissertation is aimed at contributing to the development of a spirit of enquiry, besides exposing the student to the techniques of research, critical analysis, acquaintance with the latest advanced in medical science and the manner of identifying and consulting available literature. Dissertation will be done in accordance with institutional protocol.

Process to be completed within six months of admission to DM neonatology program:

Activity	July admission	January admission
Selection of topic in consultation with PG Guide	September /October	March /April
Approval by Department PG Committee		
Institute Scientific Committee approval	November / December	May / June
Institute Ethics Committee approval		
Final approval letter by Academics Section	31st December	30th June

11. LOG BOOK

The trainees will maintain a log book of the work carried out by them and the training program undergone during the period of training including details of the neonatal cases, procedures, POCUS, telemedicine. The log book will be checked and assessed periodically by the faculty members imparting the training.

12. ROTATIONAL POSTINGS (3-6 months)

Apart from routine postings in PNC ward, OPD, NICU (all levels), birthing centre the trainee will be posted in the following allied speciality.

1. Perinatology-obstetrics : Duration- 4 weeks. The posting will be in the 2nd year of training. The objectives of the posting will be to learn management of high risk pregnancies, antenatal counselling of high risk pregnancies and fetal anomalies and their management.
2. Pediatric surgery : duration 4 weeks. The posting will be in the 3rd year of training. The objectives of the posting will be to learn management of major neonatal surgical conditions. They will also learn the intricacies and challenges in perioperative and anaesthetic management of small neonates.
3. Community neonatology : duration 4 weeks. The posting will be in 2nd year. The student will be attending to peripheral (PHC, district level), special care newborn unit. The objective will be to gain experience of working in resource limited settings.
4. Allied specialities: duration 4 weeks. posting either in radiology/ microbiology or statistics as per choice of the candidate. The objective will be to gain experience in the allied speciality with focus on perinatal medicine

5. External rotation: 4 weeks duration: there will be provision to gain experience relevant to perinatal medicine in external institutes, as per the norms and Memorandum of understanding prevailing at the time.

13. ASSESSMENT

Essential Pre-Requisite To Appear For Summative Assessment

1. Minimum 80% attendance in each year of training.
2. Minimum of four satisfactory six monthly progress reports
3. Approval of Dissertation
4. Minimum one scientific paper/poster presentation at International /National / State neonatology or pediatric Conference
5. Minimum one research paper – published / accepted for publication / sent for publication in a peer-reviewed indexed scientific Journal.
6. A minimum of 50 % marks in preliminary exam is mandatory in Theory and Practical separately, in order to be eligible to appear for the Professional Examination.

13.1 Formative assessment:

Theory:

Time	**Marks**	**Total**
At end of first year (Paper I)	100	600
At end of second year (Paper II)	100	
Preliminary (4 Papers of 100 marks each)	400	

- Pattern for Paper I and Paper II: Marks: 100 Duration: 3 hours 10 questions of 10 marks each
- The Prelim Examination will be conducted in accordance with the pattern of the final examination for theory.

Practical:

Time	Marks	Total
At end of first year (Practical I)	100	500
At end of second year (Practical II)	100	
Preliminary	300	

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13.2 Six monthly progress report:

The progress of the PG student will be monitored with the help of a structured six monthly report. The report will contain details pertaining to attendance, teaching-learning activities, clinical duties, teaching assignments, practical work, marks obtained at intermediate examinations, papers / posters presented, research publications and progress of dissertation work. The performance of the student will be graded by the PG Guide and the Head of the Department.

- The Prelim Examination will be conducted in accordance with the pattern of the final examination for practical.

13.3 Summative Assessment:

1. Theory: There shall be four theory papers as follows:

Paper I	Basic sciences as applied to neonatology and perinatology
Paper II	Clinical neonatology
Paper III	Clinical neonatology, Research methods, community neonatology, allied disciplines
Paper IV	Recent advances in neonatology and perinatology

2. Final Practical examination: 300 marks

- Long case I (a neonate receiving intensive care) (60 marks)
- Long case II (60 marks)
- Short case I (40 marks)
- Short case II (a follow up high risk newborn) (40 marks)
- Objective Structured Clinical Examination (OSCE) (40 marks)
  or if not possible, spots examination
- Structured Viva Voce (two parts) (60 marks)
  - Patient management problems (20 marks)
  - General viva (including radio- imaging Investigations i.e. ultrasound/CT/MRI records, interpretation of ABG neuro-physiological records such as BERA, EEG; national programmes, policy (40 marks)

In order to be declared successful in summative assessment, the candidate must score:

1. A minimum of 50% marks in Theory and Practical separately.
2. A minimum of 40% marks in each Theory Paper

Recommended books

3. Remington and Klein's infectious disease of the fetus and newborn infant
4. Volpe's Neurology of new born
5. Perloff clinical recognition of congenital heart disease
6. Avery and Donald's Neonatology, pathophysiology
7. Gomella's Neonatology
8. Manual of neonatal respiratory care
9. Gold smith assisted ventilation of neonate
10. Averys diseases of the newborn
11. Neonatal and infant dermatology
12. Smith's Recognizable Patterns Of Human Malformation
13. Practical neonatal echocardiography
14. Neonatology questions and controversies- Neurology

Recommended Journals:

1. Neonatology
2. Journal of maternal fetal and neonatal medicine
3. Journal of perinatology
4. Seminars in perinatology
5. Archives of disease of Childhood- fetal and neonatal edition
6. Journal of Paediatrics