Curriculum

DrNB Super Specialty

Neonatology

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I. INTRODUCTION:

The aim of the DNB Programme is to provide advanced training in Neonatology to produce competent super-specialists who are able to provide clinical care of the highest order to the newborn infants, and serve as future teachers, trainers, researchers and leaders in the field of Neonatology.

We have defined 12 areas of competence for the Resident neonatologist:

1. Ethics in Practice – The ability of a resident* to display ethical principles in practice including the appropriate use of justice, beneficence, non- maleficence, and the autonomy of patient rights.
2. Collaboration – The ability of a resident to work collaboratively in a medical team; to know how and when it is appropriate to consult with specialists and other members of the healthcare team
3. Global Health Awareness – The ability of a resident to understand the issues pertaining to basic human rights of one's patients; to be familiar with the social determinants of health and with global health priority setting strategies; to understand the role of global burden of diseases; to be familiar with the structure and function of the national or regional health system; and mechanisms for delivering cost-effective health promotion and disease prevention interventions.
4. Patient Safety and Quality Improvement – The ability of a resident to demonstrate active and meaningful engagement in quality improvement with emphasis on patient safety; to know the epidemiology of medical error and harm; to be familiar with detecting and reporting adverse events.
5. Research Principles and Evidence-based Practice – The ability of a resident to understand the basic principles of biostatistics; and to be familiar with epidemiology and clinical research design.
6. Scholarly Activity – The ability of residents to begin to demonstrate a lifelong commitment to reflective learning; and to engage in the creation & dissemination of medical knowledge.
7. Self-Leadership and Practice Management – The ability of the resident to exhibit self-leadership skills.
8. Communication and Interpersonal Skills – The ability of the resident to effectively communicate with patients, families, other health care professionals.

9. Health Advocacy and Children's Rights – The ability of the resident to respond to individual patient health needs and issues as part of patient care; and to understand how to provide effective health care in local communities.
10. Professionalism – The ability of a resident to display professional attributes and professional actions; and to practice as an expert in his field.
11. Assessment, Diagnostic, Procedural and Therapeutic Skills – The ability of a resident to demonstrate skill in a number of assessment and diagnostic tests; to be able to interpret certain routine laboratory tests and to be aware of age specific ranges for those tests; to be able to interpret routine pediatric imaging and other tests.
12. Medical Knowledge of Patient Care – The ability of a resident to show proficiency in taking an appropriate history and physical examination of children across the developmental spectrum from birth through the transition into young adulthood; to be able to form a differential diagnosis and provide appropriate management options.

II. OBJECTIVES OF THE PROGRAMME:

1. PROGRAMME GOAL

The goal of DNB Neonatology program is to provide specialized training in Neonatology to produce competent super specialists.
These specialists will be capable of providing care of the highest order to the newborn infants in the community as well as clinical tertiary care centers.
They would subsequently serve as teachers, trainers, researchers and leaders in the field of Neonatology.
They shall recognize the health needs of the community and carry out professional obligations ethically and in keeping with the objectives of the National Health Policy.

2. PROGRAMME OBJECTIVES

After completing the DNB Neonatology course the student will be able to recognize the importance of Neonatology in the context of health needs of the community & the national priorities in the health sector. Thus the trainee will be able to:

i. Provide primary, secondary, and tertiary care to all newborn infants including intensive care of the highest standard to the critically sick neonates and very low birth weight infants using advanced therapeutic and supportive modalities and skills. Effectively plan therapeutic, rehabilitative, preventive &promotive measures or strategies.

ii. Take rationale decision in the face of ethical dilemmas in perinatal – neonatal diseases. Demonstrate empathy & humane approach towards patients & their families & exhibit Interpersonal behavior in accordance with social norms & expectations.

iii. Exhibit communication skills of high order and demonstrate compassionate attributes in the field of Neonatology.

iv. Implement a comprehensive follow up and early intervention program for the "At risk" newborn infants, and plan, counsel and advise rehabilitation of the neuro developmentally and physically challenged infants.

v. Analyze neonatal health problem scientifically, taking into account behavioral epidemiology of the perinatal –neonatal morbidity and mortality.

vi. Use and maintain the essential neonatal equipment and keep abreast with advances in neonatal care technology.

vii. Teach newborn care to medical and nursing students as well as grass root health functionaries and develop learning resource materials for them.

viii. Plan and carry out research in neonatal health in clinical, community and laboratory settings. Seek analyze new literature and information on Neonatology, update the concepts, and practice evidence based Neonatology. Demonstrate adequate managerial skills.

ix. Have the ability to set up level II and level III Neonatal units independently.

x. Participate in the community programs and at the secondary level of health system endplay the assigned role in the national programmes aimed at the health of mothers and their infants. These super specialists would work as a productive member of the interdisciplinary team consisting of obstetricians, neonatologists, pediatric surgeons, other doctors, nurses and grassroots functionaries providing care to the pregnant mother, the fetus and newborn in any setting of health care system & function as an effective leader of a "Health Team" engaged in Health Care of mothers and their infants.

III. TEACHING AND TRAINING ACTIVITIES:

The fundamental components of the teaching programme should include:

1. Case presentations & discussion- once a week
2. Seminar – Once a week
3. Journal club- Once a week
4. Grand round presentation (by rotation departments and subspecialties) - once a week
5. Faculty lecture teaching- once a month
6. Clinical Audit-Once a Month
7. Mortality meeting – once a month
8. A perinatal meeting with the Deptt of OBG is highly recommended- once a month
9. A poster and have one oral presentation at least once during their training period in a recognized conference.

The rounds should include bedside sessions, file rounds & documentation of case history and examination, progress notes, round discussions, investigations and management plan) interesting and difficult case unit discussions.

The training program would focus on knowledge, skills and attitudes (behavior), all essential components of education. It is being divided into theoretical, clinical and practical in all aspects of the delivery of the rehabilitative care, including methodology of research and teaching.

i. **Theoretical:** The theoretical knowledge would be imparted to the candidates through discussions, journal clubs, symposia and seminars. The students are exposed to recent advances through discussions in journal clubs. These are considered necessary in view of an inadequate exposure to the subject in the undergraduate curriculum.

ii. **Symposia:** Trainees would be required to present a minimum of 20 topics based on the curriculum in a period of three years to the combined class of teachers and students. A free discussion would be encouraged in these symposia. The topics of the symposia would be given to the trainees with the dates for presentation.

iii. **Clinical:** The trainee would be attached to a faculty member to be able to pick up methods of history taking, examination, prescription writing and management in rehabilitation practice.

iv. **Bedside:** The trainee would work up cases, learn management of cases by discussion with faculty of the department.

v. **Journal Clubs:** This would be a weekly academic exercise. A list of suggested Journals is given towards the end of this document. The candidate would summarize and discuss the scientific article critically. A faculty member will suggest the article and moderate the discussion, with participation by other faculty members and resident doctors. The contributions made by the article in furtherance of the scientific knowledge and limitations, if any. The strengths and the weaknesses of the study must be outlined in a slide and discussed at length. It is important that for the studies which are Randomised controlled trials the checklist (*CONSORT) must be used. While for the Cohort studies the checklist (STROBE) must be used. This is done to make the journal club more innovative and useful.

vi. **Research:** The student would carry out the research project and write a thesis/ dissertation in accordance with NBE guidelines. The trainee would also be given exposure to partake in the research projects going on in the departments to learn their planning, methodology and execution so as to learn various aspects of research. It needs to be highlighted here that the NBE is very serious about the research done by candidates. The e research work done gets assessed by the experts in the field and if not found up to the mark it is rejected and the candidates are/ required to redo it as per the suggestions given by the experts and unless the thesis has been approved by the experts the candidate is not allowed to appear in the exam/ the result is withheld till the research work is cleared by the experts.

IV. SYLLABUS:

Since the students are trained with the aim of practicing as independent specialists, this course content will be mainly a guideline. They have to manage all types of cases and situations and seek and provide consultation. The emphasis shall therefore be on the practical management of the problem of the individual cases and the community within the available resources.

1. Basic Sciences

i. Basic genetics
ii. Fetal and neonatal immunology
iii. Applied anatomy and embryology
iv. Feto-placental physiology
v. Fetal growth
vi. Neonatal adaptation
vii. Drug formulary and neonate
viii. Physiology and Development of Respiratory system
ix. Physiology and development of Cardiovascular system, developmental defects, physiology and hemodynamics of congenital heart disease.
x. Physiology and Development Nervous system
xi. Physiology and Development of gastrointestinal system
xii. Physiology and Development of Renal system
xiii. Physiology and Development of Hematopoietic system
xiv. Physiology and Development of Endocrinal system
xv. Metabolic pathways pertaining to glucose, calcium and magnesium
xvi. Biochemical basis of inborn errors of metabolism
xvii. Electrolyte balance
xviii. Development pharmacology
xix. Mechanism of disease
xx. Science and the Emergence of Neonatal Medicine
xxi. Fetal and neonatal immunology
xxii. Mechanism of disease
xxiii. Applied anatomy and embryology
xxiv. Feto-placental physiology
xxv. Neonatal adaptation
xxvi. Outcome following Preterm Birth
xxvii. Developmental Care
xxviii. Counseling and Support for Parents and Families
xxix. Ethical and Legal Aspects of Neonatology
xxx. Ethics and the law
xxxi. Antenatal Diagnosis and Fetal Medicine
xxxii. Fetal Growth, Intrauterine Growth Restriction and.
xxxiii. Small-for-Gestational-Age Babies
xxxiv. Maternal Illness in Pregnancy
xxxv. Care around Birth

xxxvi. Resuscitation and Transport of the Newborn
xxxvii. Stabilization and Resuscitation of the Newborn
xxxviii. Neonatal equipment

2. Mendelian inheritance

i. Autosomal dominant
ii. Autosomal recessive
iii. X-linked recessive
iv. X-linked with incomplete penetrance
v. X-linked dominant

3. Multifactorial inheritance

4. Mitochondrial inheritance genetic diagnosis

i. Chorionic villus sampling
ii. Amniocentesis
iii. Prenatal umbilical blood sampling
    a. Noninvasive
    b. Ultrasonography
    c. Maternal blood screening
iv. Postnatal
    a. Karyotyping
    b. Fluorescent in situ hybridization
    c. Comparative genomic hybridization
    d. Molecular analysis
    e. Metabolic analysis
    f. Newborn screening

5. Chromosomes abnormalities

i. Autosomal
    a. Trisomy
    b. Deletions
    c. Translocations
    d. Duplications
    e. Inversions
    f. Contiguous gene syndromes
ii. Sex chromosomes
    a. Turner syndrome
    b. Klinefelter syndrome

6. Genetic abnormalities

i. Short stature
ii. Overgrowth syndromes
iii. Neuromuscular disorders
iv. Facial and limb abnormalities
v. Osteochondrodysplasia
vi. Craniosynostosis
vii. Storage disorders
viii. Connective tissue disorders
ix. Hamartoses

7. Miscellaneous

i. Pharmacogenetics
ii. Trinucleotide expansion
iii. Imprinting
iv. Anticipation
v. Associations
vi. Sequences
vii. Genetic counseling
viii. Embryonic basis of malformation
ix. Environmental factors in fetal development
x. Ethical and social implications of genetic testing

8. Perinatology

i. Perinatal outreach services
ii. Perinatal and neonatal mortality,
iii. Morbidity, epidemiology (Perinatal Audit)
iv. High risk pregnancy & impact on the fetus
v. Fetal monitoring
vi. Intrapartum monitoring and procedures
vii. Genetic counseling
viii. Diagnosis and management of fetal diseases
ix. Fetal intervention
x. Fetal origin of adult disease
xi. High risk pregnancy-detection monitoring and management.
xii. Fetal monitoring-clinical and electronic invasive and non- invasive
xiii. Assessment of fetal risks and decision for termination of pregnancy

9. Fetus

i. Intrauterine growth and role of placenta
ii. Fetal assessment
iii. Fetal diagnostics
iv. Fetal therapy
v. Prevention of fetal disease
vi. Gestational age determination

10. Mother

i. Maternal screening
ii. Effects of maternal systemic disease on fetus and newborn
iii. Oligohydramnios and polyhydramnios
iv. Impact of maternal medications on fetus and newborn
v. Impact of maternal substance use and abuse on fetus and newborn
vi. Aspects of pregnancy, labor and delivery that affect the newborn
vii. Risk determinants for preterm delivery (maternal and fetal)
viii. Impact of multiple gestations
ix. Impact of reproductive technologies (including ethical issues)

11. Normal newborn infants

i. Nomenclature and definitions
ii. Delivery room management
    a. Temperature control
    b. Assessment
iii. General examination of a neonate
iv. Transition and neonatal adaptation to extra uterine life
    a. Maturational assessment
    b. Appropriate-for-gestational-age (AGA)
    c. Large-for-gestational-age (LGA)
    d. Small-for-gestational-age (SGA)
    e. Preterm, term, post-term

12. Routine care

i. General
ii. Vitamin K
iii. Eye prophylaxis
iv. Feeding requirements
v. Calories

vi. Fluid
vii. Screening
viii. General
ix. Glucose
x. Hematocrit
xi. Serologic test for syphilis
xii. Expanded metabolic screening
xiii. Thyroid function
xiv. Phenylketonuria
xv. Hearing
xvi. Umbilical cord care
xvii. Physiologic events
xviii. Stool
xix. Urination
xx. Vital signs
xxi. Spitting vs vomiting
xxii. Jaundice
    a. Aspects of drug therapy unique to the newborn
    b. Discharge plans (including nutritional counseling)
    c. Home birth
    d. Identification of danger signs
    e. Newborn immunizations/infection prevention and control
    f. Determinants of neonatal mortality (local and global)
    g. Growth charts (see also Growth and Development)

13. Abnormal newborn infants

i. General
ii. Resuscitation
    a. Ventilation
    b. Suctioning
    c. Perfusion
iii. Major patterns of malformations
iv. Neonatal birth injuries and trauma
v. Very-low-birth-weight infant
vi. Conditions, diseases
    a. Hypoxia, ischemia, asphyxia
    b. Polycythemia, hyperviscosity
    c. Neonatal jaundice

d. Intracranial hemorrhage
e. Respiratory distress
f. General
g. Respiratory distress syndrome
h. Pneumothorax
i. Meconium aspiration syndrome
j. Congenital pneumonia
k. Transient tachypnea of the newborn
l. Persistent fetal circulation (pulmonary hypertension)
m. Cyanosis (nonrespiratory)
n. Bronchopulmonary dysplasia/chronic lung disease
o. Sepsis (including meningitis
p. TORCH infections, including HIV
q. Recognition and stabilization of surgical emergencies
r. Necrotizing enterocolitis
s. (m)Intestinal obstruction
t. Tracheoesophageal fistula
u. Abdominal-intestinal wall defect
v. Infants affected by maternal disorders (eg, diabetes, systemic lupus erythematous)
w. Anemia (hemolytic anemia including blood group incompatibility)
x. Multiple congenital anomalies
y. Apnea
z. Deformations (amniotic bands, positional deformations)

vii. Congenital/acquired hydrocephalus
viii. Congenital hip dislocation/dysplasia
ix. Ambiguous genitalia
x. Abnormal skin findings (rashes, nevi, vascular malformations)

a. Retinopathy of prematurity
b. Hypothermia and cold injury
c. Hypoglycemia (including refractory hypoglycemia)
d. Acute respiratory failure including ventilatory support
e. Neonatal transport and pre transport stabilization

xi. Comprehensive discharge planning and follow-up plans

a. Outcome for survival and factors influencing outcome
b. Care and follow-up of low birth weight and high risk infants

14. Neonatology

i. Neonatal resuscitation
ii. Management of normal newborn
iii. Management of LBW, VLBW, ELBW infants
iv. Management of sick neonate
v. Emergency neonatal care
vi. Thermoregulation
vii. Neonatal transport
viii. Fluid & electrolyte management
ix. Neonatal ventilation
x. Blood gas and acid base disorders
xi. Neonatal assessment
xii. Assessment of gestation, neonatal behavior, neonatal reflexes
xiii. Developmental assessment, detection of neuromotor delay, stimulation techniques

15. Respiratory system

i. Neonatal airways: physiology, pathology; management
ii. Pulmonary diseases: hyaline membrane disease, transient tachypnea, aspiration Pneumonia, pulmonary air leak syndromes, pulmonary hemorrhage, developmental defects
iii. Oxygen therapy and its monitoring
iv. Pulmonary infections
v. Miscellaneous pulmonary disorders
vi. General
    a. History
    b. Physical Examination
    c. Interpretation of laboratory results
    d. Therapeutic approaches
vii. General signs and symptoms (including distress and severe respiratory distress)
    a. Stridor
    b. Respiratory failure
    c. Cough (acute and chronic)
    d. Apnea (including sleep apnea)
    e. Wheezing
    f. Tachypnea
    g. Hemoptysis

h. Cyanosis
i. Clubbing
j. Danger signs for respiratory compromise
k. Snoring or features of sleep obstruction

viii. Upper airway
a. General
b. Croup
c. Epiglottitis
d. Foreign body

ix. Lower airway
a. Vascular anomalies
b. Congenital malformations
c. Bronchiolitis
d. Aspiration syndromes
e. Bronchiectasis
f. Tracheomalacia
g. Tracheitis
h. Foreign body aspiration
i. Pulmonary syndromes related to disorders such as sickle cell disease

x. Infectious disorders
a. Tuberculosis
b. Pertussis
c. Others (eg, bronchitis, tracheitis, epiglottitis)

xi. Parenchymal
a. Pneumonias
b. Trauma
c. Drowning, near drowning, acute respiratory distress syndrome
d. Hypoplastic lung
e. Malformations of lung
f. Lung abscess
g. Hydatid cyst
h. Pulmonary eosinophilia (Loeffler's syndrome)

xii. Newborn infants
a. Bronchopulmonary dysplasia (chronic lung disease of infancy)
b. Diaphragmatic hernia
c. Respiratory distress syndrome
d. Tetralogy of Fallot
e. Pulmonary maladaption

xiii. Cystic fibrosis
xiv. Primary ciliary dyskinesia (dysmotile cilia syndrome)
xv. Extrapulmonary
    a. Pleural fluid/empyema
    b. Pneumothorax, pneumomediastinum
    c. Thoracic deformities
    d. Mediastinal masses including lymph nodes
xvi. Pulmonary hypertension and corpulmonale
xvii. Respiratory sleep disorders
xviii. Sudden infant death syndrome
xix. Diagnostic testing
    a. Pulmonary function testing

16. Immunodeficiency Disorders

i. History
ii. Physical Examination
iii. Interpretation of laboratory
iv. Symptoms of potential immunodeficiency
v. Screening tests
vi. Immune deficiency disorders
vii. Immune dysregulation syndrome
viii. Care of the immunocompromised child
    a. Prevention
    b. Management
    c. Nutrition
    d. Immune deficiency
ix. HIV infection
x. Auto-immune disorders
xi. General
    a. History
    b. Physical Examination
    c. Interpretation of laboratory results
    d. Therapeutic approaches
xii. Signs and symptoms of potential immunodeficiency
xiii. Screening tests
xiv. Immune deficiency disorders
xv. Immune dysregulation syndrome
xvi. Care of the immunocompromised child

a. Prevention
b. Management
c. Nutrition
d. Immune deficiency

xvii. HIV infection

xviii. Auto-immune disorders

17. Cardiovascular system

i. Fetal circulation, transition from fetal to neonatal physiology

ii. Examination and interpretation of cardiovascular signs and symptoms

iii. Special tests and procedure (Echocardiography, angiography)

iv. Diagnosis and management of congenital heart diseases

v. Rhythm disturbances

vi. Hypertension in neonates

vii. Shock: pathophysiology, monitoring, management Gastrointestinal system

viii. General

a. History
b. Physical examination
c. Interpretation of laboratory results
d. Therapeutic approaches

ix. General issues

a. Blood pressure measurement
b. Chest pain
c. Syncope
d. Murmur
e. Circulatory failure and shock

x. Congestive heart failure

a. Diagnosis
b. Management

xi. Congenital heart disease

xii. General

xiii. Cyanotic disease

a. Diagnosis
b. Management

xiv. Acyanotic disease

a. Diagnosis
b. Management

xv. Antenatal management
xvi. Acquired heart disease
    a. Infectious and post-infectious diseases
    b. Infective endocarditis
    c. Rheumatic fever and rheumatic heart disease
    d. Myocarditis
    e. Pericarditis/pericardial effusion
    f. Post-cardiac surgery disorders
    g. Kawasaki disease
xvii. Rate and rhythm disorders, ischemia
xviii. Systemic diseases affecting the heart (including metabolic disorder

18. Disorders of liver and biliary system

i. Bilirubin metabolism
ii. Neonatal jaundice, Prolonged hyperbilirubinemia, Kernicterus
iii. Congenital malformations
iv. Necrotisingenterocolitis

19. Gastroenterology and Hepatology

i. General
    a. History
    b. Physical examination
    c. Interpretation of laboratory results
    d. Therapeutic approaches

ii. Abdominal pain
    a. Acute
        - General
        - Appendicitis
        - Cholecystitis, cholelithiasis
        - Pancreatitis
        - Intussusception, volvulus, malrotation
        - Trauma
        - Obstruction

iii. Chronic
    a. Functional
    b. Irritable bowel syndrome

c. Peptic disorder
d. Helicobacter pylori

iv. Abdominal distention (mass, ascites)
v. Vomiting/esophageal disorders
a. Gastrointestinal and non-gastrointestinal causes of vomiting
b. Vomiting from infectious and noninfectious causes
c. Structural causes of vomiting
d. Disorders associated with chronic vomiting
e. Motility disorders (including trauma)
f. Caustic ingestion, foreign body
g. Gastroesophageal reflux
h. Eosinophilic esophagitis

vi. Diarrhea
a. Diarrhea caused by infectious mechanisms (acute, prolonged and persistent diarrhea)
b. Diarrhea caused by noninfectious mechanisms/chronic nonspecific diarrhea
c. Dysentery
d. Management of diarrhea

vii. Constipation/encopresis (see Psychosocial)
a. Jaundice and liver diseases
- Neonates and infants
- Bilirubin metabolism
- Breast-milk jaundice
- Infectious and noninfectious causes of jaundice

b. Young children and adolescents (infectious and noninfectious causes of jaundice, obstructive jaundice)

viii. Gastrointestinal bleeding
a. Upper versus lower gastrointestinal bleeding
b. Polyps
c. Meckel diverticulum
d. Ulcer disease
e. Hepatomegaly (caused by viral hepatitis, chronic hepatitis, cirrhosis of liver, portal hypertension, etc)

ix. Malabsorption
   a. General
   b. Mucosal disease (celiac disease)
   c. Pancreatic insufficiency (cystic fibrosis, Shwachman syndrome)
   d. Enzyme deficiency (lactase, sucra/se-isomaltase)
   e. Short-gut syndrome, including bacterial overgrowth
   f. Fat malabsorption and chronic liver disease (biliary atresia, cystic fibrosis)
x. Inflammatory bowel disease

20. Neurology

i. Clinical neurological assessment
ii. EEG, ultrasonography, CT scan
iii. Neonatal seizures
iv. Intracranial hemorrhage
v. Brain imaging
vi. Hypoxic ischemic encephalopathy
vii. Neuro-muscular disorder
viii. Degenerative diseases
ix. CNS malformation

21. Renal system

i. Development disorders
ii. Renal functions
iii. Fluid and electrolyte management
iv. Acute renal failure (diagnosis, monitoring, management).
   A. General
      - History
      - Physical examination
      - Interpretation of laboratory results
      - Therapeutic approaches

   B. Normal function, physiology and developmental issues
   C. Common manifestations of nephrologic disorders
      - Proteinuria Hematuria
      - Persistent microscopic hematuria
      - Causes of gross and microscopic hematuria
      - Nonhematogenous etiology of red urine

- Dysuria
- Voiding problems
- Nocturnal
- Organic
- Functional, daytime incontinence
- Voiding dysfunction

D. Congenital nephrologic disorders

- Renal dysplasia
  - ✓ Unilateral multicystic dysplastic kidney
  - ✓ Autosomal-dominant polycystic kidney disease
  - ✓ Autosomal-recessive polycystic kidney disease
  - ✓ Renal agenesis
- Structural abnormalities
  - ✓ General
  - ✓ Hydronephrosis
  - ✓ Hydroureter and megaureter
  - ✓ Ureterocele
  - ✓ Vesicoureteral reflux
- Abnormalities of the urethra
  - ✓ Posterior urethral valves
  - ✓ Urethral stricture
- Hereditary nephropathy (e.g., familial nephritis, autosomal-dominant polycystic kidney disease, autosomal-recessive polycystic kidney disease)

E. Acquired nephrologic disorders

- Infection of the urinary tract
  - ✓ Pyelonephritis
  - ✓ Cystitis
- Acute glomerulonephritis
- Nephrotic syndrome
- Hemolytic-uremic syndrome
- Henoch-Schoenlein purpura
- IgA nephropathy
- Acute non-traumatic renal injuries
- Disorders secondary to metabolic diseases and other systemic disorders

F. Nephrotic syndrome

G. Other renal conditions

- Renal failure
  - ✓ Acute renal failure
  - ✓ Intrinsic renal failure
- Chronic kidney disease (chronic renal failure)
- End-stage kidney disease and transplantation (including renal replacement therapy)
- Trauma
  - ✓ Renal injuries
  - ✓ Urethral injury
- Toxins Urinary tract stones
- Renal tubular disorders
- Nephrogenic diabetes insipius
- Renal rickets

H. Blood pressure/hypertension

- Normal vs abnormal blood pressure
  - ✓ Complications of blood pressure measurement (eg, "White Coat")
  - ✓ Definition of hypertension in children and adolescents
- Evaluation of elevated blood pressure in childhood
- Primary/secondary hypertension
- Therapy of hypertension
- End-organ effects of hypertension

22. Diagnostic evaluation (including imaging of renal disorders)

A. General

- History
- Physical examination
- Interpretation of laboratory results
- Therapeutic approaches

B. Disorders of the bladder

- Injury from drugs and how to prevent bladder toxicity
- Cystitis
- Self-induced or factitious bladder injury
- Neurogenic bladder

C. Male

- Congenital abnormalities
  - ✓ Hypospadias
  - ✓ Cryptorchidism
  - ✓ Micropenis
  - ✓ Phimosis
  - ✓ Undescended testes
- Acquired abnormalities
  - ✓ Testicular torsion
- Infection
  - ✓ Orchitis
  - ✓ Epididymitis
  - ✓ Urethritis
- Trauma
- Testicular masses
- Varicocele
- Urethral valve

D. Female

- Congenital abnormalities
  - ✓ Imperforate hymen
  - ✓ Labial adhesions
- Acquired abnormalities
  - ✓ Ovarian torsion
  - ✓ Ovarian cyst
  - ✓ Vulvovaginitis

23. Endocrine and metabolism

i. Glucose metabolism, hypoglycemia, hyperglycemia
ii. Calcium disorders
iii. Magnesium disorders
iv. Thyroid disorders
v. Adernal disorders
vi. Ambiguous genitalia
vii. Inborn errors of metabolism

24. Hematology

i. Physiology
ii. Anemia
iii. Polycythemia
iv. Bleeding and coagulation disorders
v. Rh hemolytic disease
vi. Blood Component Therapy Nutrition

A. General
- History
- Physical examination
- Interpretation of laboratory results
- Therapeutic approaches

B. Erythrocyte disorders
- Nutritional anemias
  - ✓ Iron deficiency
  - ✓ Vitamin B12, folic acid deficiency
- Hemolytic anemias
  - ✓ Membrane disorders
  - ✓ Enzyme abnormalities
  - ✓ Hemoglobinopathies
  - ✓ Immune-mediated anemias
- Aplastic and hypoplastic erythrocyte disorders
  - ✓ Diamond-Blackfan syndrome
  - ✓ Transient erythroblastopenia of childhood
  - ✓ Drug induced
- Anemias secondary to systemic disorders
- Polycythemia

C. Leukocyte disorders
- Quantitative leukocyte disorders
  - ✓ Congenital and immune-mediated neutropenia
  - ✓ Acquired, nonimmune neutropenia
  - ✓ Sepsis
  - ✓ Drugs
- Qualitative leukocyte disorders

D. Platelet disorder
- Thrombocytopenia
- Thrombocytosis

E. Pancytopenia
- Decreased production

- ✓ Congenital (Fanconi anemia)
- ✓ Acquired aplastic anemia

- Increased destruction

F. Coagulation disorders

- Congenital and acquired bleeding and thrombotic disorders
- Thrombophilias

G. Transfusion medicine (including component therapy)

25. Nutrition

A. Normal nutritional requirements

- General requirements
- Mineral
- Vitamins
- Fat
- Protein
- Caloric intake

B. Infant feeding

- Breast-feeding
- Formula-feeding
- Introduction of solid food

C. Deficiency states and hypervitaminosis (including rickets)

- Vitamin deficiency states
- Mineral deficiency states
- Protein, calorie deficiency states (acute and chronic malnutrition including stunting, wasting and underweight)
- Hypervitaminosis

D. Principles of nutritional support

- Infant and young child feeding (IYCF) support
- Tube feeding, enteral nutrition
- Parenteral nutrition
- Weight loss

E. Nutritional problems associated with specific diseases, conditions

- Gastrointestinal disorders
- Renal disease
- Hepatic disease
- Cardiac disease
- Cystic fibrosis
- Hematologic-oncologic disease

- Neurologically handicapped children
- Burns
- Allergies
- Athletes
- Vegetarians
- Failure to thrive (management of moderate to severe malnutrition)

F. Obesity (prevention and management)

G. Weight loss

H. Eating disorders (anorexia nervosa/bulimia)

26. Fetal nutrition

i. Physiology of lactation

ii. Lactation management

iii. Parenteral nutrition

iv. Vitamins and micronutrients in newborn health

v. Human Milk Banking

27. Immunology

A. General

- History
- Physical Examination
- Interpretation of laboratory results
- Therapeutic approaches

B. Signs and symptoms of potential immunodeficiency

C. Screening tests

D. Immune deficiency disorders

E. Immune dysregulation syndrome

F. Care of the immunocompromised child

- Prevention
- Management
- Nutrition
- Immune deficiency

G. HIV infection

H. Auto-immune disorders

28. Surgery and Orthopedics

i. Diagnosis of neonatal surgical conditions

ii. Pre and post operative care
iii. Neonatal anesthesia
iv. Metabolic changes during anesthesia and surgery
v. Orthopedic problems

29. Neonatal infections

i. Intrauterine infections
ii. Superficial infections
iii. Diarrhea
iv. Septicemia
v. Meningitis
vi. Osteomyelitis and arthritis
vii. Pneumonias
viii. Perinatal HIV
ix. Miscellaneous infective disorders & fungal infections

30. Neonatal ophthalmology

i. Development aspects
ii. Retinopathy of prematurity
iii. Sequelae of perinatal infections

A. General
- History
- Physical examination
- Interpretation of laboratory results
- Therapeutic approaches

B. Normal vision development

C. Extraocular
- Alignment and movement disorders
  - ✓ Strabismus
  - ✓ Nystagmus
- Conjunctivitis
- Orbital and periorbital (preseptal) cellulitis
- Stye, chalazion
- Nasolacrimal duct obstruction
- Ptosis

D. Intraocular
- Childhood glaucoma
- The white pupil (retinoblastoma)

- Cataracts
- Papilledema, papillitis
- Retinopathy of prematurity
- Optic neuritis
- Hemorrhagic problems

E. Miscellaneous

- Amblyopia
- Foreign bodies
- Corneal abrasions
- Trauma to the eye
- Be able to evaluate trauma to the eye; including hyphema
- Recognize the clinical signs of a blow-out fracture of the orbit
- Tumor or hemangioma affecting vision
- Disorders of refraction (including myopia and hypermetropia)
- Blindness and visual defects
- Uveal tract disorders
- Ocular manifestations of systemic disorder

31. Neonatal Hearing Assessment Community neonatology

i. Vital statistics
ii. Health system
iii. Neonatal care priorities
iv. Care at primary, secondary & tertiary level of care

32. Immunizations

i. Indications and schedules
   a. Awareness of local/regional schedules
ii. General contraindications
   a. Immune deficiency
   b. Egg allergy
   c. HIV –positive in household
iii. Prevention by active immunization
   a. Influenza vaccine
   b. Meningococcal vaccine
   c. Pneumococcal vaccine
   d. Hepatitis vaccines
   e. Tetanus vaccine
   f. Diphtheria-tetanus combination

g. Pertussis vaccines (cellular and acellular)
h. DTaP and Tdap vaccines
i. Measles vaccine
j. Rubella vaccine

iv. Poliovirus vaccine
a. Hemophilusinfluenzae type b vaccine (m)Varicella vaccine
b. human papillomavirus (HPV)
c. rotavirus
d. Specific endemic diseases and schedules (eg, recombinant Calmette-Guerin bacillus (BCG)
e. Catch-up immunizations
f. Live versus killed vaccines
g. Travel indications and needs

v. Screening
a. Principles of screening tests
b. Blood pressure
c. Hematocrit
d. Lead

33. Neonatal Dermatology

i. Organization of neonatal care
a. Community neonatology
b. Vital statistics, health system;
c. Causes of neonatal, perinatal death
d. Neonatal care priorities
e. Care at secondary level of care
f. Care at primary health centre
g. Role of different health functionaries
h. National Programmes
i. National Neonatology Forum

ii. Neonatal Imaging
a. Neonatal imaging
b. X-rays, ultrasound, MRI, CT Scan etc.
c. Developmental aspects
d. Neonatal dermatology
e. Transport of Neonates.
f. Neonatal Procedures
g. Community neonatology

h. Developmental assessment and follow up
i. Organization of neonatal care
j. Adoption
k. Recent Advances
l. Laboratory Medicine
m. Neonatal procedures
n. Therapeutic agents
o. Biomedical equipments, use & maintenance

34. General Topics

i. Research methodology
ii. Teaching methodology
iii. Biostatistics
iv. Epidemiology
v. Ethics and bioethics
vi. Health economicsHealth Information System
vii. Ethics in Perinatology / Neonatology
viii. Medical education
ix. Computer & Information technology

Biostatistics, Research Methodology and Clinical Epidemiology
Ethics
Medico legal aspects relevant to the discipline
Health Policy issues as may be applicable to the discipline

V. COMPETENCIES:

List of Skills

1. **Clinical**
   - Neonatal examination & anthropometry
   - Developmental assessment
   - Neonatal resuscitation
   - Neonatal ventilation: CPAP, Mechanical ventilation
   - Blood sampling: Capillary, venous, arterial
   - Insertion of peripheral venous, umbilical venous and umbilical arterial catheters
   - Monitoring

2. **Invasive, non-invasive**

- Enteral feeding (katori-spoon, gavage, breastfeeding)
- Lactation management
- Parenteral nutrition
- Endotracheal Intubation
- Lumbar puncture and ventricular tap
- Placing of 'chest tube'
- Exchange transfusion
- Bed side tests: shake test, sepsis screen, hematocrit, glucose estimation, urine examination, CSF examination, Kleihauer technique, Apt test etc.
- Neonatal drug therapy
- Nursery housekeeping routines
- Infection control & Universal precautions
- Handling, effective utilization and troubleshooting of neonatal equipment.
- Decision making, clinical diagnosis, planning & interpretation of investigations
- Management of Neonatal Problems Communication
- Communication with parents, families and communities
- Interdepartmental communication
- Human behavior studies

3. Education / Training

- Teaching skills
- Learning skills
- Participatory and small group learning skills
- Preparing learning resource material

4. Self-Directed Learning

- Learning needs assessment, literature search, evaluating evidence Research Method Framing of research question
- Designing and conducting study
- Analyzing and interpreting data
- Publication & writing a paper
- Review & presentation of research findings

5. Training program:

There will be structured training program. The students are expected to learn in phasic manner starting with basic care progressing to advanced care management.

First year: Neonatal resuscitation protocol Care of normal newborn, low birth weight, preterm & sick neonates Neonatal Ventilation Communication Skills Research methodology

Second year: All of above plus Neonatal Surgery Total parenteral nutrition High frequency ventilation Neonatal Autopsy Neonatal radiology including imaging techniques Perinatology Community Neonatology Teaching Methodology Analytical & managerial skills

Third year: All of above plus Recent Advances Fetal Medicine National Programs Rotation Total period of DNB course is 36 months.

Of this, at least 27 – 30 months will be spent in the newborn services, 3 - 6 months will be meant for essential rotations in related specialties and the rest up to three months will be for either optional rotations, extramural rotation or for the new born services as deemed necessary.

6. **Essential rotation:**
   - Perinatology: Obstetrics 1 month
   - Neonatal surgery 15 days
   - Community neonatology 1 month
   - Extramural 2 months

7. **Optional Rotations:** The department will have flexibility of additional rotations for up to 3 months in the above mentioned areas or in other relevant areas such as (neonatal cardiology, cardiac surgery, rehabilitation services, genetics, perinatal pathology, imaging, neonatal ophthalmology, epidemiology & biostatistics, information & educational technologies etc.) depending upon the strength of the disciplines and functional requirements at the concerned institutions.

Extramural rotation Extramural rotations or elective rotations for a maximum period of 2 months will be possible during end of the 2nd year of training.

The candidates can undertake up to 2 months elective rotation at parent or other institutions in the country centers approved by the Department. There will be a continuous interaction between the Neonatology department and the allied departments to ensure that the students achieve these skills during their peripheral postings. Under no circumstances however, would the training in neonatal services

be of less than 27 months (3/4 of total course) All these postings are desirable but are not absolutely mandatory. The department must assess that the departmental work does not get adversely affected on account of the prolonged absence of thee residents from the parent department.

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.

1. Personal profile of the candidate
2. Educational qualification/Professional data
3. Record of case histories
4. Procedures learnt
5. Record of case Demonstration/Presentations
6. 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 log book. It should be duly certified by the supervisor as work done by the candidate and countersigned by the administrative Head of the Institution.
7. In the absence of production of log book, the result will not be declared.

VII. RECOMMENDED TEXT BOOKS AND JOURNALS:

List of Books

1. Neonatal –Perinatal Medicine Diseases of the fetus and infant AvroyAFanaroff Richard J Martin
2. Neonatology Pathophysiology & Management of the Newborn Gordon Avery Mary Ann Fletcher M.G. MacDonald
3. Avery Diseases of Newborn S. Avery Taeusch Ballard
4. Polin& Fox Fetal and Neonatal Physiology Richard APolin William W Fox

5. Roberton's Textbook of Neonatology Janet M Rennie N.R.C Roberton
6. Neonatology Principles and Practice Dipak K. Guha
7. Manual of Neonatal Care John P. Cloherty
8. Neonatology Management, Procedures, On call problems Diseases And Drugs Tricia Lacy Gomella
9. Breastfeeding A Guide to the Medical Profession Ruth A. Lawrence Robert M. Lawrence
10. Physical Diagnosis in Neonatology Mary Ann Fletcher
11. Nelson's Textbook of Neonatology Behrman Kleigman Arvin
12. Assisted Ventilation of the Neonate Jay P. Goldsmith Edward H. Karotkin
13. Infectious Diseases of the Fetus & Newborn Infant Remington & Klein
14. Neurology of Newborn Joseph J. Volpe
15. Smith's Recognizable Patterns of Human Malformations Kenneth Lyons Jones
16. Moss and Adams Heart Disease in Infants, Children, & Adolescents Including the Fetus & Young Adult EmmanouilidesRiemenschneider Allen &Gutgesell
17. The Clinical Recognition of Congenital Heart Disease Joseph K. Perloff
18. Pediatric Cardiology Myung Park
19. Pediatric Hematology Nathan, Oski
20. Medical disorders in Obstetric Practice Michel Deswite
21. Neonatal drug formulary
22. Textbook of Preventive & Social Medicine Park

List of Journals

1. Archives Diseases of Childhood: Fetal & Neonatal edition
2. The Journal of Pediatrics
3. Pediatrics (English Edition)
4. Indian Journal of Pediatrics
5. Indian Pediatrics
6. Clinics in Perinatology
7. Journal of Neonatology
8. Journal of Perinatology
9. Pediatrics Today
10. Archives of Pediatrics and Adolescent Medicine
11. Pediatric Clinics of North America
12. Pediatric Clinics of India
13. Recent Advances in Paediatrics
14. Seminars in Neonatology
15. Seminars in Perinatology

16. The Year Book of Pediatrics
17. ActaPaediatrica: an international journal of Paediatrics

Websites

1. www.cochrane.mcmaster.ca/neonatal
2. www.nichd.nih.gov/cochrane
3. www.neonatology.org
4. www.emedicine.com/ped/neonatology.htm
5. www.nnfi.org

आयुर्विज्ञान में राष्ट्रीय परीक्षा बोर्ड

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