# Curriculum
# For
# DM Nephrology (3-year course)


## All India Institute of Medical Sciences
## Nagpur

# CURRICULUM FOR COMPETENCY BASED POST GRADUATE TRAINING PROGRAMME FOR DM (NEPHROLOGY) (3-YEARS PROGRAM)

## 1. GOAL

The program aims at training a Physician in the specialty of Nephrology encompassing the related knowledge, skills, research methodology and attitudes which will enable him/her to function as an independent clinician/consultant, a teacher, or a research scientist.

The goal of the program is to produce a competent Nephrologist who:

1. Has acquired the competence pertaining to Nephrology that is required to be practiced in the community and at all levels of health care system
2. Has acquired the skills to manage the patient effectively pertaining to nephrology
3. Has acquired skill in effectively communicating with patient and his attendants.
4. Has the desired skills to independently manage emergency cases.
5. Is aware of the latest developments in the field of nephrology oriented to principles of research methodology
6. Has acquired skills in educating medical and paramedical professionals.

## 2. PROGRAM OUTCOMES

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

At the end of the course upon successful completion of training on passing the examination the student is expected to:

| 1. Cognitive Domain | |
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| **S.No.** | **Competencies** |
| 1.1 | Understand the normal renal anatomy and physiology from fetal life to adult. |
| 1.2 | Understand the basic principles involved in pathology of kidney diseases and their assessment as applicable to nephrology practice. |
| 1.3 | Be conversant with the etiology, pathophysiology, diagnosis, and management of common kidney diseases in an out -patient, inpatient and emergency settings. |
| 1.4 | Recognize the importance of inter-disciplinary approach in the management of various kidney diseases and obtain relevant specialist / ancillary services' consultation where appropriate. |
| 1.5 | Possess knowledge of the commonly used radio-imaging techniques like Plain X-ray, Ultrasound, CT and MRI, various contrast radiographies and nuclear imaging techniques |
| 1.6 | Acquire and demonstrate the knowledge about various forms of renal replacement therapies like hemodialysis, peritoneal dialysis, and kidney transplantation |
| 1.7 | Possess knowledge about various urological procedures/surgeries including kidney transplantation and organ perfusion. |
| 1.8 | Acquire and demonstrate knowledge about all aspects of kidney transplantation including but not limited to, its principles, laws, pathophysiology, pharmacology, immunology, histocompatibility, histology, cross-match, diagnosis, and management of graft dysfunction (rejection, infections etc.). |

| 2. Psychomotor domain | |
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| **S.No.** | **Competencies** |
| 2.1 | Understand the presentation (history and clinical examination), evaluation and management of congenital and acquired renal disorders in neonates, infants, children, and adult. |
| 2.2 | Order relevant investigations and competently interpret the results of laboratory studies including urinalysis and the results of general and renal imaging procedures performed in patient with kidney and urinary tract disorders. |
| 2.3 | Formulate and implement treatment plans, and monitor the effectiveness of their interventions for various renal diseases including management of acute kidney injury, chronic kidney disease, end-stage renal disease and patient on various forms of renal replacement therapies including kidney transplantation in a holistic manner |
| 2.4 | Perform competently all medical and invasive procedures including but not limited to (a) percutaneous biopsy of native and transplanted kidneys, (b) placement of temporary vascular access (tunnel and non-tunnel) or peritoneal catheter (both acute and chronic catheter) for renal replacement therapy (RRT), (c) Perform hemodialysis, other blood based therapies ,acute and chronic peritoneal dialysis and continuous renal replacement therapy, (d) Urine analysis, native kidney and graft biopsy handling and interpretation, (e) Arterio-Venous Fistula Creation |
| 2.5 | Acquire proficiency in prescribed minor and major procedures related to nephrology, dialysis and transplantation, initially with assistance and later independently. |
| 2.6 | Should be able to prescribe, formulate and implement the various procedure /therapies in nephrology including, but not limited to, hemodialysis, peritoneal dialysis, plasmapheresis, CRRT and other blood-based therapies |
| 2.7 | Formulate and carry out pre transplant work up for donor and recipient independently |
| 2.8 | Acquire skills to manage kidney transplant patient during intra and post operative period and should able to do organ perfusion independently. |
| 2.9 | Provide Basic and Advanced Life Support services in emergencies |

| 3. Affective Domain | |
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| **S.No.** | **Competencies** |
| 3.1 | Demonstrate respect, compassion, and integrity; a responsiveness to the needs of patients and society; and a commitment to excellence. |
| 3.2 | Demonstration of skill in listening to patients and families and the ability to effectively educate and counsel patients and their families on diagnostic and treatment decisions including initiation of renal replacement therapies and prognosis. |
| 3.3 | Develop the skills to interact with professional colleagues for the care of the renal patient. |
| 3.4 | Demonstrate the ability to lead the consult service through interactions with referring and primary doctor. |
| 3.5 | Effectively work with other members of the health care team, including referring physicians from other specialties, nurses, social workers and technicians, and to implement a treatment plan. |
| 3.6 | Effectively teach nephrology care to medical students, junior post graduate students, nurses and technician. |
| 3.7 | Adopt ethical principles in all aspects of nephrology practice/ research. (Professional honesty and integrity, humility, informed consent, counselling and recognize patients' rights and privileges). |
| 3.8 | Develop desired skills to independently manage emergency situations related to renal disease and complications associated procedures /surgeries as mentioned above. |
| 3.9 | Communicate effectively and demonstrate caring and respectful behavior when interacting with patients with renal and urinary tract problems and their families. |
| 3.10 | Be conversant with counselling techniques for the family / primary care takers. |
| 3.11 | Work with faculty and colleagues to provide patient-focused care. |
| 3.12 | Perform necessary patient care documentation in an accurate and timely manner. |
| 3.13 | Adhere to ethical standards and maintain professionalism while using social media platform for teaching, learning, and communicating. |

## 4. ELIGIBILTY CRITERIA

M.D/D.N.B(Medicine/Pediatrics) from INI/NMC recognized institute shall be the minimum qualification

## 5. SELECTION OF THE CANDIDATE

Through entrance test conducted by the competent authority

## 6. DURATION OF THE COURSE

The training shall be of 3 years full time residency pattern. During these years, the candidate shall be a senior resident who will perform clinical, teaching and research activities as prescribed in the curriculum. The candidate shall be given additional administrative responsibilities during these years as per his/her competency.

## 7. SYLLABUS

| System/Section | List of topics |
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| **A) Renal Anatomy & Physiology** | 1. Embryology of the kidney<br>2. Anatomy of the kidney<br>3. Podocyte structure and function<br>4. Renal Circulation and Glomerular hemodynamics<br>5. Renal Sodium handling<br>6. Renal Potassium handling<br>7. Renal handling of calcium, magnesium and phosphorous<br>8. Renal Acid Base handling<br>9. Renal handling of Uric acid<br>10. Urine concentration and dilution<br>11. Aquaporins<br>12. Renin angiotensin aldosterone system<br>13. Hormones and Kidney<br>14. Nephron endowment and developmental programming of blood pressure and kidney |

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| **B) Electrolyte, water and acid balance** | 1. Disorders of sodium & water balance<br>2. Disorders of potassium balance<br>3. Disorders of acid base balance<br>4. Disorders of calcium balance<br>5. Disorders of magnesium balance<br>6. Disorders of phosphate balance<br>7. Diuretics<br>8. Interpretation of electrolyte and acid-base parameters in blood and urine |
| **C) Evaluation of Kidney diseases** | 1. Approach to a patient with kidney disease<br>2. Laboratory assessment of kidney disease - GFR, Urinalysis and proteinuria<br>3. Diagnostic kidney imaging<br>4. Kidney biopsy<br>5. Biomarkers in Acute kidney injury and chronic kidney disease |
| **D) Primary glomerular diseases** | 1. Inherited disorders of glomerulus<br>2. Mechanisms and consequences of proteinuria<br>3. Mechanisms of immune glomerular injury<br>4. Infection related glomerulonephritis<br>5. Rapidly progressive glomerulonephritis and crescentic glomerulonephritis<br>6. IgA Nephropathy and Henoch - Schonlein purpura<br>7. Membranoproliferative glomerulonephritis and C3 glomerulopathies<br>8. Membranous nephropathy<br>9. Nephrotic syndrome and podocytopathies- Minimal change disease, Focal segmental glomerulosclerosis<br>10. Fibrillary glomerulonephritis and Immunotactoid glomerulopathy |

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| **E) Secondary glomerular diseases** | 1. Systemic lupus erythematosus<br>2. Mixed connective tissue disease and kidney<br>3. Vasculitic diseases of kidneys- Small vessel vasculitis, Medium vessel, Large vessel vasculitides<br>4. Anti-glomerular basement membrane disease and Goodpasture's syndrome<br>5. Hereditary Nephritis, Nail patella syndrome, Fabry's disease<br>6. Glomerular involvement with bacterial infections<br>7. Glomerular involvement with parasitic infections<br>8. Glomerular involvement with viral infections<br>9. Glomerular diseases associated with drugs<br>10. Overview of therapy for glomerular diseases |
| **F) Systemic Diseases of the kidney** | 1. Tropical Nephrology<br>2. Pathogenesis, Clinical manifestations, and natural history of Diabetic nephropathy<br>3. Prevention and treatment of diabetic nephropathy<br>4. Management of diabetic patient with CKD<br>5. Cardiac failure and kidney<br>6. Liver diseases and kidney<br>7. Sjogren's syndrome and kidney<br>8. Sarcoidosis and kidney<br>9. Rheumatoid arthritis and kidney<br>10. Sickle cell disease and kidney<br>11. Antiphospholipid syndrome and kidney<br>12. Lipoprotein glomerulopathy |

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| **G) Pregnancy and Kidney disease** | 1. Renal physiology in normal pregnancy<br>2. Renal complications in normal pregnancy<br>3. Pregnancy with pre-existing kidney disease |
| **H) Kidney and Hypertension** | 1. Role of kidneys in hypertension<br>2. Primary hypertension<br>3. Endocrine causes of hypertension<br>4. Renovascular hypertension and ischemic nephropathy<br>5. Antihypertensive therapy<br>6. Interventional treatments of resistant hypertension<br>7. Malignant Hypertension and other hypertensive crises |
| **I) Acute Kidney Injury** | 1. Epidemiology, diagnosis and staging of AKI<br>2. Pathophysiology of acute kidney injury - Ischemic and nephrotoxic<br>3. Antibiotic and immunosuppression related acute kidney injury<br>4. Nephrotoxicity of NSAIDS, Analgesics and RAAS inhibitors<br>5. Contrast associatedAKI<br>6. Nephrotoxicity secondary to environmental agents, heavy metals, drug abuse and lithium<br>7. Acute kidney injury associated with pigmenturia and crystal deposits<br>8. Acute kidney Injury in the Tropics<br>9. Evaluation of acute kidney injury<br>10. Complications of acute kidney injury<br>11. Prevention and management of acute kidney injury |

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| **J) Chronic Kidney Disease** | 1. Epidemiology and Demographics of kidney disease<br>2. Risk factors and chronic kidney disease<br>3. Adaptation to nephron loss and mechanisms of progression in chronic kidney disease<br>4. Aging and kidney disease<br>5. Pathophysiology of uremia<br>6. Chronic Kidney Disease- Mineral Bone Disorder<br>7. Therapeutic approach to CKD-MBD<br>8. Cardiovascular aspects of CKD<br>9. Hematologic aspects of CKD & Management<br>10. Endocrine aspects of CKD<br>11. Neurologic aspects of CKD<br>12. Dermatologic conditions in CKD<br>13. Nutritional management in kidney diseases<br>14. Stepped care approach to management of CKD<br>15. Drug dosing considerations in patients with kidney disease<br>16. Acquired cystic kidney disease and malignant neoplasms<br>17. Tissue Engineering, Stem cells and cell therapy in Nephrology |
| **K) Microvascular & Macrovascular diseases of the kidney** | 1. Thrombotic microangiopathies- Hemolytic uremic syndrome & Thrombotic Thrombocytopenic purpura<br>2. Atheroembolic Renal disease<br>3. Radiation Nephropathy<br>4. Macrovascular diseases of the kidney |

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| **L) Cystic and Tubular disorders** | 1. Cystic diseases of the kidney<br>2. Inherited disorders of the renal tubule<br>3. Acute tubulointerstitial nephritis<br>4. Chronic tubulointerstitial nephritis<br>5. Endemic nephropathies<br>a. Balkan endemic nephropathy and other endemic nephropathy<br>b. Chinese herbal nephropathy<br>c. CKD u |
| **M) Urinary Tract Infections, Urinary tract obstruction and Nephrolithiasis** | 1. Host - pathogen interactions and host defense mechanisms<br>2. Cystitis and urethritis<br>3. Infections of upper urinary tract<br>4. Renal and perirenal abscesses<br>5. Complicated urinary tract infections<br>6. Fungal infections of the urinary tract<br>7. Urinary tract tuberculosis<br>8. Urinary tract obstruction<br>9. Reflux nephropathy<br>10. Nephrolithiasis<br>11. Nephrocalcinosis<br>12. Malformations of the kidney |
| **N) Pediatrics Nephrology** | 1. Diseases of kidney and urinary tract in children<br>2. Fluid electrolyte and acid base disorders in children<br>3. Renal replacement therapy in Pediatric ESRD<br>4. Intervention Nephrology In Pediatric Patient |

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| **O) Dialysis** | 1. Physiologic principles and urea kinetic modelling, Adequacy of dialysis<br>2. Hemodialysis apparatus<br>3. Dialysis water, Water treatment plant<br>4. Dialyzer reuse<br>5. Vascular access for dialytic therapies -<br>a. Arteriovenous fistula<br>b. Venous catheters<br>c. Arteriovenous vascular access monitoring and complications<br>d. Venous catheter infections and complications<br>6. Complications during dialysis<br>7. Anticoagulation in Hemodialysis<br>8. Continuous renal replacement therapy<br>9. Home hemodialysis<br>10. Hemodiafiltration<br>11. Plasmapheresis<br>12. Elimination enhancement of poisons<br>13. Sorbent technology<br>14. Bioartificial kidney, Wearable kidney<br>15. Infections in ESRD patients<br>16. Physiology of peritoneal dialysis<br>17. Peritoneal dialysis apparatus<br>18. Peritoneal dialysis catheter placement and care<br>19. Adequacy of peritoneal dialysis<br>20. Volume status and fluid overload in peritoneal dialysis<br>21. Peritonitis and exit site infections<br>22. Metabolic complications of peritoneal dialysis<br>23. Hernias, Leaks and Encapsulating peritoneal sclerosis |

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| **P) Transplantation** | 1. Transplant immunology<br>2. Histocompatibility in kidney transplantation<br>3. Evaluation of Recipient<br>4. Evaluation of Donor<br>5. Kidney Preservation<br>6. Brain Death and Donation after circulatory death donor criteria and care of deceased<br>7. Donor Nephrectomy<br>8. Surgical techniques of kidney transplantation<br>9. Transplantation and abnormal bladder<br>10. Peri-operative care of patients undergoing transplantation<br>11. Early course of the patient with kidney transplant<br>12. Induction therapies for renal transplant recipient<br>13. Maintenance therapy in renal transplant recipients<br>14. Co-Stimulatory blockade in renal transplantation<br>15. Other forms of immunosuppression<br>16. Approaches to induction of tolerance<br>17. Transplantation in sensitized patients and ABO blood group incompatibility<br>18. Kidney paired donation programs<br>19. Vascular and lymphatic complications after kidney transplantation<br>20. Urological complications after kidney transplantation<br>21. Pathology of kidney transplantation-Rejections<br>22. Chronic allograft failure |

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| | 23. Cardiovascular disease in renal transplantation<br>24. Infections in kidney transplant recipients<br>25. Liver disease in renal transplant recipients<br>26. Neurological disease after kidney transplantation<br>27. Skin involvement after kidney transplantation<br>28. Malignancies in kidney transplant recipients<br>29. Pancreas and kidney transplantation for diabetic nephropathy<br>30. Combine liver and kidney transplantation, multiorgan transplantation<br>31. Renal transplantation in children<br>32. The Transplantation Laws and organ allocation system<br>33. Xenotransplantation |
| **Q) Critical Care Nephrology** | 1. Principles of Critical Care Nephrology<br>2. Principles of Renal Physiology<br>3. Epidemiology of Acute Kidney Injury in Critical Care<br>4. Exposures and Patient Susceptibility<br>5. Humoral and Cellular Mechanisms of Kidney Damage<br>6. Clinical Course of Acute Kidney Injury and Biomarkers<br>7. Mechanisms of Repair or Progression<br>8. Renal Histopathology in Acute Kidney Injury |

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| | 9. Imaging Techniques in Critical Care Nephrology<br>10. Clinical Syndromes and Acute Kidney Injury<br>11. Prevention and Treatment: General Treatment Concepts<br>12. Fluid and Electrolytes<br>13. Acid-Base, Metabolism and Nutrition in Critical Illness and Acute Kidney Injury<br>14. Infectious Diseases and Sepsis<br>15. Acute Intoxication and Poisoning<br>16. Acute Kidney Injury and Organ Crosstalk<br>17. Interaction of the Heart and the Kidney<br>18. Interaction of the Lung and Kidney<br>19. The Liver and the Kidney<br>20. Interaction of the Brain and the Kidney<br>21. Fluid Balance and its Management in the Critically Ill<br>22. General Principles of Acute Renal Replacement Therapy<br>23. Intermittent Renal Replacement Therapies<br>24. Continuous Renal Replacement Therapies (CRRT)<br>25. Peritoneal Dialysis in the Intensive Care Unit<br>26. Extracorporeal Blood Purification Techniques Beyond Dialysis |

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| | 27. Critical Care Nephrology in Pediatrics<br>28. Kidney Transplantation and Critical Care<br>29. Special Kidney Problems in the Intensive Care Unit<br>30. Principles and Management of Mechanical Ventilation |
| **R) Onconephrology** | 1. Onco-Nephrology: Growth of the Kidney-Cancer Connection<br>2. AKI Associated with Malignancies<br>3. Tumor Lysis Syndrome<br>4. Electrolyte and Acid-Base Disorders and Cancer<br>5. Glomerular Disease and Cancer<br>6. Hematologic Diseases and Kidney Disease including monoclonal gammopathies<br>7. Clinical tests for Monoclonal Proteins<br>8. Hematopoietic Stem Cell Transplant-Related Kidney Disease<br>9. Radiation Nephropathy<br>10. Chemotherapy and Kidney injury<br>11. Pharmacokinetics of Chemotherapeutic Agents in Kidney Disease<br>12. CKD as a Complication of Cancer<br>13. Hereditary Renal Cancer Syndromes<br>14. Work-up and Management of Small Renal Masses and neoplasms<br>15. Cancer in Solid Organ Transplantation<br>16. Cancer Screening in ESRD<br>17. Ethics of RRT, Initiation and Withdrawal, in Cancer Patients<br>18. Palliative Care in Patients with Kidney Disease and Cancer |

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| **S) Interventional Nephrology** | Principles and Practical use of various procedures in interventional nephrology including but not limited to:<br>1. Kidney biopsy<br>2. Pre-operative evaluation for vascular access creation<br>3. Vascular Access Creation and Its Dysfunction management<br>4. Dialysis catheter placement :- Tunnel and Non tunnel catheter at various access sites<br>5. Vascular Mapping for AVF creations<br>6. Various endovascular procedures use for management of vascular access dysfunctions<br>7. Peritoneal dialysis catheter placements for both acute Peritoneal dialysis(PD) and Continuous ambulatory peritoneal dialysis(CAPD)<br>8. Interventional procedures for diagnosis and management of peritoneal dialysis catheter dysfunction<br>9. Approach to nonfunctional, Malfunctioning and infected catheter<br>10. Thrombolysis and anticoagulation use in access dysfunction<br>11. Approach to nonfunctioning/dysfunctioning /malfunctioning AVF.<br>12. Unconventional venous access placement like trans lumbar or transhepatic dialysis catheter placements |

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| | 13. Central venous stenosis: - Clinical approach and management |
| **T) Imaging In Nephrology** | 1. Various Nuclear Imaging modalities/Techniques, its principle and practical use in nephrology including but not limited to DTPA Scan, DMSA Scan, PET scan, ACE inhibitor renal scintigraphy, Diuretic renal scintigraphy etc.<br>2. CT Scan :- Principles and Practical use in diagnosis of various renal disorders<br>3. MRI Scan :- Principles and Practical use in diagnosis of various renal disorders<br>4. Ultrasonography :- Principles and Practical use in diagnosis/management of various renal disorders<br>5. Point Of Care Ultra-Sonography (POCUS): - Principles and Practical use in diagnosis of various renal/related disorders<br>6. Urography: - Principles and Practical use in diagnosis of various renal disorders<br>7. MCU/RGU and Various other urological Imaging modalities :- Principles and Practical use in diagnosis of various renal disorders<br>8. Fistulogram and other imaging modalities for the diagnosis of Vascular access Dysfunction :- Principles and Practical use in diagnosis of vascular access dysfunction. |

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| | 9. USG Doppler study :- 1.Principles and Practical use in diagnosis of various renal disorders, 2. Its use in evaluation and management of Vascular access dysfunction<br>10. Urodynamics Studies: - Principles and Practical use in diagnosis of various urinary tract dysfunctions |
| **U) Recent Advances in the Nephrology and Allied Sciences** | 1. Recent advances in the field of Nephrology and allied sciences<br>2. Recent advances in the field of Kidney transplantation and other renal replacement therapies |
| **V) Uro-nephrology** | 1. Knowledge of common urological diseases and its management<br>2. Principles, indications, contraindication of various urological procedure and their practical use in nephrology<br>3. Cystoscopy: - Basic Principle, Techniques and practical use<br>4. Urodynamics studies, various imaging modalities: - Principles and use in diagnosis of urological disorders<br>5. Basics Principle and Knowledge of various urological surgeries including kidney transplant Surgery<br>6. Kidney Perfusions during transplantation :- Principles and Technics<br>7. Vascular Access Creation Surgeries |

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| | including AVF creations: - Principles, Techniques and Practical approach |
| **W) Medical Ethics and Laws related to Nephrology** | 1. Medical Ethics<br>2. Laws related to Nephrology, Transplantation and allied Sciences<br>3. Medical Negligence |
| **X) Genetics in Nephrology** | 1. Congenital and inherited genetic disorders in nephrology<br>2. Approach for evaluation of genetical disorders in nephrology<br>3. Diagnostics modalities/methods for genetic diseases<br>4. Principles of management<br>5. Prognostication and rehabilitation |
| **Y) Nephropathology** | 1. Approach to the Diagnosis of common glomerular disorders<br>2. Prerequisites for histological diagnosis of glomerular diseases<br>3. Various techniques used in histopathology of renal tissue<br>4. Significance and use of various stains in diagnosis of glomerular lesions (light microscopy)<br>5. Immunofluorescence: - Principles, techniques and use of various antibodies and special markers for the diagnosis of various glomerular lesions<br>6. Electron Microscopy :- Principles , Practical use and Approach in kidney diseases |

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| | 7. Approach in special and rare cases<br>8. Approach in graft biopsy including diagnosis of rejections, infection. |
| **Z) Lab Medicine** | 1. Various pathological, biochemical, genetic and microbiological test, their principles, interpretation and practical use for diagnosis of kidney diseases.<br>2. Urine analysis: - principle, techniques, demonstration and interpretation.<br>3. Various immunological, genetics, cross match, tissue typing and immunohistocompatibility testing methods in kidney transplantation. |

## 8. NEPHROLOGY DM ROTATION POSTINGS

| S. No. | Posting | Duration |
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| **1.** | Indoor services including emergency/Out patient clinics /Consultations | 17 months |
| **2** | Dialysis and Interventional Nephrology | 8 months |
| **3.** | Kidney Transplantation | 6 months |
| **4.** | Critical Care Nephrology | 1 Month |
| **5.** | Research/Elective Posting | 3 months |
| **6.** | Lab Medicine and allied posting | 1 month |

## 9. COMPETENCIES TO BE ACHIEVED IN PSYCHOMOTOR DOMAIN/PRACTICAL SKILL DURING ROTATION POSTINGS

### 9.1 Indoor services including emergency and Critical care nephrology/Out patient's clinics/Consultations

Upon completion of the course, the post graduate student should be able to perform /demonstrate his/her skill in following task.

- The candidate should take good history and demonstrating good examination techniques.
- Arrive at a logical working diagnosis, differential diagnosis after clinical examination and order appropriate investigations keeping in mind their relevance (need based) and thereby provide appropriate care that is ethical, compassionate, responsive and cost effective and in conformation with statutory rules.
- The candidate should work in the department under the guidance of faculty. They should able to make decision in clinical and investigative aspects of nephrology.
- Attend Nephrology outpatient department including all specialty renal clinics. The candidates have to write case sheets of all patients and discuss the problem of patients with faculty.
- The candidates have to maintain data for Indoor, Outdoor and consultation separately (online and offline mode)
- The candidate has to gain experience in wide variety of renal diseases.
- Candidate has to take detailed history, write the work up and management plan of each IPD patient. Trainee should take active participation in day-to-day decision making, ward round teaching, discussion and formulation of treatment plan.
- During his /her training period candidate has to familiar with the pathogenesis, clinical presentation, differential diagnosis, management of following pediatric care entities :
    - Acute kidney injury in children.
    - Must understand the causes of glomerulonephritis in children: post-streptococcal GN, IgA nephropathy, sickle cell nephropathy, familial hematuria syndromes including Alport's Syndrome and benign familial hematuria, Henoch-Schönlein purpura, various congenital diseases/syndromes

- Hypercalciuria, nephrotic syndrome, childhood and adolescent hypertension, vesicoureteralreflux, other disease states.
- Understand the different problems and management of uremia in children with reference to: Presentation of uremia, modes of dialysis, complications of uremia and dialysis in children
- Use of different renal replacement therapies in children like hemodialysis, peritoneal dialysis, use of CAPD cycler, CRRT, Therapeutic apheresis (plasmapheresis)
- Performance of different procedures in pediatric patient like kidney biopsy (graft/native), placement of vascular access like temporary and tunnel catheter, AV fistula, placement of peritoneal dialysis catheter.
- Understand the principles and management of children in reference to transplantation, including evaluation, immediate post-transplant care, and long-term follow-up.

**9.2 Dialysis and Interventional Nephrology**

- To be able to write a prescription, conduct and supervise acute and chronic intermittent hemodialysis.
  - Entails knowledge of proper indications, principles and contraindications for hemodialysis,
  - Knowledge of first dialysis precautions and modifications,
  - Writing of dialysis order which includes choosing dialysis filters, tubings, anticoagulation, blood flow, dialysate flow, ultrafiltration, access selection, duration and special modifications/precautions if any,
  - Estimating dry weight and modification during special circumstances (critically ill child, in-born errors of metabolism, post op status, bleeding diathesis etc.)
  - Choosing appropriate dialysate composition and preparations,
  - Knowledge of principle and functioning of hemodialysis apparatus including different dialysis machines,
  - Knowledge of different alarms during hemodialysis with their troubleshooting,

- Understanding and treatment of complications (during and after HD session)
- Modifying dialysis prescription for inadequate clearance in chronic hemodialysis patients to achieve adequacy.
- Use of different modifications of hemodialysis and there indication's like isolated ultrafiltration's, SLEDD (sustained low efficiency daily dialysis)
- Should be able to use different dialysis profiles during dyselectrolytemia and volume imbalance like sodium ,potassium and ultrafiltration profiling's,
- Knowledge and practical use of urea kinetic modelling ,principles and hemodialysis adequacy,
- Candidate should serve as the primary care provider for a cohort of patients receiving chronic outpatient hemodialysis and able to formulate a plan, initiate and monitor the hemodialysis.
- Evaluation and management of nutrition of the patient on HD

- Knowledge of the technology involved in home hemodialysis, the prescription of home hemodialysis, medications and access considerations for home hemodialysis. The trainee show have knowledge of the potential challenges with home hemodialysis.
- Trainee should able to independently manage short-term and long-term complications of each mode of dialysis.
- Trainee should able to plan, create, monitor dialysis access (acute and long-term vascular and peritoneal), should able to manage complication associated with access dysfunction/malfunction.
- He/she must know about arterio-venous fistula (AVF) principles, surveillance, monitoring, complication and management of short- and long-term complications associated with AVF.
- Dialysis water treatment plant management and water delivery systems
  - Knowledge of principles and functioning of different components of water treatment plant and delivery system.
  - Knowledge of different methods of water treatment use in hemodialysis unit,
  - Day to day monitoring, surveillance and troubleshooting's of water treatment plant,
  - Knowledge and practical use of different test use to detect impurities in water,
  - Knowledge and practical use of different biochemical and microbiological parameters/tests in dialysis water treatment plant ,

▪ Different methods of disinfection and sterilization of water treatment plant and delivery system,

▪ Knowledge of different materials/components use in dialysis water distribution system and different methods use in loop disinfections.

• Reuse ofdialyzers, their preservation ,the artificial membranes used in hemodialysis and its biocompatibility.

• To be able to write a prescription, conduct and supervise acute and chronic peritoneal dialysis entails :

▪ To provide an understanding of the principles and practice of peritoneal dialysis including the indications, contraindications, complications, cost-effectiveness, and application of PD to patientcare,

▪ Writing orders for peritoneal dialysis which includes dialysis prescription (volume of dialysate, frequency of exchanges, and use of different hypertonic solutions, special precautions)

▪ Modifying dialysis prescription in special situations (acidosis, metabolic disorders, dyselectrolytemia) and inadequate clearance in chronic peritoneal dialysis patients,

▪ To provide a comprehensive and longitudinal clinical experience in the care of patients on peritoneal dialysis,

▪ Must know Peritoneal physiology, including the solute clearance and ultrafiltration.

▪ Assessing adequacy of PD and implications of adequacy related to patient morbidity and mortality, transporter status, peritoneal equilibration tests and its interpretations , residual renal function, ISPD /KDOQI standards; dialysis prescriptions and their modifications to achieve adequate dialysis

▪ The short and long-term complications of PD including the pathogenesis and prevention of complications including but not limited to: peritonitis, catheter infections/dysfunction, leaks, hernias, sclerosing peritonitis, nutritional and metabolic issues, hemoperitoneum etc.

▪ Placement and maintenance of appropriate acute and chronic PD catheter

▪ An understanding of the technology of PD including PD solutions, its composition, biocompatibility, side effects and use of automated cyclers (CCPD)

▪ Pharmacology of commonly used medications and their kinetic and dosage alteration with peritoneal dialysis; drug dosage modification during PD

- Understanding of the special nutritional requirements of patients undergoing PD; urea kinetics and protein catabolic rates in PD patients; nutritional management of PD patients
- Quality of life of patients on Dialysis; psychosocial and ethical issues in patients and their families.

- To be able to write a prescription, conduct and supervise continuous renal replacement therapy (CRRT)
- Entails knowledge of proper indications, principles, contraindication, complications and different modes of CRRT,
- Comprehensive knowledge about functioning of CRRT Machine and its component,
- Writing orders for continuous renal replacement therapy (flow rate of dialysate, choosing ultrafiltration rate, blood flow rate, replacement fluid flow rate, choosing dialysate composition including the use of bicarbonate based solutions, anticoagulation protocols ),
- Understanding and treatment of complications, and modifying dialysis prescription to achieve adequate clearance in patients undergoing continuous renal replacement therapy.
- Trainee should write and implement prescription of CRRT in critical ICU patient. He/She should be able to handle day to day running of CRRT therapies and troubleshooting required for smooth running of the therapy.
- To be able to write a prescription, conduct and supervise plasmapheresis
- Entails knowledge of proper indications, principle , different methods , contraindications , complications of plasmapheresis of plasmapheresis,
- Writing orders (volume of plasma replacement, choosing rate of plasmapheresis, monitoring, anticoagulation, appropriate replacement fluid ,choosing filter size)
- Understanding and treatment of complications, and modifying plasmapheresis prescription based on the goal of plasmapheresis
- Understanding different methods of therapeutic apheresis and immunoadsorption column, there use in different scenario including but not limited to the kidney transplant patient
- To be able to perform urine analysis at bedside and in lab
- To perform correctly urinalysis and interpret findings and to know the limitations of interpretation as applied to patient care.

Must be trained in Dialysis catheter insertion (Tunneled and non-tunneled Hemodialysis catheter), insertion of CAPD catheter (Both acute and long-term Peritoneal dialysis catheter), AVF creation and kidney biopsy.

Candidate should acquire skill to create or assist in creation of AV-Fistula. Satisfactory creation of Arterio-Venous fistula entails:

- Knowledge of indication, contraindication, appropriate case selection and complication associated with A-V fistula surgery.
- He/she should be trained in Pre-op vascular mapping, selection of AVF site, pre-operative orders, counseling and taking informed consent.
- Creation and assistance in creation of A-V fistula surgery itself with proper technics and asepsis.
- Post op identification and management of complications associated with AVF .
- Monitoring and surveillance of AVF in post op period and explaining hand grip exercises to the patient.
- He /she should able to prick the AV fistula when it is mature and successful do hemodialysis through it.

Candidate should be able to perform /assist/ observe and interpret various interventional and radiological methods needed for diagnosis and management of AVF dysfunction as well as central venous stenosis. This entails:

- Candidate should able to perform /assist/observe fistulogram.
- He /she should know indications/ interpretation of fistulogram and its use in clinical practice.
- Should able to read /interpret various imaging modalities like CT angiogram/aortogram, MR angiogram, venograms, doppler study and USG.
- He/She should able to use these modalities in clinical practice for management of vascular access dysfunction

Candidate should independently be able to put peritoneal dialysis catheter. Successful placement of peritoneal dialysis catheter entails

- Knowledge of indications, contraindications, complications and different techniques and types of PD catheters.

- Placement of both acute and long term peritoneal dialysis catheter with proper technics and asepsis
- Taking informed consent and patient counseling regarding procedure and associated complications.
- Knowledge of anatomy/physiology/pathology of peritoneal cavity and abdomen
- Preoperative orders, intraoperative and post operative management of patient
- Diagnosis and management of catheter dysfunction/malfunction, peritonitis and other catheter related complications.

Candidate should able to place vascular access catheter independently. Satisfactory placement of vascular access entails:

- Knowledge of indications, contraindications, different techniques, complications
- Taking informed consent and patient counseling regarding procedure and associate complications
- Performance of procedure itself with the use of proper technique and asepsis with or without the use of USG /Doppler,
- Knowledge of vascular anatomy and pathology,
- Placement of different catheters (tunneled/non tunneled) with different techniques (over the guide wire, using peel away sheath etc.) at different sites (Jugular, femoral, trans lumbar etc.).
- Use Ultrasound/Doppler for evaluation, monitoring, diagnosing complication and assistance during procedures
- Diagnosis and management of complications and successful use of catheter for dialysis

Candidate should acquire skill to do Kidney biopsy independently. Satisfactory performance of percutaneous biopsy of native and transplant kidneys entails:

- Knowledge of indications, complications, contraindication and techniques for the procedure,
- Obtaining informed consent and counseling of patient/family about procedure /complications,

- Performance of the procedure itself including minimizing patient discomfort with the use of ultrasonography ,
- Interpretation of results of the biopsy and application into clinical practice and
- Diagnosis, monitoring, management of post biopsy complications.

- Use of Ultrasonography in Nephrology practice including Point of Care Ultrasonography (POCUS) entails:

a. *Ultrasound physics and knobology*

- Ultrasound wave properties, transducer types
- Introduction to modes: B, M, color flow, power Doppler, spectral Doppler
- Image optimization: depth, zoom, gain, time gain compensation
- Image orientation: organ presets, standard conventions
- Basics of image interpretation: acoustic impedance, relative echogenicity of various tissues
- Common ultrasound artifacts, including acoustic shadowing, acoustic enhancement, mirror image, reverberation, ring-down, and twinkle artifacts

b. *Renal ultrasound*

- Technique: probe selection, positioning, and description of movements
- Organ anatomy: gross and sonographic correlation in long and short axes
- Kidney size and appearance: length, cortical and parenchymal thickness, cortical echogenicity
- Core pathologies: hydronephrosis, stone, cyst, mass, free fluid in hepatorenal and splenorenal recesses
- Less common abnormalities: infections, vascular malformations, congenital abnormalities, and anatomic variants

c. *Renal allograft and urinary bladder ultrasound*

- Technique: probe selection, positioning, and description of movements
- Allograft anatomy: expected differences compared with native kidney (*e.g.*, prominent collecting system), proximity to bladder and pelvic organs
- Allograft core pathologies: hydronephrosis, perinephric collections, basic evaluation of vascular anastomosis, and resistive index

- Urinary bladder anatomy: gross and sonographic correlation in long and short axes

- Bladder volume calculation, urinary retention, Foley catheter malposition, differentiating pelvic ascites from urine, prostatomegaly

d. *Lung ultrasound*

- Technique: probe selection, positioning, and description of movements

- Sonographic zones of evaluation: rationale behind the existence of multiple scanning systems, correlation between various techniques

- A and B lines: physics underlying artifact generation, *i.e.*, reverberations and ring-down, cardiogenic versus pneumogenic B lines
- Pleural effusion: simple effusion, spine sign, recognition of complex/exudative effusions

- Consolidations: differentiating lobar pneumonia and atelectasis, static and dynamic air bronchograms, subpleural consolidations

e. *Focused cardiac ultrasound*

- Rationale and limitations

- Technique: probe and preset selection, probe positioning to acquire basic cardiac views namely, parasternal long axis, parasternal short axis, apical 4 and 5 chamber, subxiphoid 4 chamber, and inferior vena cava

- Utility of M-mode and color Doppler

- Cardiac anatomy: gross and sonographic correlation of the basic views

- Evaluation of 5 Es: ejection (left and right ventricular systolic function including M-mode parameters), effusion (pericardial effusion from different windows, quantification), equality (identification of gross alterations in cardiac chamber size), entrance (estimation of right atrial pressure using inferior vena cava), and exit (evaluation of the aortic root in a patient who is hemodynamically unstable)
- Pitfalls of isolated inferior vena cava ultrasound

f. *Integrative assessment of fluid volume status*

- Rationale behind using multiorgan POCUS for objective evaluation of fluid status

- Patient studies illustrating the role of integrating findings from focused cardiac ultrasound, lung ultrasound, and limited abdomen to assess fluid status
- Limitations of basic POCUS and introduction to hemodynamic assessment using Doppler ultrasound

g. *Sonographic evaluation of the dialysis access*

- Principles of spectral Doppler focusing on pulsed wave Doppler, scale adjustment, aliasing, angle correction
- Anatomy of vascular access: gross and sonographic correlation in long and short axes
- Technique: probe selection, measurement of depth, diameter, volume flow
- Core pathologies: pseudoaneurysm, hematoma, thrombosis, narrowing and turbulent flow; assessment of maturity of a newly placed access. Detailed assessment of stenosis/vein mapping is beyond the scope of POCUS
- Peritoneal dialysis access: abdominal wall anatomy, sonographic appearance of normal catheter and cuff, tunnel infection, abscess, pericatheter leaks

h. *Limited Doppler echocardiography*

- Principles of cardiac Doppler: continuous and pulsed wave Doppler, tissue velocity imaging
- Technique: appropriate cardiac view and correct placement of Doppler gate and/or cursor to obtain the chosen parameter
- Doppler parameters: left ventricular outflow tract velocity time integral, cardiac output, right ventricular outflow tract velocity time integral and waveform assessment, pulmonary artery systolic pressure, mitral inflow Doppler including E/A ratio, E-wave deceleration time, mitral annular E', tricuspid annular S'

i. *Quantification of venous congestion using Doppler ultrasound*

- • Rationale behind venous congestion assessment, effect of fluid overload on downstream organs, overview of venous excess Doppler ultrasound (VExUS)
- • Technique: probe selection, preset, positioning, standard, and alternative imaging windows
- • Components of VExUS:

- o. Hepatic vein waveform: genesis, nomenclature of normal waves, transformation with increasing right atrial pressure, pitfalls, utility of simultaneous electrocardiographic trace
- o. Portal vein waveform: normal appearance, transformation with increasing right atrial pressure, pitfalls
- o. Renal parenchymal vessels waveform: normal appearance, transformation with increasing right atrial pressure, pitfalls

- • Three to four patient studies illustrating the role of integrating findings from Doppler echocardiography, VExUS, and lung ultrasound

j. *Ultrasound-guided procedures and others*

- Temporary hemodialysis catheter placement: probe selection, vessel selection, visualization of the needle tip, technique of catheter insertion, confirmation of correct placement by cardiac ultrasound (rapid atrial swirl sign)

- Renal biopsy (native and transplant): probe selection, site selection, visualization of the renal cortex, vasculature, needle tip and surrounding anatomy (*e.g.*, bowel loop interference in the case of allograft), evaluation of postbiopsy hematoma/Doppler signs of active bleeding along the needle track
- Others: brief overview of ocular, soft tissue, musculoskeletal ultrasound pertinent to nephrology including evaluation of papilledema, cellulitis/abscess, deep vein thrombosis, and crystalline arthropathies

- He/She should have knowledge of indications/ principles /interpretations of common urological procedures like cystoscopy, placement of percutaneous nephrotomy/nephrolithotomy, DJ-stenting, uroflowmetry/urodynamic studies, MCU/RGU etc.
- Candidate expected to assist/observe/perform these urological procedure and interpret there results in day to day clinical practice.
- The candidate would maintain record of all the procedures/ interventions in a log book, which would be certified by the Head of the department. A proficiency certificate from the head of the department regarding the clinical competence and skillful performance of procedures by the candidate will be necessary before he would be allowed to appear in the examination.

## 9.3 Transplantation

Successful training in kidney transplantation entails:

- Knowledge of indications for kidney transplantation, criteria for selection of donors and recipients, understanding of the risks and benefits of renal transplant,
- Candidate must be well aware of transplant laws/guidelines in India and international level. He/She must know the medicolegal aspects of kidney transplantation,
- He/she must have the knowledge about functioning of various government and non-government organizations working for transplantation like National Organ and Tissue Transplant Organization (NOTTO), Regional Organ and Tissue Transplant Organization (ROTTO), State Organ and Tissue Transplant Organization (SOTTO) and Zonal Transplant Coordination Center (ZTCC),
- Candidate will have to work with transplant coordinator for transplant related work up both for live and deceased donortransplantation,
- Candidate should be able to do workup of kidney donors and recipient and prepare recipient for renal transplantation, manage them postoperatively in the immediate and long-term follow-up,
- They should able to do organ perfusion and intraoperative monitoring of both donor and recipient.
- He/She should observe the transplant surgery, know the basic principle, surgical steps, surgical anatomy and intra op and immediate post-operative complications,
- They will have to maintain waiting list for the recipient for live and cadaveric kidney transplant,
- Understand management plans, such as treatment of rejection, adjustment of immunosuppressive medications and diagnostic procedures,
- Formulate and execute a plan to diagnose allograft dysfunction in the immediate and late post-transplant period. Medical management of rejection: use of plasmapheresis and immunemodulating treatment,
- Clinical and laboratory diagnosis of cellular and antibody mediated rejection, use of renalbiopsy and immunohistochemistry,
- Performance of graft kidney biopsies and its interpretation. Long-term follow-up of transplant patients: management of hypertension, bone disease,

dyslipidemias, screening for malignancy and infectious diseases.

- Principles of tissue typing and management of living donor transplants with a positive crossmatch .Visit the tissue typing laboratory to gain an insight into practical aspects of transplant immunology.
- Should be able to know the principles, interpretation, application in practical scenario of various immunological test , genetic test , cross match , tissue typing and ABO antibody titration methods related to transplantation.
- Learn basic principles of pharmacology and the mechanisms of action of immunosuppressant agents, including glucocorticoids, azathioprine, mycophenolate mofetil, cyclosporine, tacrolimus, sirolimus and monoclonal and polyclonal antibodies. Learn principles of pharmacology of immunosuppressive medications used in transplant and medications used for the prophylaxis of infection and the treatment of concurrent illnesses, with an emphasis on anticipating and managing drug interactions
- Should able to perform/ manage/observe special transplant situations like ABO incompatible transplant, pediatric kidney transplant, repeat kidney transplant, immunologically high risk transplant and multiorgan transplantation like combined liver kidney transplant.

### 9.4 Critical Care Nephrology

- Management of critically ill nephrology patient and patient from other specialty having kidney related issues (both adult and pediatric),
- It includes management of fluids, electrolyte and acid base abnormalities of patient in ICU,
- Planning, implementations and monitoring of various therapies required for critical patients (including children) admitted in ICU like SLEDD, CRRT, Plasmapheresis and peritoneal dialysis.
- Principles and management of non-invasive and invasive mechanical ventilation
- Trainee should know the working /functioning, various modes, settings in different conditions of mechanical ventilator.
- He/she should be trained in basic life support (BLS) and advanced cardiovascular life support (ACLS) . Candidate should participate in institutional level training program.
- Management of multiorgan failure patient with organ support system

### 9.5 Research/Elective posting

- During this period, the candidate will complete his on-going research projects and would alsofamiliarize himself/herself with research methodologies
- Candidates will be required to attend the courses on Bio-statistics/biomedical research (online/offline /institutional level)
- Use of Computers and online resources in Medicine
- Bio ethics, ethical issues in transplantation and nephrology including "Human Organ Transplant Act"
- Each candidate will be required to undertake research under the guidance of the faculty in charge and they will be required to submit a research plan within 6 months
- In addition, the candidate will participate in all the departmental research activities and various ongoing trials.
- Candidate can be posted to any other elective or allied posting in this period as per the directive of head of the department
- Candidate will be required to do minimum one scientific research paper OR poster presentation at an international/national/state/zonal/regional conference / scientific society meetings.
- Candidate will be required to do minimum one scientific research paper – for publication/ accepted for publication / sent for publication in a peer-reviewed indexed scientific journal.

### 9.6 Lab Medicine and allied posting

Candidate must know the basic principles, indications, procedure/techniques, interpretations and use in day-to-day clinical practice of various laboratory and imaging test including but not limited to

Biochemistry/pathology : He/she must familiarize himself/herself with the following investigations:

- Routine urine examination
- Proteinuria /albuminuria quantification
- Electrolyte and acid base analysis

- Renal function tests
- Auto analyzer functioning
- Liver functioning test
- Complete and differential blood count , peripheral smear , RBC indices reticulocyte count
- Iron studies
- Immunosuppression drug levels
- Electrolyte and acid base analysis

Radiology: Candidate must be acquainted with;

- Ultrasonography
- Intravenous urography
- Micturating cystourethrography
- Digital subtraction angiography
- Selective renal angiography and interventional angioplasty and stenting
- Selective renal venography
- Doppler studies
- Antegrade and retrograde pyelography
- CT imaging
- Magnetic resonance imaging

**Pathology:**

- Become familiar with the preparation of renal biopsy specimens, type of solutions/media used for light (LM), immunofluorescence (IF), and electron microscopy (EM)
- Explain the uses and advantages of specific stains to include hematoxylin and eosin, periodic acidSchiff, Trichrome (Masson), silver-stains, elastin stain, Congo red, methyl violet, thioflavin T, Immunoperoxidase staining.
- Recognize the histopathologic characteristics of normal kidney on LM, IF, and EM.

- Recognize the histopathologic characteristics of the variety of glomerular, tubular, microvascular andinterstitial disease (as outlined in the curriculum). In renal transplant biopsies, an understanding of acute rejection, chronic allograft nephropathy, drug toxicity, infections and thrombotic microangiopathy on LM, IF, and EM (using a combination of actual cases and teaching slides)

**Nuclear Medicine:**

- Various renal isotope imaging and functional techniques, DTPA, DMSA ,
- Urodynamic studies
- Renal plasma flow, GFR

**Microbiology:**

- Viral, Bacterial and fungal cultures, Serological and PCR/ELISA techniques, HIV,HCV, HBV,CMV, BK viral load ,

Immunological/genetic tests:

- ANCA, ANA, Anti dsDNA, complement, Anti GBM antibody, Cryoglobulin, Immuno-electrophoresis, flowcytometric test, ANA immunoblot, Anti-phospholipid antibody, anti PLA2R antibody, test to detect compliment pathways abnormality like anti factor H, MLPA, clinical exon sequencing, FISH, free light chain assay and other myeloma work up panel,

Tissue typing:

- Cross match, serological typing, molecular HLA typing, PRA, DSA, flow cytometry, single antigen beads

## 10 ACADEMIC ACTIVITY:

| Academic Activity | Frequency |
|---|---|
| Clinical case presentation (Long and short) | Once a Month |
| Seminar | Once in a week |
| Journal club | Once in a month |
| Departmental dialysis meet | Once a month |
| Transplant meet | As per cases scheduled |
| Nephro-patho (Histopathology) meet | Once in month |
| Nephro-Radio /Nuclear Medicine Meet | Once in three months |
| Nephro- Uro meet | Once a month |
| Mortality/ audit /Data meeting | Once in 3 months |
| Institutional level CME | As per the institute's schedule |
| Research Project Progress Report | Once in 6 month |

## 11 LOG BOOK

The DM Nephrology student shall maintain a log book of the work carried out by them and the training program undergone during the period of training including details of procedures assisted or done independently by the trainees. The log book shall be checked and assessed periodically by the faculty members imparting the training. Maintenance of performance record in log book is mandatory. Certified and assessed copy should be made available at the time of practical examination for review by examiners.

## 12 DISSERTATION:

The postgraduate dissertation will orient the student to the principles of research methodology, will instill an element of inquiry, with development of a research aptitude.

| Activity | January admission | July admission |
|---|---|---|
| Selection of topic in consultation with PG Guide | March / April | September / October |
| Approval by Department PG Committee | | |
| Institute Scientific Committee approval | May / June | November / December |
| Institute Ethics Committee approval | | |
| Final approval letter by Academics Section | 30th June | 31st December |
| Final submission to academic section | 30th June (Third Year) | 31st December (Third Year) |

## 13 ASSESSMENT

### A. INTERNAL ASSESSMENT (FORMATIVE ASSESSMENT)

During the training includes:

1. Evaluation of clinical skills, academic performance and personal attributes will be an ongoing process. Periodic formative assessment will be done every 6 months and feedback will be given to trainee.
2. The academic presentations shall be graded at the time of presentation by the faculty in-charge/HOD.
3. Systematic theory and practical assessment will be done at the end of each year.

### A 1. Six monthly Progress Report

The progress of the PG student will be monitored with the help of a six monthly structured 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.

Timing for six monthly evaluation:

| Report | July Session | | January session | |
|---|---|---|---|---|
| | Period | To be submitted | Period | To be submitted |
| **First** | July to December | 7th January | January to June | 7th July |
| **Second** | January to June | 7th July | July to December | 7th January |
| **Third** | July to December | 7th January | January to June | 7th July |
| **Fourth** | January to June | 7th July | July to December | 7th January |
| **Fifth** | July to December | 7th January | January to June | 7th July |
| **Sixth** | January to June | 10th June | July to December | 10th December |

**A 2. Formative Assessment (600 Theory + 600 Practical = Total 1200 Marks)**

**Theory (600 Marks)**

| S.N. | Schedule | Marks | Pattern and Marks Distribution |
|---|---|---|---|
| 1. | At end of First year | 100 (1 Paper) | 10 Short Questions x 10 Marks each (Total Duration 3 hrs.) |
| 2. | At end of Second year | 100 (1 Paper) | 10 Short Questions x 10 Marks each (Total Duration 3 hrs.) |
| 3. | Pre-professional | 400 (4 Papers of 100 marks each) | As per Final Professional Examination |
| | Total | 600 Marks | |

**Practical (600 Marks)**

| S.N. | Schedule | Marks | Pattern and Marks Distribution |
|---|---|---|---|
| 1. | At end of First year | 100 | 2 Cases x 25 Marks each (Total 50 marks),<br>25 for Histopathology/Radiology,<br>25 for viva voce |
| 2. | At end of Second year | 100 | |
| 3. | Pre-professional | 400 (Practical 200 + Ward rounds 100+Viva 100) | As per Final Professional Examination |
| | Total | 600 marks | |

**Eligibility for Professional/Summative assessment:**

1. Candidate should secure a minimum of 50% marks in Theory and Practical separately in formative assessments, in order to be eligible to appear for Professional Examination
2. At least four out of six-monthly progress report should be satisfactory
3. Minimum 80% attendance in each year of training.
4. Acceptance of Dissertation is mandatory
5. Successful completion of Research Methodology program at induction
6. Minimum one scientific paper OR poster presentation at an international/national/state/zonal/regional conference / scientific society meetings.
7. Minimum one scientific research paper – for publication/ accepted for publication / sent for publication in a peer-reviewed indexed scientific journal.

## B. SUMMATIVE ASSESSMENT/FINAL PROFESSIONAL ASSESSMENT

at the end of the training will be as follows:

| | | |
|---|---|---|
| **1** | **Theory** | **4 Papers each of 100 marks = 400 marks** |
| **2** | **Practical** | **Clinical Cases +Ward Round+ Viva = 400 marks** |

The DM (Nephrology) examination shall be in two parts:

**B.1 Theory:**

There shall be 4 papers; each of 3 hours duration carrying 100 marks each.

Each paper shall consist of ten short questions for 10 marks each

| **Paper** | **Title** | **Marks** | **Marks Distribution** |
|---|---|---|---|
| Paper I | Basic Sciences as applied to the subject of Nephrology and Allied subjects | 100 | Short Answer Question marks : 10 X 10 =100 |
| Paper II: | Clinical Nephrology | 100 | |
| Paper III | Dialysis and Transplantations | 100 | |
| Paper IV | Recent Advances in Nephrology | 100 | |
| | Total | 400 | |

**B.2 Practical: The practical examination should consist of the following**

| | Subjects | Content | Marks Distribution | Total Marks |
|---|---|---|---|---|
| A. | One long and Two short Clinical Cases from various sections of Nephrology | History taking, physical examination, interpretation of clinical findings, differential diagnosis, investigations, prognosis and management. | - 100 x 1(Long Case)<br>- 50x 2 (Short Cases) | 200 |
| B | Ward rounds | Discussion of practical problems in the management of nephrology patients, communication skills and consent. | 25x4 | 100 |
| B | Viva-voce examination | 1.Histopathology, microscopy, investigations and instruments<br>2.Radiology, imaging, and nuclear medicine<br>3. Viva on various topics related to Nephrology and recent advance<br>4. Research methodology, thesis, logbook evaluation and medical ethics. | 25 x 4 | 100 |
| | | | Total | 400 |

**Note:**

**(A) Minimum 40% marks in each paper and aggregate of 50% marks in order to be declared pass in theory exam**

**(B) Minimum 50% marks required in Theory & Practical separately, in order to be declared successful in summative exam**

## 14 RECOMMENDED READING /LEARNING RESOURCES:

Trainee should make the use of learning resources in both offline and online mode including but not limited to the list given below.

**Recommended Books**

1. Brenner and Rectors The Kidney.
2. Oxford Textbook of Clinical Nephrology.
3. Schrier's Diseases of the Kidney.
4. Comprehensive Clinical Nephrology
5. Handbook of Dialysis by John T. Daugirdas.
6. Handbook of Kidney Transplantation by Dr. Gabriel M. Danovitch MD.
7. Kidney Transplantation - Principles and Practice by Peter Morris.
8. Nolph and Gokal's Textbook of Peritoneal Dialysis.
9. Heptinstall's Pathology of the Kidney.
10. Acid-Base and Electrolytes disorders Burton D Rose.
11. Harrison's Principles of Internal Medicine
12. Textbook of Paediatric Nephrology
13. Textbook of Intervention Nephrology
14. Critical Care Nephrology

**Recommended Journals**

**National**

1. Indian Journal of Nephrology (IJN)
2. Indian Journal of Transplant (IJT).
3. Indian Journal of Peritoneal Dialysis (IJPD).
4. Journal of Nephrology Society (JONS)

**International**

1. Kidney International (KI)
2. American Journal of Kidney Disease (AJKD)
3. Nephrology Dialysis and Transplantation (NDT)

| | |
|---|---|
| 4. | Journal of American Society of Nephrology (JASN) |
| 5. | Clinical Journal of American Society of Nephrology (CJASN) |
| 6. | Transplantation |
| 7. | Saudi Journal of kidney Diseases and Transplantation (SJKDT) |
| 8. | New England Journal of Medicine (NEJM) |
| 9. | Seminars in nephrology |
| 10. | Seminars in dialysis |
| 11. | Nature Reviews Nephrology |
| 12. | The Lancet |
| **Society Guidelines /Learning resources** | |
| 1. | International Society of Nephrology (ISN) |
| 2. | The Transplantation Society (TTS) |
| 3. | American Society of Nephrology (ASN) |
| 4. | European Renal Association (ERA) |
| 5. | European Dialysis and Transplant Association (EDTA) |
| 6. | International Society of Peritoneal Dialysis (ISPD) |
| 7. | Indian Society of Nephrology (ISN,India) & its various zones |
| 8. | Indian Society of Organ Transplant (ISOT) |
| 9. | Peritoneal Dialysis Society Of India (PDSI) |
| 10. | The Nephrology Society |
| Online Learning Materials (Websites and Programme) | |
| 1. | https://www.uptodate.com/contents/search |
| 2. | https://notto.gov.in/ |
| 3. | https://rottosottokem.in/ |
| 4. | ZTCC,Nagpur |
| 5. | https://twitter.com/NephJC |
| 6. | https://www.kidney.org/ |
| 7. | https://www.theisn.org/in-action/education/ |
| 8. | https://kidneyeducation.com/ |
| 9. | NephroPOCUS.com |