CURRICULUM/STATUTES & REGULATIONS

FOR
5 YEARS DEGREE PROGRAMME
IN
NEPHROLOGY
(MD NEPHROLOGY)

UNIVERSITY OF HEALTH SCIENCES, LAHORE

STATUTES

1. Nomenclature Of The Proposed Course

The name of degree programme shall be MD Nephrology. This name is well recognized and established for the last many decades worldwide.

2. Course Title:

MD Nephrology

3. Training Centers

Departments of Nephrology (accredited by UHS) in affiliated institutes of University of Health Sciences Lahore.

4. Duration of Course

The duration of MD Nephrology course shall be five (5) years (first year in Part I, first two years in Part II and next three years in Part III) with structured training in a recognized department under the guidance of an approved supervisor.

The course is structured in three parts:

Part I is structured for the 1st calendar year. The candidate shall undertake didactic training in Basic Medical Sciences, Behavioural Sciences and Biostatistics & Research Methodology. At the end of first year the examination shall be held in Basic Medical Sciences. The clinical training in fundamental concepts of Internal Medicine shall start from the 1st day of enrollment.

Part II is structured for the 1st and 2nd calendar years. The candidate shall undertake clinical training in fundamental concepts of Internal Medicine. At the end of 2nd year, the examination shall be held in fundamental concepts of Internal Medicine. The clinical training in Nephrology shall start from 3rd year onwards in the in recognized institutions.

Part III is structured for 3rd, 4th and 5th calendar years in MD Nephrology. The candidate shall undergo training to achieve educational objectives of MD Nephrology (knowledge & skills) along with rotation in relevant fields. Over the five years duration of the course, candidate will spend total time equivalent to

one calendar year for research during the training. Research can be done as one block in 5th year of training or it can be done in the form of regular periodic rotations over five years as long as total research time is equivalent to one calendar year.

5. Admission Criteria

1. For admission in MD Nephrology course, the candidate shall be required to have:
    - MBBS degree
    - Completed one year House Job
    - One year experience in Nephrology/Internal Medicine/Allied medical discipline in the given order of preference
    - Registration with PMDC
    - Passed Entry Test conducted by the University & aptitude interview by the Institute concerned
    - Having up to the mark credentials as per UHS rules (no. of attempts in each professional, any gold medals or distinctions, relevant work experience, Rural/ Army services, research experience in a recognized institution, any research article published in a National or International Journal) may also be considered on case to case basis.

2. Exemptions: A candidate holding FCPS/MRCP/Diplomate American Board/equivalent qualification in Internal Medicine shall be exempted from Part-I & Part-II Examinations and shall be directly admitted to Part-III Examinations, subject to fulfillment of requirements for the examination.

6. Registration and Enrollment

- Total number of students enrolled for the course must not exceed 2 per supervisor/year.

- The maximum number of trainees that can be attached with a supervisor at a given point of time (inclusive of trainees in all years/phases of MD training), must not exceed 6.
- Beds to trainee ratio at the approved teaching site shall be at least 5 beds per trainee.
- The University will approve supervisors for MD courses.
- Candidates selected for the courses after their enrollment at the relevant institutions shall be registered with UHS as per prescribed Registration Regulations.

7. *Accreditation Related Issues of the Institution*

1.Faculty

Properly qualified teaching staff in accordance with the requirements of Pakistan Medical and Dental Council (PMDC)

2.Adequate Space

Including class-rooms (with audiovisual aids), demonstration rooms, computer lab and clinical pathology lab etc.

3. Library

Departmental library should have latest editions of recommended books, reference books and latest journals (National and International).

- Accreditation of Nephrology training program can be suspended on temporary or permanent basis by the University, if the program does not comply with requirements for residents training as laid out in this curriculum.
- Program should be presented to the University along with a plan for implementation of curriculum for training of residents.
- Programs should have documentation of residents training activities and evaluation on monthly basis.
- To ensure a uniform and standardized quality of training and availability of the training facilities, the University reserves the right to make surprise visits of the training program for monitoring purposes and may take appropriate action if deemed necessary.

AIMS AND OBJECTIVES OF THE COURSE

AIM

The aim of five years MD programme in Nephrology is to train residents to acquire the competency of a specialist in the field of Nephrology so that they can become good teachers, researchers and clinicians in their specialty after completion of their training.

GENERAL OBJECTIVES

MD Nephrology training should enable a student to:

Access and apply relevant knowledge to clinical practice:

- Maintain currency of knowledge
- Apply scientific knowledge in practice
- Appropriate to patient need and context
- Critically evaluate new technology

- Safely and effectively performs appropriate clinical skills & procedures:
  - Consistently demonstrate sound clinical skills
  - Demonstrate procedural knowledge and technical skill at a level appropriate to the level of training
  - Demonstrate manual dexterity required to carry out procedures
  - Adapt their skills in the context of each patient and procedure
  - Maintain and acquire new skills
  - Approach and carries out procedures with due attention to safety of patient, self and others
  - Critically analyze their own clinical performance for continuous improvement
- Design and implement effective management plans:
  - Recognize the clinical features, accurately diagnose and manage nephrological problems
  - Formulate a well-reasoned provisional diagnosis and management plan based on a thorough history and examination
  - Formulate a differential diagnosis based on investigative findings
  - Manage patients in ways that demonstrate sensitivity to their physical, social, cultural and psychological needs

- Recognize disorders of the Nephrological system and differentiate those amenable to medical treatment
- Effectively recognize and manage complications
- Accurately identify the benefits, risks and mechanisms of action of current and evolving treatment modalities
- Indicate alternatives in the process of interpreting investigations and in decision-making
- Manage complexity and uncertainty
- Consider all issues relevant to the patient
- Identify risk
- Assess and implement a risk management plan
- Critically evaluate and integrate new technologies and techniques.

- Organize diagnostic testing, imaging and consultation as needed:
  - Select medically appropriate investigative tools and monitoring techniques in a cost-effective and useful manner
  - Appraise and interpret appropriate diagnostic imaging and investigations according to patients' needs
  - Critically evaluates the advantages and disadvantages of different investigative modalities
- Communicate effectively:
  - Communicate appropriate information to patients (and their family) about procedures, potentialities and risks associated, in ways that encourage their participation in informed decision making
  - Communicate with the patient (and their family) the treatment options including benefits and risks of each
  - Communicate with and co-ordinate health management teams to achieve an optimal patient management
  - Initiate the resolution of misunderstandings or disputes
  - Modify communication to accommodate cultural and linguistic sensitivities of the patient
- Recognize the value of knowledge and research and its application to clinical practice:
  - Assume responsibility for self-directed learning

- Critically appraise new trends in Nephrology
- Facilitate the learning of others

- Appreciate ethical issues associated with Nephrology:
  - Consistently apply ethical principles
  - Identify ethical expectations that impact on medico-legal issues
  - Recognize the current legal aspects of informed consent and confidentiality
  - Be accountable for the management of their patients.
- Professionalism by:
  - Employing a critically reflective approach to Nephrology
  - Adhering with current regulations concerning workplace harassment
  - Regularly carrying out self and peer reviewed audit
  - Acknowledging and have insight into their own limitations
  - Acknowledging and learning from mistakes
- Work in collaboration with members of an interdisciplinary team where appropriate:
  - Collaborate with other professionals in the selection and use of various types of treatments assessing and weighing the indications and contraindications associated with each type
  - Develop a care plan for a patient in collaboration with members of an interdisciplinary team
  - Employ a consultative approach with colleagues and other professionals
  - Recognize the need to refer patients to other professionals.
- Management and Leadership
  - Effective use of resources to balance patient care and system resources
  - Identify and differentiate between system resources and patient needs
  - Prioritize needs and demands dealing with limited system resources.
  - Manage and lead clinical teams
  - Recognize the importance of different types of expertise which contribute to the effective functioning of clinical team
  - Maintain clinically relevant and accurate contemporaneous records
- Health advocacy:
  - Promote health maintenance of patients
  - Advocate for appropriate health resource allocation

SPECIFIC LEARNING OUTCOMES

Residents completing MD Nephrology training will have formal instruction, clinical experience, and will be able to demonstrate competence in the evaluation and management of adult and paediatric patients and applying scientific principles for the identification, prevention, treatment and rehabilitation of following acute and chronic disorders in Nephrology. Pathophysiology, pathology, natural history and management of glomerular, tubulo-intestitial and vascular diseases of the kidney. The candidate should be familiar with both primary renal diseases and those which occur in the context of systemic disorders such as diabetes mellitus, connective tissue disease, infectious diseases, haematological diseases, as well as other metabolic infiltrative and inflammatory diseases and also in the context of diseases in remote organ systems such as heart failure and hepato-renal syndrome. The diseases unique to our region or which occur predominantly in a third world setting should be appreciated and understood.

- The diagnosis, differential diagnosis, investigation and management of acute renal failure and its complications.
- The diagnosis, differential diagnosis, investigation and management of chronic renal failure and its complications.
- The physiology of, indications for, complications of, the various forms of haemodialysis and peritoneal dialysis. Experience with the management of patients on acute and chronic dialysis.
- The diagnosis, physiology, pathophysiology and therapy of disorders of water, sodium, potassium and acid-base regulation.
- The diagnosis, pathophysiology and therapy of disorders of calcium, phosphorus and magnesium balance.
- Renal pharmacology including the effect of disturbances in renal function of the use of common drugs, the effects of various drugs and therapeutic procedures on the kidney, toxicology, the use of dialysis in the treatment of overdoses and poisoning.
- The diagnosis, differential diagnosis and therapy of all forms of hypertension, including complications of anti-hypertensive medications.
- Pathogenesis and management of renal stone formation and urinary tract infection.
- The diagnosis, investigation, medical management of urinary tract obstruction.
- The principles of immunology involved in the mechanisms of renal disease.
- The management of renal transplant, including understanding of the donor and the recipient's selection, histocompatibility typing, mechanisms of rejection and management of immunosuppression and its complications.
- Genetics, cell biology and molecular medicine as applicable to renal disease.
- Ethical issues related to the practice of renal medicine in South Africa and the African continent.

- Additional skills
- Candidates would be expected to develop the following skills:
- Urinalysis including examination of the urine sediment.

- The performance and interpretation of the renal function tests.
- Interpretation of radiological, radio-isotopic and ultrasound examination of the urinary tract.
- Performance of renal biopsies, including indications, preparation and complications.
- Interpretation of basic renal histopathology.
- The ability to establish access for acute dialysis.
- Critical appraisal of scientific publications, including basic research, pertinent nephrology.
- Manage other staff working in a renal unit in a team fashion.
- Basic administrative skill required in the management of dialysis unit and renal patients.
- Be able to do basic costing and cost analysis in the treatment of patients with renal disease.
- Be able to identify the problems unique to practicing renal medicine in a developing country.
- Understand the principles of scientific research and be able to write a basic research protocol, as well as be able to conduct a scientific study.
- Active participation in relevant:
    - Congresses
    - Organized CME's
    - Academic meetings
    - Research programmes

REGULATIONS

1. Scheme of the Course

A summary of five years course in MD Nephrology is presented as under:

Course Structure	Components	Examination
Part I	• **Basic medical sciences** Anatomy, Physiology, Biochemistry, Pathology, Pharmacology, Behavioural Sciences and Biostatistics & Research Methodology.	Part-I examination at the end of 1st year of MD Nephrology programme. • **Written:** Paper I: MCQs Paper II: SEQs
Part-II	• **Fundamental Concepts in Internal Medicine**: Training in clinical techniques of Internal Medicine with compulsory rotations for two years starting from the first day of enrollment	Part-II examination at the end of 2nd year of MD Nephrology programme. • **Written:** Papers 1 & 2: Problem-based questions in Internal Medicine • **Oral & Practical/ Clinical Examination** • OSCE • Clinical Examination (Long case, Short cases) • **Log Book**
Part-III	**<u>Clinical component of Part III</u>** • **Professional Education in Nephrology** Training in Nephrology during 3rd, 4th and 5th years of MD programme Three years of training with compulsory/ optional rotations in related fields **<u>Research component of Part III</u>** • **Research and Thesis Writing:** Research work/Thesis writing project must be completed and thesis be submitted before the end of training.	Part-III examination in specialized components of Nephrology at the end of 5th year of MD programme • **Written:** Paper 1 & 2: Problem-based questions in the subject • **Oral & Practical / Clinical Examination** • OSCE • Clinical Examination (Long case, Short cases) • **Log Book** Part-III thesis examination with defence at the end of fifth (5th) year of MD Nephrology programme.

2. Examinations

Part-I Examination

1. All candidates admitted in MD Nephrology courses shall appear in Part-I examination at the end of 1st calendar year.
2. The examination shall be held on biannual basis.
3. The candidate who fails to pass the examination in 3 consecutive attempts, availed or un-availed, shall be dropped from the course.
4. The examination shall have two components:

Paper-I MCQs (single best)	100 Marks
Paper-II SEQs	100 Marks

5. Subjects to be examined shall be Basic Sciences relevant to Nephrology (Anatomy, Physiology, Biochemistry, General Pathology, Pharmacology), Behavioural Sciences and Biostatistics & Research Methodology.
6. To be eligible to appear in Part-I examination the candidate must submit;
    i. duly filled, prescribed Admission Form to the Controller of Examinations duly recommended by the Principal/Head of the Institution in which he/she is enrolled;
    ii. a certificate by the Principal/Head of the Institution, that the candidate has attended at least 75% of the lectures, seminars, practical/clinical demonstrations;
    iii. Examination fee as prescribed by the University
7. To be declared successful in Part-I examination the candidate must secure 60% marks in each paper.

Part-II Examination

1. All candidates admitted in MD Nephrology course shall appear in Part-II examination at the end of 2nd calendar year, and having passed part I examination.
2. The examination shall be held on biannual basis.
3. The candidate who fails to pass the examination within 3 years of passing the Part-I examination shall be dropped from the course.
4. The examination shall have the following components:
    a. Written 200 Marks
    b. OSCE 50 Marks
    c. Clinical examination 100 Marks
    d. Log Book Evaluation 80 Marks (40 marks per year)
5. There shall be two written papers of 100 marks each:
   Paper 1 & 2: Principles of Internal Medicine
6. The types of questions shall be of Short/Modified essay type and MCQs (single best).
7. Oral & practical/clinical examination shall be held in clinical techniques in Internal Medicine.
8. To be declared successful in Part-II examination the candidate must secure 60% marks in each component and 50% in each sub-component.
9. Only those candidates, who pass in theory papers, will be eligible to appear in the Oral & Practical/clinical Examination.
10. The candidates, who have passed written examination but failed in oral & practical/ clinical examination, will re-appear only in oral & practical/clinical examination.
11. The maximum number of attempts to re-appear in oral & practical /clinical Examination alone shall be three, after which the candidate shall have to appear in both written and oral & practical/clinical examinations as a whole.
12. To be eligible to appear in Part-II examination the candidate must submit;

i. duly filled, prescribed Admission Form to the Controller of Examinations duly recommended by the Principal/Head of the Institution in which he/she is enrolled;
ii. a certificate by the Principal/Head of the Institution, that the candidate has attended at least 75% of the lectures, seminars, practical/clinical demonstrations;
iii. a certificate of having passed the Part-I examination;
iv. Examination fee as prescribed by the University.

Part-III Examination

1. All candidates admitted in MD Nephrology course shall appear in Part-III (clinical) examination at the end of structured training programme (end of 5th calendar year), and having passed the part I & II examinations. However, a candidate holding FCPS / MRCP / Diplomate American Board/equivalent qualification in Internal Medicine shall be exempted from Part-I & Part-II Examinations and shall be directly admitted to Part-III Examinations, subject to fulfillment of requirements for the examination.
2. The examination shall be held on biannual basis.
3. To be eligible to appear in Part-III examination the candidate must submit;
    i. duly filled, prescribed Admission Form to the Controller of Examinations duly recommended by the Principal/Head of the Institution in which he/she is enrolled;
    ii. a certificate by the Principal/Head of the Institution, that the candidate has attended at least 75% of the lectures, seminars, practical/clinical demonstrations;
    iii. Original Log Book complete in all respect and duly signed by the Supervisor (for Oral & practical/clinical Examination);
    iv. certificates of having passed the Part-I & part-II examinations;
    v. Examination fee as prescribed by the University.
4. The Part-III clinical examination shall have the following components:

▪ Written	300 marks
▪ Oral & practical/clinical examination	300 marks
▪ Log Book Evaluation	120 marks (40 marks per year)

5. There shall be two written papers of 150 marks each.
6. Both papers shall have problem-based Short/Modified essay questions and MCQs.
7. Oral & practical/clinical examination shall have 300 marks for:

i.	1 Long Case	100
ii.	4 Short Cases	100(25 marks each)
iii.	OSCE	100

8. To be declared successful in Part-III examination the candidate must secure 60% marks in each component and 50% in each sub-component.

9. Only those candidates, who pass in theory papers, will be eligible to appear in the Oral & Practical/ Clinical Examination.
10. The candidates, who have passed written examination but failed in Oral & Practical/ Clinical Examination, will re-appear only in Oral & Practical / Clinical examination.
11. The maximum number of attempts to re-appear in oral & practical /clinical Examination alone shall be three, after which the candidate shall have to appear in both written and oral & practical/clinical examinations as a whole.
12. The candidate with 80% or above marks shall be deemed to have passed with distinction.
13. *Log Book/Assignments:* Through out the length of the course, the performance of the candidate shall be recorded on the Log Book.
14. The Supervisor shall certify every year that the Log Book is being maintained and signed regularly.
15. The Log Book will be developed & approved by the Advanced Studies & Research Board.
16. The evaluation will be maintained by the Supervisor (in consultation with the Co- Supervisor, if appointed).
17. The performance of the candidate shall be evaluated on annual basis, e.g., 40 marks for each year in five years MD Nephrology course. The total marks for Log Book shall be 200.The log book shall reflect the performance of the candidate on following parameters:
    - Year wise record of the competence of skills.
    - Year wise record of the assignments.
    - Year wise record of the evaluation regarding attitude & behaviour
    - Year wise record of journal club / lectures / presentations / clinico-pathologic conferences attended & / or made by the candidate.

3. Submission / Evaluation of Synopsis

1. The candidates shall prepare their synopsis as per guidelines provided by the Advanced Studies & Research Board, available on UHS website.
2. The research topic in clinical subject should have 30% component related to basic sciences and 70% component related to applied clinical sciences. The research topic must consist of a reasonable sample size and sufficient numbers of variables to give training to the candidate to conduct research, to collect & analyze the data.
3. Synopsis of research project shall be submitted by the end of the 3rd year of MD program. The synopsis after review by an Institutional Review Committee shall be submitted to the University for consideration by the Advanced Studies & Research Board, through the Principal / Dean /Head of the institution.

4. Submission of Thesis

1. Thesis shall be submitted by the candidate duly recommended by the Supervisor.
2. The minimum duration between approval of synopsis and submission of thesis shall be one year, but the thesis can not be submitted later than 8 years of enrolment.
3. The research thesis must be compiled and bound in accordance with the Thesis Format Guidelines approved by the University and available on website.
4. The research thesis will be submitted along with the fee prescribed by the University.

5. Thesis Examination

1. All candidates admitted in MD course shall appear in Part-III thesis examination at the end of 5th year of their training course.
2. Only those candidates shall be eligible for thesis evaluation who have passed Part I, II & III (clinical) Examinations.
3. The examination shall include thesis evaluation with defense.

4. The Vice Chancellor shall appoint three external examiners for thesis evaluation, preferably from other universities and from abroad, out of the panel of examiners approved by the Advanced Studies & Research Board. The examiners shall be appointed from respective specialty. Specialists from Internal Medicine and related fields may also be appointed/co-opted, where deemed necessary.
5. The thesis shall be sent to the external examiners for evaluation, well in time before the date of defense examination and should be approved by all the examiners.
6. After the approval of thesis by the evaluators, the thesis defense examination shall be held within the University on such date as may be notified by the Controller of Examinations. The Controller of Examinations shall make appropriate arrangements for the conduct of thesis defense examination in consultation with the supervisor, who will co-ordinate the defense examination.
7. The thesis defense examination shall be conducted by two External Examiners who shall submit a report on the suitability of the candidate for the award of degree. The supervisor shall act as coordinator.

6. Award of MD Nephrology Degree

After successful completion of the structured courses of MD Nephrology and qualifying Part-I, Part-II and Part-III examinations, the degree with title MD Nephrology shall be awarded.

CONTENT OUTLINE

Part I MD Nephrology

Basic Sciences:
Student is expected to acquire comprehensive knowledge of Anatomy, Physiology, Pathology (Microbiology), Biochemistry, Pharmacology relevant to the clinical practice appropriate for Nephrology

1. Anatomy

- Cell Biology: Cytoplasm – Cytoplasmic matrix, cell membrane, cell organelles, cytoskeleton, cell inclusions, cilia and flagella.
- Nucleus – nuclear envelope, nuclear matrix, DNA and other components of chromatin, protein synthesis, nucleolus, nuclear changes indicating cell death.
- Cell cycle, mitosis, meiosis, cell renewal.
- Cellular differentiation and proliferation.
- Tissues of Body: Light and electron microscopic details and structural basis of function, regeneration and degeneration. Confocal microscopy.
- The systems/organs of body – Cellular organization, light and electron microscopic features, structure function correlations, and cellular organization.

Embryology

- General Features of Human Development
- Features of mitotic and meiotic modes of cell division. Genetic consequences of meiotic division.
- Abnormal miototic and meiotic divisions of clinical importance.

Early Embryonic Development:
- Cleavage, morula and blastocyst formation and implantation.
- Formation of the three primary germ layers.
- List of the derivatives of the respective germ layers.

Period of the Growing Fetus:
- Various stages and salient features of the fetus development

Extraembryonic Membranes:
- Development, functions and anomalies of yolk sac, amnion, chorion, allantois, umbilical cord and placenta.
- Development of kidney
- Urogenital sinus & its transformation
- Origin of Mullerian system
- Development/ Descent of Testis
- Endocrinological influences on male & female genitalia
- Development of adrenals
- Embryology of extrophy, hypo / epispadias

Teratogenesis:

- Factors known to be involved in the development of congenital anomalies especially related to the urological system.
- Concept of critical periods.

Histology:

Structural and Functional Organization of the Tissues of Body

- Classification of tissues and identification of various tissues particularly those related to the urological system, in routine histological preparations under the light microscope.

The Epithelial Tissue

- General structure, functions and classification of epithelia
- Their location in the body
- The Connective Tissue
- Histology of the kidney

Gross Anatomy:

- Anterior abdominal wall and loin with
- Anatomy & relations of kidneys & ureters and suprarenal glands.
- Anatomy of pelvic fascia & diaphragm.
- Anatomy of perineum including perineal pouches.
- Urinary bladder --------- ligaments & blood supply.
- Lymphatic drainage of pelvis and posterior abdominal wall.

2. Physiology

- Functional anatomy of kidney, nephron-structure, parts, function, types.
- Juxtaglomerular apparatus: autoregulation, peculiarities, measurements.
- Renal circulation: Auto regulation, peculiarities, and measurement
- Glomerular filtration: filtration barrier, forces governing filtration, measurement.
- Tubular functions: re-absorption, secretion, Tm values
- Regulation of ECF-volume, osmolality and electrolytes
- Micturition
- Renal function tests, renal clearance, abnormal constituents of urine
- Excretory functions of skin
- Control of water balance & fluid compartments
- Acid base balance
- Oedema & lymphatic function in renal disease
- Calcium metabolism
- Testicular function ----- Spermatogenesis & Endocrine
- Renal & Suprarenal Endocrines
- Physiology of Bladder-innervation
- Clinical and applied physiology

3. Biochemistry

- Membrane biochemistry and signal transduction

- Gene expression and the synthesis of proteins
- Bioenergetics; fuel oxidation and the generation of ATP
- Carbohydrate metabolism
- Lipid metabolism
- Nitrogen metabolism
- Enzymes and biologic catalysis
- Tissue metabolism
- Biotechnology and concepts of molecular biology with special emphasis on use of recombinant DNA techniques in medicine and the molecular biology of cancer
- General principles of biochemical investigations
- Basic techniques in molecular biology
- Cloning and gene analysis
- Immunochemical techniques
- Protein chemistry and enzymology
- Cloning & PCR
- Protein chemistry and quantification
- Electrophoretic techniques; PAGE
- Immunoblotting
- Raising and purifying antibodies
- ELISA
- Composition of intracellular and extracellular compartment fluids.
- Water and sodium balance. Role of kidney in its maintenance.
- Renal mechanism for pH regulation.

4. **Pharmacology**

- The evolution of medical drugs
- British pharmacopeia
- Introduction to pharmacology
- Receptors
- Mechanisms of drug action
- Pharmacokinetics
- Pharmacokinetic process
    - Absorption
    - Distribution
    - Metabolism
    - Desired plasma concentration
    - Volume of distribution
    - Elimination
    - Elimination rate constant and half life
    - Creatinine clearance
- Drug effect
    - Beneficial responses
    - Harmful responses
    - Allergic responses
- Drug dependence, addiction, abuse and tolerance
- Applied aspects related to pharmacokinetics
- Drug therapies of renal failure (including drug interactions)

- Commonly used drugs (anti-hypertensive, anti-diabetic drugs, diuretics etc.)
- Principals and use of anti microbial therapy
- Antiseptics
- Drug interactions
- Dialysis
- Drug use in pregnancy and in children
- Renal toxicity and medication

5. **Pathology**

Pathological alterations at cellular and structural level in infection, inflammation, ischaemia, neoplasia and trauma affecting the ear, nose and upper respiratory tract

Cell Injury and adaptation

- Reversible and Irreversible Injury
- Fatty change, Pathologic calcification
- Necrosis and Gangrene
- Cellular adaptation
- Atrophy, Hypertrophy,
- Hyperplasia, Metaplasia, Aplasia

Inflammation

- Acute inflammation
- Cellular components and chemical mediators of acute inflammation
- Exudates and transudate
- Sequelae of acute inflammation
- Chronic inflammation
- Etiological factors and pathogenesis
- Distinction between acute and chronic (duration) inflammation
- Histologic hallmarks
- Types and causes of chronic inflammation, non-granulomatous & granulomatous,

Haemodynamic disorders

- Etiology, pathogenesis, classification and morphological and clinical manifestations of Edema, Haemorrhage, Thrombosis, Embolism, Infarction & Hyperaemia
- Shock; classification etiology, and pathogenesis, manifestations.
- Compensatory mechanisms involved in shock
- Pathogenesis and possible consequences of thrombosis
- Difference between arterial and venous emboli

Neoplasia

- Dysplasia and Neoplasia
- Benign and malignant neoplasms
- Etiological factors for neoplasia
- Different modes of metastasis
- Tumor staging system and tumor grade

Immunity and Hypersensitivity

- Immunity

- Immune response
- Diagnostic procedures in a clinical Immunology laboratory
- Protective immunity to microbial diseases
- Tumour immunology
- Immunological tolerance, autoimmunity and autoimmune diseases.
- Transplantation immunology
- Hypersensitivity
- Immunodeficiency disorders
- Immunoprophylaxis & Immunotherapy

Related Microbiology

- Role of microbes in various urological disorders
- Infection source
- Nosocomial infections
- Bacterial growth and death
- Pathogenic bacteria
- Vegetative organisms
- Spores
- Important viruses
- Important parasites
- Surgically important microorganisms
- Sources of infection
- Asepsis and antisepsis
- Sterilization and disinfection
- Infection prevention
- Immunization
- Personnel protection from communicable diseases
- Use of investigation and procedures in laboratory
- Basics in allergy and immunology

Special Pathology

- Discuss the pathogenesis, clinical course, and outcome of post-streptococcal and crescentic glomerulonephritis.
- Discuss three causes of the nephrotic syndrome.
- Recognize the gross and most important microscopic characteristics of various types of acute glomerulonephritis.
- Compare the pathology and clinical symptoms of acute and chronic pyelonephritis.
- Compare glomerulonephritis. and. pyelonephritis.
- Describe the pathology and clinical features of renal cell carcinoma, Wilms' tumor, and transitional cell carcinoma of the renal pelvis and bladder.
- Glomerulonephritis, pyelonephtitis, renal cell carcinoma, bladder transitional cell carcinoma.

6. Biostatistics & Research Methodology

- Introduction to bio-statistics
- Introduction to bio- medical research
- Why research is important?
- What research to do?
  i. Selecting a field for research
  ii. Drivers for health research
  iii. Participation in national and international research
  iv. Participation in pharmaceutical company research
  v. Where do research ideas come from
  vi. Criteria for a good research topic
- Ethics in health research
- Writing a scientific paper
- Making a scientific presentation
- Searching the literature

7. Behavioural Sciences

- Bio-psycho-social (BPS) model of health care
- Use of non-medicinal interventions in clinical practice
  - Communication skills
  - Counselling
  - Informational skills
- Crisis intervention/disaster management
- Conflict resolution
- Breaking bad news
- Medical ethics, professionalism and doctor-patient relationship
  - Hippocratic oath
  - Four pillars of medical ethics (autonomy, beneficence, non-malficence and justice)
  - Informed consent and confidentiality
  - Ethical dilemmas in a doctor's life
- Delivery of culturally relevant care and cultural sensitivity
- Psychological aspects of health and disease
  - Psychological aspect of health
  - Psychological aspect of disease
  - Stress and its management
  - Psychological aspect of pain
  - Psychological aspect of aging

Part-II MD Nephrology

Internal Medicine training for first two years starting from first day of enrollment. Resident should get exposure in the following organ and system competencies (listed below) while considering and practicing each system in terms of:-

- Medical ethics
- Professional values, student teachers relationship
- Orientation of in-patient, out-patients and Nephrological labs
- Approach to the patient
- History taking
- General physical examination
- Systemic examination
- Routine investigations
- Special investigations
- Diagnostic and therapeutic procedures

Course Contents:

1. Cardiovascular Medicine

Common and / or important Cardiac Problems:

- Arrhythmias
- Ischaemic Heart Disease: acute coronary syndromes, stable angina, atherosclerosis
- Heart Failure
- Hypertension – including investigation and management of accelerated hypertension
- Valvular Heart Disease
- Endocarditis
- Aortic dissection
- Syncope
- Dyslipidaemia

Clinical Science:

- Physiological principles of cardiac cycle and cardiac conduction
- Pharmacology of major drug classes: beta blockers, alpha blockers, ACE inhibitors, Angiotensin receptor blockers (ARBs), anti-platelet agents, thrombolysis, inotropes, calcium channel antagonists, potassium channel activators, diuretics, anti-arrhythmics, anticoagulants, lipid modifying drugs, nitrates, centrally acting anti-hypertensives

2. Dermatology;

Common and / or Important Problems:

- Cellulitis
- Cutaneous drug reactions
- Psoriasis and eczema
- Skin failure: e.g. erthryoderma, toxic epidermal necrolysis
- Urticaria and angio-oedema

- Cutaneous vasculitis
- Herpes zoster and Herpes Simplex infections
- Skin tumours
- Skin infestations
- Dermatomyositis
- Scleroderma
- Lymphoedema

Clinical Science:

- Pharmacology of major drug classes: topical steroids, immunosuppressants

3. Diabetes & Endocrine Medicine

Common and / or Important Diabetes Problems:

- Diabetic ketoacidosis
- Non-acidotic hyperosmolar coma / severe hyperglycaemia
- Hypoglycaemia
- Care of the acutely ill diabetic
- Peri-operative diabetes care

Common or Important Endocrine Problems:

- Hyper/Hypocalcaemia
- Adrenocortical insufficiency
- Hyper/Hyponatraemia
- Thyroid dysfunction
- Dyslipidaemia
- Endocrine emergencies: myxoedemic coma, thyrotoxic crisis, Addisonian crisis, hypopituitary coma, phaeochromocytoma crisis

Clinical Science:

- Outline the function, receptors, action, secondary messengers and feedback of hormones
- Pharmacology of major drug classes: insulin, oral anti-diabetics, thyroxine, anti-thyroid drugs, corticosteroids, sex hormones, drugs affecting bone metabolism

4. Respiratory Medicine

Common and / or Important Respiratory Problems:

- COPD
- Asthma
- Pneumonia
- Pleural disease: Pneumothorax, pleural effusion, mesothelioma
- Lung Cancer
- Respiratory failure and methods of respiratory support
- Pulmonary embolism and DVT
- Tuberculosis
- Interstitial lung disease
- Bronchiectasis
- Respiratory failure and cor-pulmonale
- Pulmonary hypertension

Clinical Science:

- Principles of lung function measurement

- Pharmacology of major drug classes: bronchodilators, inhaled corticosteroids, leukotriene receptor antagonists, immunosuppressants

5. Allergy

Common or Important Allergy Problems

- Anaphylaxis
- Recognition of common allergies; introducing occupation associated allergies
- Food, drug, latex, insect venom allergies
- Urticaria and angioedema

Clinical Science

- Mechanisms of allergic sensitization: primary and secondary prophylaxis
- Natural history of allergic diseases
- Mechanisms of action of anti-allergic drugs and immunotherapy
- Principles and limitations of allergen avoidance

6. Haematology

Common and / or Important Problems:

- Bone marrow failure: causes and complications
- Bleeding disorders: DIC, haemophilia
- Thrombocytopaenia
- Anticoagulation treatment: indications, monitoring, management of over-treatment
- Transfusion reactions
- Anaemia: iron deficient, megaloblastic, haemolysis, sickle cell,
- Thrombophilia: classification; indications and implications of screening
- Haemolytic disease
- Myelodysplastic syndromes
- Leukaemia
- Lymphoma
- Myeloma
- Myeloproliferative disease
- Inherited disorders of haemoglobin (sickle cell disease, thalassaemias)
- Amyloid

Clinical Science:

- Structure and function of blood, reticuloendothelial system, erythropoietic tissues

7. Immunology

Common or Important Problems:

- Anaphylaxis (see also 'Allergy')

Clinical Science:

- Innate and adaptive immune responses
- Principles of Hypersensitivity and transplantation

8. Infectious Diseases

Common and / or Important Problems:

- Fever of Unknown origin
- Complications of sepsis: shock, DIC, ARDS

- Common community acquired infection: LRTI, UTI, skin and soft tissue infections, viral exanthema, gastroenteritis
- CNS infection: meningitis, encephalitis, brain abscess
- HIV and AIDS including ethical considerations of testing
- Infections in immuno-compromised host
- Tuberculosis
- Anti-microbial drug monitoring
- Endocarditis
- Common genito-urinary conditions: non-gonococcal urethritis, gonorrhoea, syphilis

Clinical Science:

- Principles of vaccination
- Pharmacology of major drug classes: penicillins, cephalosporins, tetracyclines, aminoglycosides, macrolides, sulphonamides, quinolones, metronidazole, anti-tuberculous drugs, anti-fungals, anti-malarials, anti-helminthics, anti-virals

9. Medicine in the Elderly

Common or Important Problems:

- Deterioration in mobility
- Acute confusion
- Stroke and transient ischaemic attack
- Falls
- Age related pharmacology
- Hypothermia
- Continence problems
- Dementia
- Movement disorders including Parkinson's disease
- Depression in the elderly
- Osteoporosis
- Malnutrition
- Osteoarthritis

Clinical Science:

- Effects of ageing on the major organ systems
- Normal laboratory values in older people

10. Musculoskeletal System

Common or Important Problems:

- Septic arthritis
- Rheumatoid arthritis
- Osteoarthritis
- Seronegative arthritides
- Crystal arthropathy
- Osteoporosis – risk factors, and primary and secondary prevention of complications of osteoporosis
- Polymyalgia and temporal arteritis
- Acute connective tissue disease: systemic lupus erythematosus, scleroderma, poly- and dermatomyositis, Sjogren's syndrome, vasculitides

Clinical Science:

- Pharmacology of major drug classes: NSAIDS, corticosteroids, immunosuppressants, colchicines, allopurinol, bisphosphonates

11. Neurology

Common or Important Problems:

- Acute new headache
- Stroke and transient ischaemic attack
- Subarachnoid haemorrhage
- Coma
- Central Nervous System infection: encephalitis, meningitis, brain abscess
- Raised intra-cranial pressure
- Sudden loss of consciousness including seizure disorders (see also above syncope etc)
- Acute paralysis: Guillian-Barré, myasthenia gravis, spinal cord lesion
- Multiple sclerosis
- Motor neuron disease

Clinical Science:

- Pathophysiology of pain, speech and language
- Pharmacology of major drug classes: anxiolytics, hypnotics inc. benzodiazepines, antiepileptics, anti-Parkinson's drugs (anti-muscarinics, dopaminergics)

12. Psychiatry

Common and /or Important Problems:

- Suicide and parasuicide
- Acute psychosis
- Substance dependence
- Depression

Clinical Science:

- Principles of substance addiction, and tolerance
- Pharmacology of major drug classes: anti-psychotics, lithium, tricyclic antidepressants, mono-amine oxidase inhibitors, SSRIs, venlafaxine,

donepezil, drugs used in treatment of addiction (bupropion, disulpharam, acamprosate, methadone)

13. Cancer and Palliative Care

Common or Important Nephrology Problems:

- Hypercalcaemia
- SVC obstruction
- Spinal cord compression
- Neutropenic sepsis
- Common cancers (presentation, diagnosis, staging, treatment principles): lung, bowel, breast, prostate, stomach, oesophagus, bladder)

Common or Important Palliative Care Problems:

- Pain: appropriate use, analgesic ladder, side effects, role of radiotherapy
- Constipation
- Breathlessness
- Nausea and vomiting
- Anxiety and depressed mood

Clinical Science:

- Principles of oncogenesis and metastatic spread
- Apoptosis
- Principles of staging
- Principles of screening
- Pharmacology of major drug classes in palliative care: anti-emetics, opioids, NSAIDS, agents for neuropathic pain, bisphosphonates, laxatives, anxiolytics

Investigation Competencies

.

Outline the Indications for, and Interpret the Following Investigations:

- Basic blood biochemistry: urea and electrolytes, liver function tests, bone biochemistry, glucose, magnesium
- Inflammatory markers: CRP / ESR

Procedural Competencies

- The trainee is expected to be competent in performing the following procedures by the end of core training. The trainee must be able to outline the indications for these interventions. For invasive procedures, the trainee must recognize the indications for the procedure, the importance of valid consent, aseptic technique, safe use of local anaesthetics and minimization of patient discomfort.
- Venepuncture
- Cannula insertion, including large bore
- Ascitic tap and aspiration
- Abdominal paracentesis
- Central venous cannulation
- Basic and, subsequently, advanced cardiorespiratory resuscitation
- Urethral catheterization

Part-III Specialty training in Nephrology

Specific Program Content

1. Specialized training in Nephrology
2. Compulsory rotations
3. Research & thesis writing
4. Maintaining of Log-book

Specialized training in Nephrology can be divided into the following:

A. General Nephrology
B. Dialysis and Extracorporeal Therapy
C. Renal Transplantation
D. Ambulatory Services [Out-Patient Clinic]
E: Electives
F . Technical and Other Skills
G. Research opportunities

General Nephrology

1. Disorders of mineral metabolism, including nephrolithiasis, osteoporosis and renal osteodystrophy
2. Disorders of fluid, electrolyte, and acid-base balance
3. Acute renal failure
4. Chronic Kidney Disease and its management by conservative and nutrition methods
5. End-stage renal disease
6. Hypertensive disorders
7. Renal disorders of pregnancy
8. Urinary tract infections
9. Tubulointerstitial renal diseases, including inherited diseases of transport, cystic diseases, and other congenital disorders
10. Glomerular and vascular diseases, including the glomerulonephritides, diabetic nephropathy, renovascular disease and microvascular syndromes
11. Malignancy related to the Kidneys
12. Disorders of drug metabolism, adjustment of medications according to the GFR and renal drug toxicity.

Dialysis and Extracorporeal Therapy

Each trainee will be exposed to dialysis and extracorporeal therapies. During this rotation, the trainee evaluates all initial consults when hemodialysis is considered even if it is not imminent, supervised by the dialysis consultant of the month. The clinical experience includes:

1. Evaluation and selection of patients for acute hemodialysis or continuous renal replacement therapies.

2. Evaluation of end-stage renal disease patients for various forms of therapy and their instruction regarding treatment options. The plan for access placement and evaluation.
3. Drug dosage modification during dialysis and other extracorporeal therapies.

4. Evaluation and management of medical complications in patients during and between dialysis and other extracorporeal therapies, including dialysis access and an understanding of their pathogenesis and prevention.
5. Long-term follow-up of patients undergoing chronic dialysis, including their dialysis prescription and modification and assessment of adequacy of dialysis.
6. An understanding of the principles and practice of peritoneal dialysis, including the establishment of peritoneal access, the principles of dialysis catheters and how to choose appropriate catheters.
7. An understanding of the technology of peritoneal dialysis, including the use of cyclers.
8. Assessment of peritoneal dialysis efficiency, using peritoneal equilibration testing and the indications and interpretation of peritoneal biopsy.
9. An understanding of how to write a peritoneal dialysis prescription and how to assess peritoneal dialysis adequacy.
10. The pharmacology of commonly used medications and their kinetic and dosage alteration with peritoneal dialysis.
11. An understanding of the complications of peritoneal dialysis, including peritonitis and its treatment, exit site and tunnel infections and their management, hernias, pleural effusions, and other less common complications and their management.
12. An understanding of the special nutritional requirements of the hemodialysis and peritoneal dialysis patient.

Renal Transplantation:

The trainee will be part of the Transplantation service to include transplant donor and recipient evaluation, hospital admission of patients receiving transplants or those with transplants who are suffering from acute or chronic complications, as well as the outpatient management of patients post-transplant. Each trainee will have two rotations 6 months and three months respectively. The trainee is trained in the pre and post transplant management and follow up of patients. During the rotation, the trainee attends out-patient transplant clinics weekly and participates in management decisions. This transplant experience includes the following:
1. Evaluation and selection of transplant candidates.
2. Preoperative evaluation and preparation of transplant recipients.
3. Observation of at least 3 renal transplant surgeries. Immediate postoperative management of transplant recipients including administration of immunosuppressive drugs.
4. Clinical diagnosis and management of all forms of acute and chronic rejection including laboratory, histopathologic and imaging techniques.
5. Recognition and medical management of the surgical and non surgical complications of transplantation.
6. Long-term follow-up of transplant donors and recipients in the out patient clinic.

Ambulatory Renal Service:

The trainee will spend one-half day each week in the ambulatory practice setting, seeing the entire spectrum of out-patient nephrology. The trainee will evaluate the patients and formulate plans and will discuss the case with the consultant physician. The trainee is responsible for communicating with referral physicians and for longitudinal follow-up of these patients when appropriate. This rotation will expose trainee to:

1. Evaluation and management of patients with hematuria and proteinuria
2. Evaluation and management of the complicated hypertensive patients
3. Management of patients with chronic renal failure
4. Evaluation and management of patients with nephrolithiasis
5. Evaluation of patients for transplantation
6. Transplant donor evaluations
7. Management of patients following renal transplantation

Electives

2 Electives of 2 weeks each will be provided to the trainee during the General Nephrology Rotation in the second and the 4th Years of training, to spend in:

1. Pediatrics : If specialty clinic for pediatrics is available in the pediatrics department.
2. Radiology: This elective should be structured with the Department of Radiology. During this elective, the trainee will attend the various renal-focused procedures and the interpretation sessions.
3. Pathology: This rotation involves supervised training in the preparation and processing of renal tissues, and in the interpretation of the material by light or electron microscopy. During the elective, the trainee presents the pathology findings during the weekly pathology conference.

Technical and Other Skills trainee will be provided hands on training, including the indications, contraindications, complications, and interpretation of results of the following procedures:

1. Urinalysis: Perform a dipstick urinalysis and prepare urine sediment for microscopy
2. Percutaneous biopsy of native and transplanted kidneys
3. Peritoneal dialysis
4. Placement of temporary vascular access (subclavian, femoral or internal jugular) for hemodialysis and related procedures.
5. Acute and chronic hemodialysis
6. Placement of peritoneal catheters acute and chronic
7. Renal ultrasound (use and interpretation)
8. Continuous hemofiltration, arteriovenous and/or venovenous
9. Placement of temporary peritoneal catheters
10. Perform bladder catheterization

Certain Procedures if not available or performed will be still discussed and opportunities sought to expose the trainee to such procedures.

1. Radiology of vascular access
2. Balloon angioplasty of vascular access
3. Therapeutic plasmapheresis

4. Hemoperfusion
5. Electron microscopy and Immunoflourescence.

PRACTICAL PROCEDURES

Technical Skills

It is essential that every trainee becomes competent in the techniques of:

a) Biopsy of both native and transplanted kidneys.

b) Temporary vascular access.

Diagnostic Techniques

Trainees should understand the indications for and interpretations of the results from the following procedures:

a) Urinalysis

b) Serum biochemistry

c) Percutaneous biopsy of native and transplanted kidneys

d) Ultrasound of the urinary tract

e) Intravenous urography

f) Renal angiography

g) Radionuclide imaging and measurement of renal function

h) CT and MRI scanning

Additional training and experience will be required for trainees wishing to obtain a license from the Administration of Radioactive Substances Advisory Committee (ARSAC) to allow them to personally perform investigations using radioactive substances.

Therapeutic Procedures

Trainees should be aware of the indications for and the contraindications and complications of the following techniques:

a) Peritoneal dialysis, acute and chronic

b) Haemodialysis, acute and chronic

c) Continuous hemofiltration and allied techniques

d) Plasmapheresis

e) Angioplasty

f) Percutaneous nephrostomy

Medical Knowledge

Theoretical knowledge to be acquired during the training period includes:

a) Renal anatomy, physiology and pathology including examination of renal biopsies by light and electron microscopy and immunofluorescent or immunoperoxidase techniques.

b) Disorders of fluids and electrolytes and acid-base balance.

c) Normal mineral metabolism and its alteration in renal disease, metabolic bone disease and nephrolithiasis.

d) Pathogenesis, natural history and management of hereditary, congenital and acquired diseases of the kidney and urinary tract and renal diseases associated with pregnancy and systemic disorders such as diabetes and vasculitides.

e) The pathogenesis and management of urinary tract infections.

f) The pathogenesis and management of acute renal failure.

g) Clinical pharmacology, including drug metabolism and pharmacokinetics and the effects of drugs on renal structure and function.

h) Nutritional aspects of renal disorders.

i) Immunology, including:

1. Basic principles
2. Immunological mechanisms of renal disease
3. Immunological tests relevant to renal disease

j) Normal and deranged blood pressure regulation.

k) Transplantation including:

1. Biology of transplant rejection.
2. Indications for and contraindications to renal transplantation.
3. Principles of transplant recipient evaluation and selection.
4. Principles of evaluation of transplant donors, both live and cadaveric, including histocompatibility testing.
5. Principles of organ harvesting, preservation and storage.
6. Short and long-term complications of transplantation.
7. Mechanisms of action and usage of immunosuppressive drugs.
8. Histopathology of transplant rejection.
9. Psycho-social aspects of organ donation and transplantation.

l) Dialysis and Extra-Corporeal Therapy including:

1. The kinetic principles of both haemodialysis and peritoneal dialysis.
2. The short-term and long-term complications of each mode of dialysis and their management.
3. An understanding of the principles of dialysis access, including indications, techniques and complications. This includes both acute and chronic vascular access and peritoneal access.
4. Prescription of and assessment of adequacy of dialysis, including an understanding of the use and limitations of urea kinetics and protein catabolic rate.
5. The influence of the various dialysis modes on drug metabolism.
6. The nutritional management of haemo and peritoneal dialysis patients.
7. An understanding of the artificial membranes used in haemodialysis and the issue of biocompatibility.
8. The psycho-social and ethical issues of dialysis.

Clinical Rotations as a 6 month Block:

3rd Year:

General Nephrology [1]: 6 months

The trainee will be assigned to the nephrology ward taking care of the nephrology inpatients only. The trainee will also be responsible for the procedures performed, relating to nephrology, in these patients.

Hemodialysis and Peritoneal Dialysis: 6 months

The trainee will be assigned to the Dialysis unit taking care of the chronic Hemodialysis and any acute or chronic Peritoneal Dialysis patients.

4th year

Transplant service: 6 months

The trainee will be assigned to the Renal Transplant Unit taking care of the Renal transplant patients, [pre transplant evaluation, Attend at least 3-5 transplant surgeries, post transplant care, follow up of stable renal transplant patients and managing acute and chronic complications in a renal transplant patient].

Consultation and Ambulatory Clinics [Nephrology and Transplant Services].

Topic assignment and submission for research: 6 months

The trainee will be responsible for evaluating and making initial decisions for all nephrology consultations form the different units of the hospital. The trainee will also be responsible for the procedures performed, relating to nephrology, in these patients.

[The Fellow will see all requests for consultation called in to the Renal Consultation service. After seeing the patient, the fellow discusses the problem with the visit for the Renal Consult service, writes an initial note after communication with the attending nephrologist, and follow-up notes as considered appropriate. Medical Residents rotating on the Renal Service may also take this role, and students are also involved in working up and following these patients. A fixed time is designated each day for the fellow (+/- student and resident) to meet with the attending nephrologist to discuss progress and plans. The fellow sees all the Nephrology Division patients admitted to the hospital, whatever the reason for admission is. If patients are admitted to the Renal Visit on the private medical service, the fellow and the visit will act as the primary caretakers (in concert with the medical house staff) during hospitalization. When patients are admitted to the medical ward service or other non-medical services, the fellow acts as a consultant giving input as needed and appropriate. The fellow also manages any problems with peritoneal dialysis patients.

The trainee will be assigned to the nephrology and Transplant out patient clinics i.e. 2 half day clinics / week.

During this time the trainee should plan and submit the research topic for approval. This will help the trainee to initiate research during the end of the 3rd year so that ample time is available for conducting the study and analyzing it in the final year.

5th Year:

General Nephrology [2]: 6 months

As above.

Transplant Service [2]: 3 months

As above

Hemodialysis and Peritoneal Dialysis [2]: 3 months

As above

RESEARCH / THESIS WRITING

RESEARCH / THESIS WRITING

Total of one year will be allocated for work on a research project with thesis writing. Project must be completed and thesis be submitted before the end of training. Research can be done as one block in 5th year of training or it can be stretched over five years of training in the form of regular periodic rotations during the course as long as total research time is equivalent to one calendar year.

Research Experience

The active research component program must ensure meaningful, supervised research experience with appropriate protected time for each resident while maintaining the essential clinical experience. Recent productivity by the program faculty and by the residents will be required, including publications in peer-reviewed journals. Residents must learn the design and interpretation of research studies, responsible use of informed consent, and research methodology and interpretation of data. The program must provide instruction in the critical assessment of new therapies and of the surgical literature. Residents should be advised and supervised by qualified staff members in the conduct of research.

Clinical Research

Each resident will participate in at least one clinical research study to become familiar with:

1. Research design
2. Research involving human subjects including informed consent and operations of the Institutional Review Board and ethics of human experimentation
3. Data collection and data analysis
4. Research ethics and honesty
5. Peer review process

This usually is done during the consultation and outpatient clinic rotations.

Case Studies or Literature Reviews

Each resident will write, and submit for publication in a peer-reviewed journal, a case study or literature review on a topic of his/her choice.

Laboratory Research

Bench Research

Participation in laboratory research is at the option of the resident and may be arranged through any faculty member of the Division. When appropriate, the research may be done at other institutions.

Research involving animals

Each resident participating in research involving animals is required to:

1. Become familiar with the pertinent Rules and Regulations of the University of Health Sciences Lahore i.e. those relating to "Health and

Medical Surveillance Program for Laboratory Animal Care Personnel" and "Care and Use of Vertebrate Animals as Subjects in Research and Teaching"

2. Read the "Guide for the Care and Use of Laboratory Animals"
3. View the videotape of the symposium on Humane Animal Care

Research involving Radioactivity

Each resident participating in research involving radioactive materials is required to

1. Attend a Radiation Review session
2. Work with an Authorized User and receive appropriate instruction from him/her.

METHODS OF INSTRUCTION/COURSE CONDUCTION

As a policy, active participation of students at all levels will be encouraged. Following teaching modalities will be employed:

1. Lectures
2. Seminar Presentation and Journal Club Presentations
3. Group Discussions
4. Grand Rounds
5. Clinico-pathological Conferences
6. SEQ as assignments on the content areas
7. Skill teaching in ICU, emergency and ward settings
8. Attend genetic clinics and rounds for at least one month.
9. Attend sessions of genetic counseling
10. Self study, assignments and use of internet
11. Bedside teaching rounds in ward
12. OPD & Follow up clinics
13. Long and short case presentations

In addition to the conventional teaching methodologies interactive strategies like conferences will also be introduced to improve both communication and clinical skills in the upcoming consultants. Conferences must be conducted regularly as scheduled and attended by all available faculty and residents. Residents must actively request autopsies and participate in formal review of gross and microscopic pathological material from patients who have been under their care. It is essential that residents participate in planning and in conducting conferences.

1. Clinical Case Conference

Each resident will be responsible for at least one clinical case conference each month. The cases discussed may be those seen on either the consultation or clinic service or during rotations in specialty areas. The resident, with the advice of the Attending Physician on the Consultation Service, will prepare and present the case(s) and review the relevant literature.

2. Monthly Student Meetings

Each affiliated medical college approved to conduct training for MD Nephrology will provide a room for student meetings/discussions such as:

a. Journal Club Meeting
b. Core Curriculum Meetings
c. Skill Development

a. Journal Club Meeting

A resident will be assigned to present, in depth, a research article or topic of his/her choice of actual or potential broad interest and/or application.

Two hours per month should be allocated to discussion of any current articles or topics introduced by any participant. Faculty or outside researchers will be invited to present outlines or results of current research activities. The article should be critically evaluated and its applicable results should be highlighted, which can be incorporated in clinical practice. Record of all such articles should be maintained in the relevant department.

b. Core Curriculum Meetings

All the core topics of Nephrology should be thoroughly discussed during these sessions. The duration of each session should be at least two hours once a month. It should be chaired by the chief resident (elected by the residents of the relevant discipline). Each resident should be given an opportunity to brainstorm all topics included in the course and to generate new ideas regarding the improvement of the course structure

c. Skill Development

Two hours twice a month should be assigned for learning and practicing clinical skills.

List of skills to be learnt during these sessions is as follows:

1. Residents must develop a comprehensive understanding of the indications, contraindications, limitations, complications, techniques, and interpretation of results of those technical procedures integral to the discipline (mentioned in pg. 34-35).
2. Residents must acquire knowledge of and skill in educating patients about the technique, rationale and ramifications of procedures and in obtaining procedure-specific informed consent. Faculty supervision of residents in their performance is required, and each resident's experience in such procedures must be documented by the program director.
3. Residents must have instruction in the evaluation of medical literature, clinical epidemiology, clinical study design, relative and absolute risks of disease, medical statistics and medical decision-making.
4. Training must include cultural, social, family, behavioral and economic issues, such as confidentiality of information, indications for life support systems, and allocation of limited resources.
5. Residents must be taught the social and economic impact of their decisions on patients, the primary care physician and society. This can be achieved by attending the bioethics lectures and becoming familiar with Project Professionalism Manual such as that of the American Board of Internal Medicine.
6. Residents should have instruction and experience with patient counseling skills and community education.

7. This training should emphasize effective communication techniques for diverse populations, as well as organizational resources useful for patient and community education.

8. Residents may attend the series of lectures on Nuclear Medicine procedures (radionuclide scanning and localization tests and therapy) presented to the Radiology residents.
10. Residents should have experience in the performance of clinical laboratory and radionuclide studies and basic laboratory techniques, including quality control, quality assurance and proficiency standards.
11. Each resident will observe and participate in each of the procedures (pg.34-35) , preferably done on patients firstly under supervision and then independently.

3. Annual Grand Meeting

Once a year all residents enrolled for MD Nephrology should be invited to the annual meeting at UHS Lahore.
One full day will be allocated to this event. All the chief residents from affiliated institutes will present their annual reports. Issues and concerns related to their relevant courses will be discussed. Feedback should be collected and suggestions should be sought in order to involve residents in decision making.
The research work done by residents and their literary work may be displayed.
In the evening an informal gathering and dinner can be arranged. This will help in creating a sense of belonging and ownership among students and the faculty.

LOG BOOK

The residents must maintain a log book and get it signed regularly by the supervisor. A complete and duly certified log book should be part of the requirement to sit for MD examination. Log book should include adequate number of diagnostic and therapeutic procedures observed and performed, the indications for the procedure, any complications and the interpretation of the results, routine and emergency management of patients, case presentations in CPCs, journal club meetings and literature review.

Proposed Format of Log Book is as follows:

Candidate's Name: ----------

Supervisor ----------

Roll No. ----------

The procedures shall be entered in the log book as per format

Residents should become proficient in performing the related procedures (pg.12,13,46,47). After observing the technique, they will be observed while performing the procedure and, when deemed competent by the supervising physician, will perform it independently. They will be responsible for obtaining informed consent, performing the procedure, reviewing the results with the pathologist and the attending physician and informing the patient and, where appropriate, the referring physician of the results.

Procedures Performed

Sr.#	Date	Name of Patient, Age, Sex & Admission No.	Diagnosis	Procedure Performed	Supervisor's Signature
1					
2					
3					
4					

Nephrological Emergencies Handled

Sr. #	Date	Name of Patient, Age, Sex & Admission No.	Diagnosis	Procedure / Management	Supervisor's Signature
1					
2					
3					
4					

Case Presented

Sr.#	Date	Name of Patient, Age, Sex & Admission No.	Case Presented	Supervisor's Signature
1				
2				
3				
4				

Seminar/Journal Club Presentation

Sr.#	Date	Topic	Supervisor's Signature
1			
2			
3			
4			

Evaluation Record
(Excellent, Good, Adequate, Inadequate, Poor)

At the end of the rotation, each faculty member will provide an evaluation of the clinical performance of the fellow.

Sr.#	Date	Method of Evaluation (Oral, Practical, Theory)	Rating	Supervisor's Signature
1				
2				

EVALUATION & ASSESSMENT STRATEGIES

Assessment

It will consist of action and professional growth oriented ***student-centered integrated assessment*** with an additional component of ***informal internal assessment***, ***formative assessment*** and measurement-based ***summative assessment*.**

Student-Centered Integrated Assessment

It views students as decision-makers in need of information about their own performance. Integrated Assessment is meant to give students responsibility for deciding what to evaluate, as well as how to evaluate it, encourages students to **'own'** the evaluation and to use it as a basis for self-improvement. Therefore, it tends to be growth-oriented, student-controlled, collaborative, dynamic, contextualized, informal, flexible and action-oriented.

In the proposed curriculum, it will be based on:

- Self Assessment by the student
- Peer Assessment
- Informal Internal Assessment by the Faculty

Self Assessment by the Student

Each student will be provided with a pre-designed self-assessment form to evaluate his/her level of comfort and competency in dealing with different relevant clinical situations. It will be the responsibility of the student to correctly identify his/her areas of weakness and to take appropriate measures to address those weaknesses.

Peer Assessment

The students will also be expected to evaluate their peers after the monthly small group meeting. These should be followed by a constructive feedback according to the prescribed guidelines and should be non-judgmental in nature. This will enable students to become good mentors in future.

Informal Internal Assessment by the Faculty

There will be no formal allocation of marks for the component of Internal Assessment so that students are willing to confront their weaknesses rather than hiding them from their instructors.

It will include:

a. Punctuality
b. Ward work
c. Monthly assessment (written tests to indicate particular areas of weaknesses)
d. Participation in interactive sessions

Formative Assessment

Will help to improve the existing instructional methods and the curriculum in use

Feedback to the faculty by the students:

After every three months students will be providing a written feedback regarding their course components and teaching methods. This will help to identify strengths and weaknesses of the relevant course, faculty members and to ascertain areas for further improvement.

Summative Assessment

It will be carried out at the end of the programme to empirically evaluate **cognitive, psychomotor** and **affective domains** in order to award degrees for successful completion of courses.

MD NEPHROLOGY EXAMINATION

Part-I MD Nephrology
Total Marks: 200

All candidates admitted in MD Nephrology course shall appear in Part I examination at the end of first calendar year.

Components of Part-I Examination:

Paper-I, 100 MCQs (single best, having one mark each)	100 Marks
Paper-II, 10 SEQs (having 10 marks each)	100 Marks

Topics included in paper:	**Paper-I**	**Paper-II**
1. Anatomy	(20 MCQs)	(2 SEQs)
2. Physiology	(20 MCQs)	(2 SEQS)
3. Pathology	(20 MCQs)	(2 SEQs)
4. Biochemistry	(15 MCQs)	(1 SEQS)
5. Pharmacology	(10 MCQs)	(1 SEQ)
6. Behavioural Sciences	(10 MCQs)	(1 SEQ)
7. Biostatistics & Research Methodology	(05 MCQs)	(1 SEQ)

Part-II MD Nephrology
Total Marks: 430

All candidates admitted in MD Nephrology course shall appear in Part II examination at the end of 2nd calendar year.

There shall be two written papers of 100 marks each, Oral & practical/ clinical examination of 150 marks and log book assessment of 80 marks.

Topics included in paper 1

Principles of internal medicine including;

1. Pulmonary Medicine	(10 MCQs)
2. Allergy and Immunology	(10 MCQs)
3. Cardiovascular Illness	(10 MCQs)
4. Cancer and Palliative Care	(10 MCQs)
5. Ophthalmology & Otolaryngology	(05 MCQs)
6. Infectious Disease	(05 MCQs)

Topics included in paper 2

Principles of internal medicine including;

1. Endocrinology and Metabolism (10 MCQs)

2. Neurology & Psychiatry (10 MCQs)
3. Hematology (10 MCQs)
4. Dermatology (10 MCQs)
5. Rheumatology (10 MCQs)

Components of Part II Examination

Theory:

Paper 1:	**100 Marks**	**3 Hours**
10 SEQs (No Choice; 05 marks each)	50 Marks	
50 MCQs	50 Marks	

Paper 2:	**100 Marks**	**3 Hours**
10 SEQs (No Choice; 05 marks each)	50 Marks	
50 MCQs	50 Marks	

The candidates, who pass in theory papers, will be eligible to appear in the structured viva voce.

Oral & practical/clinical examination shall be held in basic clinical techniques relevant to internal medicine.

OSCE **50 Marks**

10 stations each carrying 05 marks of 10 minutes duration; each evaluating performance based assessment with five of them interactive

Clinical **100 Marks**

Four short cases (15 marks each)	60 Marks
One long case:	40 Marks

Log Book **80 Marks**

Part-III MD Nephrology
Total Marks: 920

All candidates admitted in MD course shall appear in Part-III examination at the end of structured training programme (end of 5th calendar year and after clearing Part I & II examinations).

There shall be two written papers of 150 marks each, practical/ clinical examination of 300 marks, log book assessment of 120 marks and thesis examination of 200 marks.

Topics included in paper 1

1. General Nephrology (75 MCQs)

Topics included in paper 2

1. Dialysis and Extracorporeal Therapy (40 MCQs)
2. Renal Transplantation (35 MCQs)

Components of Part III Examination

Theory

Paper I	**150 Marks**	**3 Hours**
15 SEQs (No Choice)	75 Marks	
75 MCQs	75 Marks	

Paper II	**150 Marks**	**3 Hours**
15 SEQs (No Choice)	75 Marks	
75 MCQs	75 Marks	

The candidates, who pass in theory papers, will be eligible to appear in the clinical & viva voce.

OSCE/ Viva **100 Marks**

10 stations each carrying 10 marks of 10 minutes duration; each evaluating performance based assessment with five of them interactive

Clinical **200 Marks**

Four short cases (each 25 marks)	100 Marks
One long case	100 Marks

Log Book **120 Marks**

Thesis Examination **200 Marks**

All candidates admitted in MD courses shall appear in Part-III thesis examination at the end of 5th calendar year of the MD programme and not later than 8th calendar year of enrolment. The examination shall include thesis evaluation with defense.

Suggested Reading
and
Methods of Teaching

FORMATS

To achieve the Training Program's overall goals in providing quality training in patient care, teaching and research, several venues are utilized.

A. One-on-one teaching

This is traditionally the core of the learning process. It is carried out on a daily basis both in the clinical (in-patient and out-patient) and research settings.

B. Guided readings These include the following standard texts of Nephrology as well as material available in the nephrology journals and internet

1. *Comprehensive Clinical Nephrology*: by Richard J. Johnson and John Feehally 2. "*Clinical Physiology of Acid-Base and Electrolyte Disorders*" by Rose

3. "*Renal Pathophysiology*" by Rose and Rennke.

4. "*UptoDate in Medicine* " Burton D Rose

5. *Handbook of Dialysis by Daugirdas* and Ing

6. *Handbook of Renal Transplantation* by . Danovitch

7.. *Fundamentals of Renal Pathology:* Books: Agnes B. Fogo

8. "*Core Curriculum in Nephrology* " Series of articles published in American Journal of Kidney Disease.

9. "*Nephsap"* series of supplement with Journal of the American Society of Nephrology.

10. Important Nephrology Journals:

Journal of the American Society of Nephrology.

American Journal of Kidney Disease.

American Journal Of Nephrology

American Journal Of Physiology " Renal"

Nephron

Nephrology Dialysis Transplantation

Transplantation

American Journal Of Transplantation

Artificail Organs

Kidney International

Peritoneal Dialysis International

Seminars in Nephrology

Seminars in Diaysis

C. Independent reading Other texts and journals, as well as bibliographic search capabilities is available in the university of Health Sciences library, the department of Nephrology Library and the individual Medical College Libraries.

D. Weekly Conferences:

These weekly conferences will be scheduled by the nephrology department to provide lecture series, clinical and research discussions. These are important forums for the trainee to develop its presentation skills and confidence as well as interaction with other staff from time to time.

1. Renal Grand Rounds

A weekly hour-long formal seminar. A wide range of mainly clinical topics are presented by the Trainee.

2. Transplant Seminar

A joint seminar series with the Transplant service and Nephrology Service. The subject matter addresses both basic and clinical aspects of transplantation along with case presentations.

3. Nephrology Division Seminars

Formal presentations are given by local as well as invited speakers to the trainees in the main nephrology curriculum. These are a series of lectures given at the beginning of the academic year on dialysis, transplantation and the care of renal emergencies.

4. Radiology Rounds

These are held in the Radiology Department. During these hour-long sessions, radiology reports on active renal patients are reviewed and the findings explained and discussed.

5. Medical Grand Rounds of the department of Medicine

Held at all institutions on a weekly basis.

6. . Dialysis Conference

This meeting is held in the Dialysis Unit and attended by the trainee during the dialysis rotation, dialysis consultant, dialysis nurses, dietitians. In this meeting, the progress of hemodialysis and peritoneal dialysis patients is reviewed.

7. *Journal Club*

Important and recent articles published in the nephrology literature to be reviewed and critically discussed by the trainee.

8. Nephrology Division Research Meeting

The 4th and 5th year trainees are required to attend this weekly meeting. Formal presentations of ongoing research work are discussed. This gives the opportunity for the faculty to review its progress and at the same time research ideas and incentive for the trainee.

9. Renal Pathology Conference

The goal is to learn how to interpret renal biopsies and make correlations between the clinical and pathological findings. This forum also provides the trainee to correlate the disease with the pathology and learn from the different views and experiences of the consultants.

10. Clinical Trainees' Conference

To present problem cases in a group meeting that includes the clinical Staff, listen to formal presentations given by the trainee addressing an in depth review of a topic or of recent journal articles. The objective is to become proficient in clinical practice and up to date in the nephrology literature.

E. Teaching

Teaching is a very effective way of learning. As such, the trainees have ample opportunities to teach in the training Program. The trainees are responsible for the daily bedside teaching of medical students and residents attending Nephrology Department Rotations.

Evaluation

Learning goals are established by the attending at the beginning of the rotation and reviewed on a monthly or as needed basis. Face-to-face feedback by the consultant provided at middle of each rotation i. e. at 3 monthly intervals.

Written evaluations: Written evaluations, forms provided by the UHS, of each trainee should be done at the end of each rotation and discussed by the evaluating

consultant. This will provide an opportunity to identify weaknesses and strengths. A copy of these evaluations should be provided to the trainee as well as the UHS Education Department.

Attendance of the weekly conferences should be provided to the UHS each month.

Log Book:

A log book should be filled by the trainee and duly signed by the consultant authorizing the performance of the procedure. The log should include the name of the patient, Date of the Procedure, complications and name of the consultant Physician.

Temporary Dialysis Access Catheters:

Femoral:	10
Internal Jugular:	10

Renal Biopsy

Native Kidney Biopsy:	20
Transplanted Kidney Biopsy:	10

Peritoneal Dialysis Catheter:

Acute:	10
Chronic:	5

Continuous Renal Replacement Therapy: