

**Dialysis Technology - 1st Year**

1

- ❁ **Anatomy & Physiology**  
(normal kidney structure and functions)
- ❁ **Derangement of Kidney functions**  
(aetiology, clinical manifestation, diagnosis of acute and chronic renal failure)
- ❁ **Dialysis - the concept**  
(Brief history, definition, mechanism)
- ❁ **Components - Basics**  
(Blood circuit: tubing, pump, dialyzer, flow rate, dialysate circuit, concentrates, delivery systems, flow rate)
- ❁ **Anticoagulation**  
(Heparin, alternatives to Heparin, regional no anticoagulation)
- ❁ **Vascular access**  
(Temporary, Permanent)
- ❁ **Dialysis Water and water treatment**
- ❁ **Dialysis and Dialyzer**  
(Including reuse)
- ❁ **Hemodialysis machine**

**PRACTICAL****A. Demonstration of-**

- ◆ A Hemodialysis unit
- ◆ Demineralisation plant
- ◆ Machine
- ◆ Initiation of Dialysis

- ◆ **Conduction of Dialysis**
  - ◆ **Dialysis - closure**
  - ◆ **Washing, cleaning reuse**
  - ◆ **Maintenance of hygiene in Dialysis unit**
  - ◆ **Access - care**
  - ◆ **Anticoagulation**
- B. Actual participation in Dialysis Procedure: including clinical evaluation of patient**

## **1st YEAR**

**A. Anatomy & Physiology**

1. **Head and Neck-** Anatomical terms and position, Brain, Facial and Cranial Bones, Orbits, Sinuses, EAM, Pharynx - Naso, Oro and Laryngeal apart of Pharynx. Different types of tissues and their identification, Thyroid and Parathyroid glands.
2. **Skeleton System** - Types of Bones and bony joints, Joints of Skull, Bones of Upper extremity, Lower extremity, Vertebral column, Pelvic girdle, Thoracic cage etc.
3. **Cardiovascular system** - Circulation: Pulmonary and Systemic, Heart - Anatomy, Pericardium, Aorta, Arteries, Veins Arterial and Venous Circulation.
4. **Respiratory system:** Larynx, Trachea, Lungs.
5. **Digestive system:** Oesophagus, Stomach, Liver, Biliary System, Spleen, Pancreas, Small intestine,

- Large intestine, Gall bladder, Rectum and Anus.
6. **Urinary System:** Kidneys, Ureters, Bladder, Urethra, Prostate, Adrenal glands.
  7. **Reproductive system:** Male Seminal Vesicles, Scrotum and Testes, Female - Uterus, Cervix, Vagina, Ovaries, Urethra.
  8. **Musculo-Skeletal System-** Muscles structure, their action and functions.
  9. **Lymphatic system** - Lymph nodes, glands.
  10. **Nervous system** - Brain, Meninges, Ventricles, Spinal cord, Nerves and branches.
  11. **Eye and Ear** - Structure and functions.
  12. **Endocrinology**  
(Thyroid Functions)  
(Pituitary Functions)  
Adrenal Gland Functions)
  13. **Kidneys & Genito - Urinary System**
    - a. Functions of Kidneys
    - b. Nephrons
    - c. GFR
    - d. Mechanism of Urine Formations
    - e. Functions of Testis, Ovary, Seminal Vesicles
  14. **Blood**
    - a. Composition and Functions of Blood.

**B. Microbiology and Pathology**

**Introduction to microbiology**

- Brief historical review of bacteriology and microbiology
- Basic structure and active micro organism.

### **Cause of Diseases**

- Congenital - Traumatic - Metabolic and deficiency - infection (Micro - Organism).

### **Infection**

Source of infection, mode of exit and transmission of diseases.

Transfer of infection through various sources

### **Reaction of body**

Control and destruction of micro organism.

Sterilization, disinfection, medical and surgical aspects, cross infection.

### **Immunization**

Types, Immunizing Agents.

### **Introduction to Pathology**

Importance of the study of pathology

Inflammation, healing and repair.

### **Special pathology fo major organ system**

Respiratory tract, CVS, GI system, Gerito urinary system.

### **Clinical Pathology**

Pathology: Definition cell growth

Cell deformaties - cell damage - defence mechanism - cell repair.

### **Neoplasia.**

Benign & Malignant including its mode of growth

and metastasis.

Blood Diseases: Leukaemias, Anaemias.

**Bio Safety and Waste Management**

**C. BASIC SCIENCE**

1. Medical Ethics and Relevant Medico - Legal Aspects
2. Responsibilities & Duties
3. Ethics and Behavior
4. Biomedical Waste Management
5. Cardio Pulmonary resuscitation (CPR)
6. Basic Cardiac Life Support (BLS) and Advanced Cardiac Life Support (ALS)
7. Critical Care Nephrology
8. Management of Renal failure in ICU
9. Basic Principles of Blood transfusion and Fluid therapy.
10. Sterilization - Material & Methods.
11. Renal Transplantation - Principles, Immunology, Complication, Post-Transplant Evaluation & management.

**D. APPLIED DIALYSIS TECHNOLOGY**

1. Indications of Dialysis.
2. History and types of Dialysis.
3. Theory of Haemodialysis: Diffusion, Osmosis, ultra-filtration.
4. Haemodialysis apparatus:- Types of Dialysers

- and membranes.
5. Physiology of peritoneal Dialysis.
6. Vascular Access for Haemodialysis and Associated complications.
7. Dialysis machine - Mechanism of Functioning and Management.
8. Complications of Haemodialysis.
9. Bio-chemical investigations required for Renal dialysis.
10. Anti-coagulants and substitutes.
11. Peritonitis and exit-site infections.
12. Withdrawal of dialysis criteria (Acute / chronic dialysis)

**E. ANATOMY - II**

1. Anatomy of Heart and its chambers, cardiac - valves etc.
2. Major Blood Vessels and their Anatomy.
3. Coronary Arterial circulation.
4. Feotal circulation.
5. Anatomy of Respiratory Tract.
6. Various lobes of Lungs.
7. Pulmonary circulation.
8. Anatomy fo G.I. system (upto Anus).
9. Anatomy of Liver, G.B., pancreas, Spleen.
10. Gross Anatomy of Brain.
11. Peripheral Nerves and Cranial nerves.
12. Gross Anatomy of Kidneys, Ureter and urinary bladder.

13. Anatomy of Male Genital system.
14. Anatomy of Female Genital Tract.
15. Muscles of upper and lower limb.
16. Major bones of Body.

**F. PHYSIOLOGY -II**

1. Blood circulation through Heart and Lungs.
2. Pulse and Blood Pressure.
3. E.C.G.
4. Conduction system of Heart.
5. Mechanism of Respiration.
6. Physiology of Gas Exchange.
7. Pulmonary Function Tests.
8. Mechanism of Digestion and Absorption of various food components.
9. Function of Liver, G.B. and pancreas.
10. Thyroid Function.
11. Adrenal Gland Function.
12. Pituitary Function.
13. Function of Kidneys, Nephrons.
14. Mechanism of urine formation.
15. Functioning of Testis, ovary and seminal vesicles.
16. Composition and Functions of Blood.

## 2nd YEAR

### **A. Complications of Hemodialysis**

- ◆ Access related complication.
- ◆ Dialyzer related complication.
- ◆ Dialysate related complication.
- ◆ Anticoagulant related complication.
- ◆ Machine / Blood Pump associated complication.
- ◆ Special type of complication.
- ◆ Management of complications.
- ◆ Maintenance of hygiene in dialysis unit.
- ◆ Access - core
- ◆ Anticoagulation.

### **B. Doses of Hemodialysis**

- ◆ Duration, index, clearance
- ◆ Middle molecules, Urea reduction ration.
- ◆ Urea kinetic modeling, Dialysis adequacy.

### **C. Continuous Dialysis**

- ◆ Continuous arteiovenous hemofiltration.
- ◆ Continuous venovenous hemofiltration.
- ◆ Continuous hemoduafiltration.
- ◆ Continuous slow hemodialysis.
- ◆ Component, access, tubing, filter, replacement, fluid, Antigoatulation, flow rate.



**D. Peritoneal Dialysis**

- ◆ History, Peritoneal physiology, kinetics technique, catheter, dialysate, fluid, insertion procedure, drainage, complication. Continuous peritoneal dialysis procedure, dose.

**PRACTICAL**

- ◆ Actual conduction of Hemodialysis
- ◆ Actual conduction of Peritoneal Dialysis.
- ◆ Clinical assessment of patients.

**A. Techniques and Procedure in Dialysis Lab.**

- ◆ **Cardiac Arrhythmias-Drugs used for control.**
- ◆ **Vasodilators**
- ◆ **Contrast media- Uses and Side, effects, Reactions**
- ◆ **Emergencies in Dialysis Lab. Failing Heart - Assessment of cardiac function, Causes.**
- ◆ **Principles of Dialysis**
- ◆ **Dialysis Procedure**
- ◆ **Dialysis Equipment**
  - General Protocol
  - Variables and Protocol Optimization
- ◆ **Dialysis Membranes and MWCO**
- ◆ **Laboratory Dialysis Formats**
- ◆ **Dialysis definition and facts.**
- ◆ **What is dialysis? Requirement of dialysis, Types of dialysis - How do they work?**
- ◆ **Advantages and Disadvantages of the**

**different types of dialysis, life expectancy for someone on dialysis.**

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- ◆ **Special type of complication.**
- ◆ Management of complications.
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**E. Peritoneal Dialysis**

- ◆ History, Peritoneal physiology, kinetics technique, catheter, dialysate fluid, insertion procedure, drainage, complication.
- ◆ Continuous peritoneal dialysis procedure, dose.

**F. New Dialysis Techniques**

**G. Mortality During Extended Follow-up in the frequent Hemodialysis network.**

**H. Nocturnal Trial**

- ◆ Randomized controlled multicenter trial of a heparin-grafted polyacrylonitrile membrane for no-heparin hemodialysis versus standard of care.
- ◆ Long-Term effects of Frequent in-center hemodialysis.

**G. Administration and management in dialysis Lab.**

◆ **Introduction**

Administration Department- Elements and Principles.

◆ **Functions**

Planning Layout

Organisation

Supervision

Finance

Budgeting

Co-ordination

◆ **Organisation**

Layout Plan-Scrubbing and Washing Room, Preparation Room, Changing Room, Septic Room, Procedure Room, Recovery Room.

◆ **Staffing Pattern**

Duties of Technical, Non Technical Staff, Their Role and responsibilities.

◆ **Upkeep and Maintenance**

Maintenance of all Major and Minor Equipments

CSSD

Powersupplies

◆ **Inventory Control**

Handing over and Takig over.

Stock management

◆ **Store Keeping**

Stock and their proper storage.

◆ **Record Keeping**

◆ **Infection Control Measures**

◆ **Patient Education, Counselling.**

◆ **Duties and responsibilities of Technician.**

**H. Electrocardiography**

◆ **Introduction to Echocardiography**

◆ **Introduction to Cardiac Monitor**

◆ **Introduction to Electrocardiography.**

History, Physiological basis of ECG,

Conduction velocity and Pathway of activation, Electrophysiology, Central terminal of Wilson, Augmentation of leads, Recording of normal and routine ECG, Recording of Rhythm strip, Esophageal leads, Measurement of blood pressure.

♦ **Normal Electrocardiogram:-**

Atrial complexes, PR interval, QRS interval, ST segment, T and U waves, QT interval, Electrical Axis of heart, Heart position, Interpretation of ECG.

♦ **Abnormal Electrocardiogram:-**

Abnormal P, QRS, PR, ST, T and U waves, Conduction defects, Hypertrophy patterns, overload concepts, Coronary artery diseases.

♦ **Exercise Tests**

Various ECG recording units and Models.

I. **Applied Science**

1. **Common diseases affecting Heart**

- Atherosclerosis
- Coronary Artery
- Rheumatic Heart Disease
- Hypertension
- Shock
- Pericarditis

2. **Common Diseases affecting G.I. Tract**

- Jaundice
- Pancreatitis

- Mal-Absorption

3. Common Diseases affecting Endocrines.

- Diabetes - Mellitus
- Hypo and Hyper pituitarism
- Hypo and Hyper thyrodism
- Goitre
- Cushing's Syndrome
- Addison disease

4. Diseases of Nervous System

- Epilepsy
- Syncope
- Parkinson's Disease
- Meningitis
- Peripheral Neuropathy.

5. Renal Disease

- Urimeia: CRF, ARF
- Glomerulonephritics
- Renal Calculus Disease
- HDN

6. Respiratory Disease

- T.B.
- Asthma
- Pneumonia
- COPD
- Pleural Effusion.

J. Bio-Chemistry

- ◆ Concept of Solutions:

Molar, Normal and Percent, Aeibles, Basis, Salts, Buffers

◆ Colorimeter:

Spectrophotometry, Chromatography.

◆ Carbohydrates:

Introduction, Classification and Function.

◆ Proteines:

Classification and function, essential and non-essential Amino-accides structure of protein.

◆ Lipids:

Definition, classification and function, role of lipides, fatty-acide, tri-glycerides, phaspho-lipids, cholesterol and lipo-proteines.

◆ Nucleic -Acides:

Introduction, pyrimide basis, types of nucleorides and nucleotides

◆ Structure of DNA & RNA

◆ Introduction of Laboratory Apparatus:

Different types of pipettes

Beakers, petri-dishes, Burretes, measuring cylinders.

**K. Pharmacology Related to Haemodialysis**

1. I/V Fluid Therapy with special emphasis in Renal Disease.
2. Di-uretics: classification, side-effects and contra- indications Action, Dosage.

3. Anti-Hypertensives: Classification, Action Dosage, side-effects and contra-indications units special reference on dialysis.
4. Dose and Duration of Drugs; Pheonobarbitone, Lithium etc.
5. Role of Dis-infectants Like Formaline, Sodium-Hypochloride, Hydrogen-peroxide etc. and adverse-effects of residual particles.

**L. Applied Dialysis Technology:**

1. Dialysis in Special situations:-
  - Patients with congestive Heart failure
  - Patients pastitive for HIV, HbsAg and HCV.
  - Failed Transplant
  - Poisoning Cases
  - Pregnancy.
2. Special Dialysis procedures:-
  - CAPD
  - haemodial-filtration
  - SLED
  - Plasmophoresis.
3. Special Prostems in Dialysis patients:
  - Psychology and Rehabilitation
  - Diabetes
  - Hypertension
  - Infections.
4. Water Treatment System
5. Renal Anemia Management.