MALLA REDDY VISHWAVIDYAPEETH

SCHOOL OF ALLIED HEALTHCARE SCIENCES & TECHNOLOGY

Suraram X Roads, Jeedimetla,
Hyderabad-500055
Web: https://mrvv.edu.in/

Program

Master of Science (M.Sc.)

DIALYSIS THERAPY

2026

MALLA REDDY VISHWAVIDYAPEETH

SCHOOL OF ALLIED HEALTHCARE SCIENCES & TECHNOLOGY

Master of Dialysis Therapy (MDT)

Vision

1. To become a centre of excellence in renal care education, research, and dialysis technology.
2. To produce competent dialysis professionals with advanced clinical and ethical skills.
3. To promote innovation and evidence-based practice in nephrology and extracorporeal therapies.
4. To improve the quality of life of patients with renal disorders through advanced healthcare services.

Mission

1. To provide competency-based education and clinical training in dialysis therapy.
2. To develop skilled professionals capable of delivering safe and patient-centered renal care.
3. To encourage research, leadership, teamwork, and lifelong learning in nephrology sciences.
4. To uphold professional ethics, infection control practices, and healthcare quality standards.

Program Educational Objectives (PEOs)

After completion of the program, graduates will be able to:

1. Apply advanced knowledge and technical expertise in dialysis and renal care management.
2. Function effectively as dialysis therapists, educators, researchers, and healthcare leaders.
3. Demonstrate ethical practice, communication skills, and multidisciplinary teamwork.
4. Contribute to innovation, research, and quality improvement in dialysis services.

Program Outcomes (POs)

At the end of the program, students will be able to:

1. Demonstrate comprehensive knowledge of renal physiology, pathology, and dialysis procedures.
2. Perform and manage haemodialysis, peritoneal dialysis, CRRT, and related therapies safely.
3. Apply critical thinking, clinical decision-making, and problem-solving in patient care.
4. Conduct research activities and utilize evidence-based practices in dialysis therapy.

Program Specific Outcomes (PSOs)

Students of M.Sc. Dialysis Therapy will be able to:

1. Operate and troubleshoot advanced dialysis equipment and water treatment systems.
2. Monitor dialysis patients and manage complications during renal replacement therapies.
3. Implement infection prevention, biomedical waste management, and patient safety protocols.
4. Assist in renal transplantation care, counselling, and advanced extracorporeal therapies.

Course Outcomes (COs)

After completion of the course, students will be able to:

1. Explain principles of nephrology, renal disorders, and dialysis technologies.
2. Demonstrate competency in dialysis procedures and patient monitoring techniques.
3. Analyse clinical data and provide appropriate therapeutic interventions in renal care.
4. Develop research aptitude, professional ethics, and communication skills in healthcare practice.

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SCHOOL OF ALLIED HEALTHCARE SCIENCES & TECHNOLOGY

Master of Dialysis Therapy (MDT)

COURSE STRUCTURE

I year I semester

Course Code	Course	Result in Group (RG) #	Credit/ Week				Hours/ Semester			Attendance %	Continuous Internal assessment CIA- Theory/ Practical (a)	End Semester		Grand Total
			Lecture	Tutorial/ Clinical	Practical/ Research	Credits	Lecture	Practical/ Tutorial	Total Hours			Theory (b)	Practical/ Viva (c)	Theory: a+(b÷2) =100 Practical: a + c =100
MDT001	Anatomy (Basic anatomy/ Nephroanatomy / Embryology/ Histology)	A	4			4	60		60	80	50	100		100
MDT002	Physiology (General physiology/ Nephrophysiology / Endocrinology)	B	4			4	60		60	80	50	100		100
MDT003	Biochemistry	C	4			4	60		60	80	50	100		100
MDT004	Microbiology	D	4			4	60		60	80	50	100		100
MDT005	Renal Genetics & Molecular Biology		4			4	60		60	80	50	100		100
MDT006	Anatomy (Practical)	A			2	2		60	60	80	50		50	100
MDT007	Physiology (Practical)	B			2	2		60	60	80	50		50	100
MDT008	Biochemistry (Practical)	C			2	2		60	60	80	50		50	100
MDT009	Microbiology (Practical)	D			2	2		60	60	80	50		50	100
MDT010	Residency - 1			2		2		90	90	80	50		50	100
Total			20	2	8	30	300	330	630		500	500	250	1000

I year II semester

Course Code	Course	Result in Group (RG) #	Credit/ Week				Hours/ Semester			Attendance %	Continuous Internal assessment CIA- Theory/ Practical (a)	End Semester		Grand Total
			Lecture	Tutorial/ Clinical	Practical/ Research	Credits	Lecture	Practical/ Tutorial	Total Hours			Theory (b)	Practical/ Viva (c)	Theory: a+(b÷2) =100 Practical: a + c =100
MDT011	Renal Pathology	E	4	-	-	4	60	-	60	80	50	100	-	100
MDT012	Pharmacology	F	4	-	-	4	60	-	60	80	50	100	-	100
MDT013	Nephro-Immunology	G	3	-	-	3	45	-	45	80	50	100	-	100
MDT014	Research Methodology and Biostatistics		4	-	-	4	60	-	60	80	50	100	-	100
MDT015	Biophysics & Biomedical Instrumentation		2	-	1	3	30	30	60	80	50	100	-	100
MDT016	Elective Course (To be chosen by the student)		3	-	-	3	45	-	45	80	50	100	-	100
MDT017	Renal Pathology (Practical)	E	-	-	1	1	-	30	30	80	50	-	50	100

MDT018	Pharmacology (Practical)	F	-	-	1	1	-	30	30	80	50	-	50	100
MDT019	Nephro-Immunology (Practical)	G	-	-	1	1	-	30	30	80	50	-	50	100
MDT020	Residency - 2		-	3	-	3	-	135	135	80	100	-	50	100
Total			20	3	4	27	300	255	555		500	600	200	1000

II year III semester

Course Code	Course	Result in Group (RG) #	Credit/ Week				Hours/ Semester			Attendance %	Continuous Internal assessment CIA- Theory/ Practical (a)	End Semester		Grand Total
			Lecture	Tutorial/ Clinical	Practical/ Research	Credits	Lecture	Practical/ Tutorial	Total Hours			Theory (b)	Practical/ Viva (c)	Theory: a+(b÷2) =100 Practical: a + c =100
MDT021	Renal Disease	H	4	-	-	4	60	-	60	80	50	100	-	100
MDT022	Emergency Medicine and Renal Nutrition& Dietetics	I	3	-	-	3	45	-	45	80	50	100	-	100
MDT023	Nephro- Radiology and Imaging sciences	J	4	-	-	4	60	-	60	80	50	100	-	100
MDT024	Renal Disease (Practical)	H	-	-	1	1	-	30	30	80	50	-	50	100
MDT025	Emergency Medicine and Renal Nutrition & Dietetics (Practical)	I	-	-	1	1	-	30	30	80	50	-	50	100
MDT026	Nephro- Radiology and Imaging sciences (Practical)	J	-	-	1	1	-	30	30	80	50	-	50	100
MDT027	Residency - 3		-	5	-	5	-	225	225	80	100	-	-	100
MDT028	Seminar on Dissertation		-	-	3	3	-	90	90	80	100	-	-	100
Total			11	5	6	22	165	405	570		500	300	150	800

II year IV semester

Course Code	Course	Result in Group (RG) #	Credit/ Week				Hours/ Semester			Attendance %	Continuous Internal assessment CIA- Theory/ Practical (a)	End Semester		Grand Total
			Lecture	Tutorial/ Clinical	Practical/ Research	Credits	Lecture	Practical/ Tutorial	Total Hours			Theory (b)	Practical/ Viva (c)	Theory: a+(b÷2) =100 Practical: a + c =100
MDT029	Advanced Renal Replacement Therapy	K	4	-	-	4	60	-	60	80	50	100	-	100
MDT030	Renal transplantation and coordination/Psychology	L	4	-	-	4	60	-	60	80	50	100	-	100
MDT031	Quality assurance and management of Dialysis unit	M	4	-	-	4	60	-	60	80	50	100	-	100
MDT032	Advanced Renal Replacement Therapy (Practical)	K	-	-	1	1	-	30	30	80	50	-	50	100
MDT033	Renal transplantation and coordination/Psychology (Practicals)	L	-	-	1	1	-	30	30	80	50	-	50	100

MDT034	Quality assurance and management of Dialysis unit (Practical)	M	-	-	1	1	-	30	30	80	50	-	50	100
MDT035	Residency - 4		-	4	-	4	-	180	180	80	100	-	-	100
MDT036	Dissertation and viva voce		-	-	6	6	-	180	180	80	50	-	50	100
Total			12	4	9	25	180	450	630		450	300	200	800
Grand Total			63	14	27	104	945	1440	2385		1950	1700	800	3600

Introduction:

The Master of Dialysis Therapy (MDT) is specifically aimed at those pursuing a professional career in Dialysis Therapy. It is designed to provide specialized training both in basic scientific principles of modern Dialysis Therapy and in the application of these principles to the understanding of a wide variety of renal-uro disorders. It is designed as a higher degree program suitable for graduates having experience in Dialysis Therapy.

It is designed to provide training for a future career in research in basic and clinical renal science. The program aims to enhance the scientific skills of clinicians and to provide non-clinical graduates with insight into clinical problems that will allow them to work alongside clinicians in clinical research projects.

Learning Objectives:

Upon successful completion of the Masters‟ program, students will have developed a broad knowledge of the contribution of basic renal scientific mechanisms to clinical disorders of the excretory system. In particular they will:

1. Understand how mechanisms operating at the molecular, cell, network and system sub-level serve normal function and how damage or dysfunction at these different levels produces specific disorders of importance to clinical dialysis therapy.
2. Have a good working knowledge of modern methods for scientific and clinical investigation of the renal system.
3. Be aware of the major recent developments in research in the area of clinical dialysis therapy.
4. Be able to embark upon a successful career in their chosen direction of advanced nephro- research.

Scope of Curriculum & Expectation from the future graduate in the providing patient care

1. The primary goal of the Master of Dialysis Therapy program is to prepare accomplished professionals in Dialysis Therapy with a specific emphasis on clinical skills and technical knowledge along with professional research.
2. Trainees acquire the research-based knowledge and procedural skills necessary to deliver a high standard of care to the patients with chronic kidney disease requiring renal replacement therapy.
3. This course involves all aspects of care for patients undergoing chronic hemodialysis, continuous ambulatory peritoneal dialysis (CAPD) and other extracorporeal therapies.
4. Overall goal of this training is to foster the trainee‟s development into an independent

care provider and researcher in the field of dialysis.

5. The program intends for its post graduates to contribute to a new generation of academic dialysis professional equipped to address the challenging problems in renal replacement therapy and Other Extracorporeal Therapies.

Eligibility for admission:

1. Bachelor in Dialysis Therapy Technology

Duration of the program

Duration of the program is 2 years or 4 semesters with 945 hours of Lecture & 1440 hours of Practical Training.

Total number of hours – 2385

Total Credits: 104

Medium of instruction:

English shall be the medium of instruction for all the subjects of study and for examination of the course.

Attendance:

A candidate has to secure minimum -

1. 80% attendance in theoretical
2. 80% in Skills training (practical) for qualifying to appear for the final examination.

No relaxation, whatsoever, will be permissible to this rule under any ground including indisposition etc.

Assessment:

Cognitive Assessment

Structured logbook
Viva-voce
examination.
Structured case presentation
Formative assessment
Summative assessment
Case presentation

Psychomotor Assessment

Objective Structured Clinical Examination (OSCE) Objective Structured Practical Examination (OSPE) Mini Clinical Evaluation Exercise (Mini-CEX) Direct Observation of Procedural Skills (DOPS) Simulation-based assessment

Marks qualifying for a pass

For University examination subjects:

50% in internal assessment, 50% in university theory examination, 50% in university practical examination and 50% in aggregate

For thesis and defence:

50% in aggregate

SEMESTER – 1

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MDT003	Biochemistry	C	4			4	60		60	80	50	100		100
MDT004	Microbiology	D	4			4	60		60	80	50	100		100
MDT005	Renal Genetics & Molecular Biology		4			4	60		60	80	50	100		100
MDT006	Anatomy (Practical)	A			2	2		60	60	80	50		50	100
MDT007	Physiology (Practical)	B			2	2		60	60	80	50		50	100
MDT008	Biochemistry (Practical)	C			2	2		60	60	80	50		50	100
MDT009	Microbiology (Practical)	D			2	2		60	60	80	50		50	100
MDT010	Residency - 1			2		2		90	90	80	50		50	100
Total			20	2	8	30	300	330	630		500	500	250	1000

MDT -001: Anatomy (60 Hours) L/T/P/C:4/-/-/4

Learning Objectives

1. Understand structure of human body with focus on renal system.
2. Learn nephroanatomy, embryology, and histology.
3. Identify organs related to urinary and reproductive systems.
4. Correlate anatomical structures with clinical dialysis relevance.

Learning Outcomes

1. Describe anatomy of kidney, ureter, bladder, and related organs.
2. Identify structures in imaging and clinical procedures.
3. Explain developmental anomalies affecting renal system.
4. Apply anatomical knowledge during dialysis procedures.

1. Anatomical Terminology

Descriptive anatomical terms, terms related to movement and position.

2. **Skeletal system-Name and parts of the Bone and joints**
   a. Skeleton, skull, vertebrae, pelvis, ribs, principal joints-Hip joint, Shoulder joint, Sacroiliac joint.
   b. Lumbar vertebra and pelvis in detail

3. **Muscular system**
   Classification, Types, Attachment, Action and nerve supply of the Muscles of Abdomen and Pelvis

4. **Cardiovascular system**
   Heart and Major Blood Vessels- arteries of upper limb, lower limb, - Arch of Aorta and its Branches Abdominal Aorta and its branches, Inferior Vena cava and its Tributaries, Pericardium& Pericardial sinuses.

5. **Heart: -External and Internal features**
   a. Structure of the heart
   b. Conducting system of the heart,
   c. Blood supply of the Heart
   d. Nervous supply of the heart
   e. Valves of the heart

6. **Respiratory system**
   Pleura and recesses

7. **Mediastinum**
   Superior, Anterior, posterior, middle Mediastinum, Trachea, Larynx, Principal Bronchus

8. **Lungs**
   Lobes and Fissures–Right Lung, Left lung

9. **Bronchopulmonary Segments**
   Blood Supply to the lungs, Lymphatic drainage of the lungs, Nerve supply of the lungs

10. **Nerve supply of Abdomen and pelvis- Lumbar & sacral plexus in detail.**
11. **Lymphatics of Abdomen and pelvis**
12. **Peritoneal Cavity– Peritoneum, Folds and Recesses**
13. **Urinary system: Organs –Kidney, Ureter, Bladder and Urethra**
14. **Male Reproductive system**

15. **Female Reproductive system**
16. **Regional -** Cubital Fossa, Inguinal canal, Femoral Triangle and Adductor canal
17. **Embryology:** Urogenital System-Development of-Kidney, ureter, urinary bladder, urethra, prostate, uterus, uterine tube, vagina, male external genitalia, female external genitalia

18. **Histology of kidney, ureter, urinary bladder & urethra**

References:

1. **"Gray's Anatomy for Students"** by Richard L. Drake, A. Wayne Vogl, and Adam W. M. Mitchell
2. **"Clinically Oriented Anatomy"** by Keith L. Moore and Arthur F. Dalley
3. **"Netter's Atlas of Human Anatomy"** by Frank H. Netter
4. Anatomy and physiology –Vijaya D Joshi, Ashalatha N Nandedkar, Sadhana S Mendhurwar
5. Anatomy and physiology- Indu Khurana and Arushi Khurana
6. Human anatomy &physiology for nursing -Mahindra Kumar Anand & Meena Verma
7. Understanding human anatomy & physiology- William Davis (McGraw-Hill)
8. Histology- inderbir singh
9. Embryology: Langman's & inderbir singh
10. Human anatomy by B.D.Chaurasia's

MDT -002: Physiology (60 Hours) L/T/P/C:4/-/-/4

Learning Objectives

1. Understand normal body functions and homeostasis.
2. Learn renal physiology and fluid-electrolyte balance.
3. Study endocrine regulation affecting kidneys.
4. Understand mechanisms of urine formation and acid-base balance.

Learning Outcomes

1. Explain kidney function and regulation mechanisms.
2. Interpret fluid and electrolyte imbalances.
3. Analyze acid-base disorders in patients.
4. Apply physiological concepts in dialysis management.

Introduction to physiology: The cell and general physiology-Functional organization of the human body and control of the "Internal Environment"-Homeostasis-Regulation of body functions the cell and its function-Physical structure of the cell-Functional systems of the cell Genetic control of protein synthesis, cell function and cell reproduction-RNA- Cell differentiation

Temperature regulation: Body Temperature-Heat production & loss- role of hypothalamus-neuronal effectors mechanism-body temp-Behavior control-local skin temperature-Fever-Exposure to cold.

Nephro-Endocrinology Introduction to endocrinology The pituitary hormones and their control by the hypothalamus: The pituitary Gland and its relation to the hypothalamus – control of pituitary secretion by the hypothalamus – physiological functions of growth hormone – The posterior pituitary gland and its relation to the hypothalamus The thyroid metabolic hormones: Formation and secretion of the thyroid hormones – functions of the thyroid hormones in the tissues – regulation of thyroid hormone secretion – disease of the thyroid. The adrenocortical Hormones: Chemistry of Adrenocortical secretion – Functions of the mineralocorticoids-aldosterone – Functions of the glucocorticoids – The adrenal androgens – Abnormalities of adrenocortical secretion. Insulin, Glucagon and diabetes mellitus: Insulin and its metabolic effects Glucagon and its functions – somatostatin – hyperinsulinism. Parathyroid hormone, Calcitonin, calcium and phosphate metabolism, vitamin D, Bone and Teeth: calcium and phosphate in the extracellular fluid and plasma-function of vit D – Bone and its relationships to extracellular calcium and phosphates – parathyroid hormone – calcitonin – overall control of calcium Ion concentration – physiology of parathyroid and bone diseases

The Kidneys and Body Fluids

The body fluid compartments: extracellular and intracellular fluids interstitial fluid and Edema

a. Body fluid compartments
b. Constituents of extracellular and intracellular fluids
c. Osmotic equilibrium and fluid shifts between the extracellular and intracellular fluid
d. Changes in the volumes and osmolalities of the extracellular and Intracellular fluid compartments in abnormal states
e. Edema fluids in the potential spaces of the body

Formation of urine by the kidney: Renal Blood Flow, Glomerular filtration and their Control.

a. Physiologic anatomy of the kidney
b. Basic theory of nephron function
c. Renal blood flow and pressures
d. Glomerular filtration and the glomerular filtrate

e. Control of the glomerular filtration rate and renal blood flow
f. Reabsorption of fluid by the peritubular capillaries

Formation of urine by the kidney: Processing of the filtrate in the tubules

a. Effect of tubular load and tubular transport maximum on urine constituents
b. The concept of Plasma Clearance its use in assessing renal function

Renal associated mechanism for controlling extracellular fluid osmolality and sodium concentration.

a. The mechanism for excreting excess water: Excretion of a dilute urine
b. The mechanism for excreting excess solutes: The countercurrent mechanism for excreting a concentrated urine
c. Control of extracellular fluid osmolality and sodium concentration
d. Sodium excretion and its control by aldosterone

Renal regulation of Blood volume and extracellular fluid Volume: Excretion and regulation of urea, potassium, and other substances

a. control of blood volume
b. control of extra cellular fluid volume
c. urea excretion
d. Potassium excretion
e. Control of the extracellular concentrations of of the ions

Regulation of Acid-Base Balance

a. Function of Acid – Base Buffers
b. Respiratory regulation of Acid – Base balance
c. Renal control of Hydrogen Ion concentration
d. Clinical abnormalities of Acid-Base Balance

Renal Disease, Diuresis, and Micturition

a. Renal Disease
b. Renal Function tests
c. Diuretics and mechanisms of their actions
d. Micturition

References:

1. Guyton and Hall Textbook of Medical Physiology (Southeast Edition)
2. Principles of Physiology by Debasis Pramanik.
3. Review of Physiology by Soumen Manna.

4. Human Anatomy & Physiology for Nursing – Mahindra Kumar Anand & Meena Verm
5. Understanding Human Anatomy & Physiology – William Davis (McGraw Hill)
6. Anatomy & Physiology – Kaarna Muni Shekhar
7. Textbook of Physiology for BDS students - Dr Jain
8. Textbook of Physiology for BDS students – Dr Sambulingam
9. Handbook of Human Physiology – Vidya Ratan
10. Concise Medical Physiology – Sujith K Choudhari
11. Physiology- Ganong
12. Monoglam – Morby series- kidney – Bruce M.Koepen & Bruce A.Stanton
13. Anatomy and physiology in health and illness – Ross and Willson

MDT-003: Biochemistry (60 Hours) L/T/P/C:4/-/-/4

Learning Objectives

1. Understand metabolism of carbohydrates, proteins, and lipids.
2. Learn biochemical basis of renal function tests.
3. Study acid-base balance and electrolyte chemistry.
4. Understand biochemical changes in renal disorders.

Learning Outcomes

1. Interpret renal biochemical investigations (urea, creatinine).
2. Analyze metabolic disturbances in CKD patients.
3. Explain acid-base imbalance biochemistry.
4. Apply lab data in clinical decision-making.

1. Chemistry and metabolism of Carbohydrates
2. Chemistry and metabolism of Lipids
3. Chemistry and metabolism of proteins
4. Chemistry and metabolism of nucleic acids
5. Enzymes and vitamins, biological oxidation
6. Water and minerals
7. Hemoglobin chemistry and metabolism
8. Acid- Base balance
9. Renal functions tests (Renal function Formation and composition of urine–Specific gravity and pH, solids and 24-hour urine, abnormal constituents of urine- Glycosuria-

glycosuria, fructosuria, pentosuria, lactosuria, galactosuria. Proteinuria, Ketone bodies, Bile pigments and bile salts, Blood, porphyrins, Urinary lithiasis).

10. LFT
11. Detoxification
12. Hormones
13. Energy metabolism
14. Elements of Biochemical Genetics & Inborn errors of metabolism
15. Classification, mechanism of action of hormones regulating hormones calcium and phosphorous.
16. Regulation of pH of Blood and body fluids: Regulatory mechanisms, Renal Mechanism, Disturbances in acid-base balance, respiratory acidosis, respiratory alkalosis, metabolic acidosis, metabolic alkalosis, assessment of the acid-base balance, carbon-dioxide combining power of blood, alkali reserve, anion gap
17. Overview of estimation of serum creatinine, blood urea, serum electrolytes, 24 hrs. Urinary protein –Lab methods.

References

1. "Lehninger Principles of Biochemistry" by David L. Nelson and Michael M. Cox
2. "Biochemistry" by Jeremy M. Berg, John L. Tymoczko, and Lubert Stryer
3. "Harper's Illustrated Biochemistry" by Robert K. Murray, Daryl K. Granner, Peter A. Mayes, and Victor W. Rodwell
4. Harper’s Biochemistry – 26th edition
5. Text Book of Biochemistry – DM Vasudevan
6. Lippincott’s illustrated reviews – Biochemistry- Pamela C. Champey, Richard A Harvey.
7. Clinical Chemistry- Zilva, Philip Mayher
8. Clinical Diagnosis and Management by Laboratory Methods – 17th edition- Todd, Sanford – Henry
9. Biochemistry – Devlin.

MDT -004: Microbiology (60 Hours) L/T/P/C:4/-/-/4

Learning Objectives

1. To have the basic knowledge about the general characteristics of bacteria.
2. To understand the principles of immunology.
3. To learn about the application of Microbiology and Immunology in dialysis.

Learning Outcomes

1. Identify infection sources in dialysis settings.
2. Apply infection control protocols effectively.

3. Interpret microbiological reports.
4. Prevent hospital-acquired infections.

Theory:

1. Classification, Morphology, and nutritional requirements of bacteria.
2. Sterilization, disinfection, and antimicrobial agents.
3. Normal flora of human body, infection, sources, and modes of transmission of infection.
4. Immunity: Innate immunity, acquired immunity, humoral and cell mediated immunity.
5. Antigen, antibody & complement.
6. Structure and functions of immune system and immune response.
7. Hypersensitivity and transplant immunology.
8. Pyogenic cocci.
9. Aerobic and anaerobic spore bearers & Corynebacterium.
10. Mycobacteria.
11. Enterobacteriaceae, Pseudomonas & Vibrio
12. Spirochetes.
13. General properties of viruses.
14. Hepatitis, HIV & CMV.
15. Oncogenic viruses & antiviral drugs.
16. Opportunistic, parasitic, and fungal infections and Nosocomial infections.
17. Diagnostic microbiology: An approach to lab diagnosis of microbial infections.
18. Hospital infection- Causative agents, transmission methods, investigation, prevention, and control
19. Biomedical waste management

References

1. CP. Baveja. Textbook of Microbiology for nurses. Arya Publishing Company.
2. RL Ichhpujani, Rajesh Bhatia. Essentials of Medical Microbiology. Jaypee Brothers Medical Pub (p) Ltd.
3. Seema Sood. Microbiology for Nursing Students & Nurses. Elsevier India Pvt.Ltd.
4. Satish Gupte. Short Textbook of Medical Microbiology. Jaypee Brothers Medical Pub (p) Ltd.
5. CK Jayaram Paniker, Ananthanarayan R. Textbook of Microbiology for nurses. Publisher Universities Press (India) Limited.
6. B.S.Nagoba. Clinical Microbiology. Bi Publications Pvt Ltd.
7. Clint E Carter, Burton J Bogitsh, Thomas N Oeltmann. Human Parasitology. Publisher Elsevier India Pvt. Ltd.
8. Paniker – Medical Microbiology.
9. Textbook Medical Microbiology- Gupta.

MDT -005: Renal genetics and molecular biology (60 Hours) **L/T/P/C:4/-/-/4**

Learning Objectives

1. Understand genetic basis of renal diseases.
2. Learn molecular mechanisms of kidney disorders.
3. Study gene expression and mutations.
4. Explore role of molecular biology in nephrology research.

Learning Outcomes

1. Explain genetic causes of renal disorders.
2. Interpret molecular diagnostic tests.
3. Correlate genetics with disease progression.
4. Apply knowledge in research and advanced care.

1. Introduction, Cell, Cell Organelles, cell Cycle, and Cell division
2. Nucleic Acids – Structure, Function, and Chemical Properties, DNA, RNA
3. Introduction to Clinical Genetics, Glossaries, Genome Organization, Mutations: - Types, Pedigree analysis, Inheritance pattern, Genetic syndromes, and Inborn errors of metabolism
4. Genetics of Renal disorders, polycystic kidney, Hereditary nephropathy, Urinary tract malformation, Renal Stones, Renal transport disorder, and concept of Counseling
5. Introduction to Molecular Biology
    a. Concept
    b. Molecular Biology
6. Identification of the genetic materials
7. Chemical nature of genetic materials
8. Replication of DNA
9. Non-genetic ribonucleic Acid (RNA)and transcription
10. Genetic code
11. Protein synthesis
12. Regulation of gene action
13. Stem cell research: principles and application

References:

1. Molecular and Genetic Basis of Renal Disease E-Book: by David B. Mount, Martin R. Pollak · 2007
2. Kidney Development, Disease, Repair and Regeneration by Melissa Helen Little · 2015
3. ABC of Clinical Genetics, Third Edition, Helen M Kingston, Consultant Clinical

Geneticist,Regional Genetic Service, St. Mary's Hospital, Manchester, UK.
4. Practical Genetic Counseling: Peter S. Harper MA, DM, FRCP, Fifth Edition, Arnold Publishers.

MDT -006: Anatomy Practical (60 Hours) L/T/P/C:-/-/2/2

Learning Objectives

1. To understand human anatomical structures relevant to renal system.
2. To identify organs through models, specimens, and imaging.
3. To learn structural relationships of body systems.
4. To develop basic dissection and observation skills.

Learning Outcomes

1. Identify and describe renal and related anatomical structures.
2. Correlate anatomy with clinical dialysis procedures.
3. Demonstrate specimen handling and observation skills.
4. Apply anatomical knowledge in clinical settings.

Spotters:

- Identification of arteries.
- Identification of veins.
- Identification of organs.
- Identification of muscles of abdomen.
- Identification of vertebra, ribs and pelvis.

Discussion:

- Development of urogenital system.
- Histology of kidney, ureter, bladder and urethra.
- Male and female pelvis.

References

1. Bd Chourasia's Human Anatomy - 10Ed Vol 1 Regional and Applied Dissection And Clinical Upper Limb Thorax With Free Workbook And Ebooks (Pb 2025)
2. Netter's Atlas of Human Anatomy

MDT -007: Physiology Practical (60 Hours) **L/T/P/C:-/-/2/2**

Learning Objectives

1. To understand physiological functions of organs.
2. To perform basic physiological experiments.
3. To learn interpretation of physiological data.
4. To correlate theory with practical observations.

Learning Outcomes

1. Conduct and interpret physiological experiments.
2. Explain kidney functions and body fluid regulation.
3. Record and analyze experimental findings.
4. Apply physiological principles in patient care.

Hematology

1. Study of a compound microscope.
2. Estimation of hemoglobin (Shali"s Method)
3. Determination of Total erythrocyte (RBC) count
4. Determination of RBC indices or blood standards
5. Determination of total Leucocytes (WBC) count
6. Preparation of peripheral blood smear and determination of different leucocyte count
7. Determination of BT & CT
8. Determination of Blood group (A, B, C, & Rh system)
9. Determination of specific gravity of blood
10. Determination of osmotic fragility of RBC
11. Determination of ESR & PCV
12. Determination of platelet count, reticulocyte, absolute eosinophil count

Clinical examination

1. An introduction to clinical examination
2. Clinical examination of the abdomen
3. Clinical examination of the Respiratory system
4. Clinical examination of the CVS
5. Clinical examination of the NS

Cardio-Vascular System

1. Recording system arterial Blood Pressure
2. Effect of posture and exercise on Blood pressure
3. Measurement of blood flow by venous occlusion plethysmography

References

1. Textbook of Practical Physiology by G.K. Pal & Pravati Pal (Practical)
2. Manual of practical physiology – A.K.Jain

MDT -008: Biochemistry Practical (60 Hours) **L/T/P/C:-/-/2/2**

Learning Objectives

1. To understand biochemical processes in the body.
2. To perform laboratory tests (blood, urine analysis).
3. To learn use of biochemical instruments.
4. To interpret lab values clinically.

Learning Outcomes

1. Perform routine biochemical investigations.
2. Analyze renal function test results.
3. Operate lab equipment safely.
4. Correlate biochemical findings with diseases.

- Analysis of abnormal Urine
- Estimation of urea, creatinine, uric acid, Sugar. Cholesterol
- Demonstration – Agarose gel electrophoresis of Serum Protein, Arterial blood gas analysis

References

1. Principles and Techniques of Biochemistry and Molecular Biology" by Wilson and Walker
2. "Practical Textbook of Biochemistry for Medical Students" by DM Vasudevan:

MDT -009: Microbiology Practical's (60 Hours) **L/T/P/C:-/-/2/2**

Learning Objectives

1. To understand microorganisms related to infections.
2. To learn culturing and staining techniques.
3. To identify pathogens in clinical samples.
4. To study infection control practices.

Learning Outcomes

1. Perform microbiological techniques (staining, culture).
2. Identify common pathogens in dialysis settings.
3. Apply infection control measures.
4. Interpret microbiological reports.

1. Compound microscope.
2. Demonstration of sterilization equipment"s: hot air oven, autoclave, bacterial filters.
3. Demonstration of commonly used culture media, nutrient broth, nutrient agar, blood agar, chocolate agar, MacConkey medium, L J media, Robertson cooked meat media, Potassium tellurite media with growth, MacConkey medium with LF & NLF, NA with staph.
4. Anaerobic culture methods.
5. Antibiotic susceptibility test.
6. Demonstration of common serological tests: Widal, VDRL, ELISA.
7. Gram staining.
8. Acid fast staining.
9. Fungal Staining
10. Stool exam for helminthic ova & cysts.
11. Visit to hospital for demonstration of work done by infection control team and biomedical waste management department.

References

1. Practical Handbook of Microbiology by Lorrence H Green, Emanuel Goldman
2. Microbiology Practical Manual, 1st Edition-E-book by Amita Jain, Jyotsna Agarwal, Vimala Venkatesh
3. Practical Medical Microbiology for Clinicians by Frank E. Berkowitz, Robert C. Jerris · 2015

MDT -010: Residency - I (90 Hours) **L/T/P/C:-/2/-/2**

Learning Objectives

1. To gain comprehensive clinical exposure across multiple hospital departments related to dialysis therapy.
2. To develop practical skills in patient care, diagnostic support, and procedural assistance.
3. To understand multidisciplinary teamwork in managing renal and critical care patients.
4. To enhance professional behavior, communication skills, and ethical clinical practice.

Learning Outcomes

1. Demonstrate integrated clinical skills in patient care across various hospital settings.
2. Assist effectively in diagnostic, emergency, and surgical procedures related to renal care.
3. Collaborate efficiently with healthcare teams in delivering patient-centered care.
4. Apply clinical knowledge, technical skills, and professional ethics in real-world practice.

In the residency the professional is expected to work and contribute to the Dialysis Therapy unit. Areas to be Covered.

1. Blood Bank
2. PHC, CHC
3. OPD
4. Transplant Work Up
5. Emergency Medicine
6. Radiology
7. Psychiatric
8. Operation Theater for assisting in AVF, AVG Creation, Renal Transplantation and PD Catheterization

SEMESTER - 2

Course Code	Course	Result in Group (RG) #	Credit/ Week				Hours/ Semester			Attendance %	Continuous Internal assessment CIA- Theory/ Practical (a)	End Semester		Grand Total
			Lecture	Tutorial/ Clinical	Practical/ Research	Credits	Lecture	Practical/ Tutorial	Total Hours			Theory (b)	Practical/ Viva (c)	Theory: a+(b÷2) =100 Practical: a + c =100
MDT011	Renal Pathology	E	4	-	-	4	60	-	60	80	50	100	-	100
MDT012	Pharmacology	F	4	-	-	4	60	-	60	80	50	100	-	100
MDT013	Nephro-Immunology	G	3	-	-	3	45	-	45	80	50	100	-	100
MDT014	Research Methodology and Biostatistics		4	-	-	4	60	-	60	80	50	100	-	100
MDT015	Biophysics & Biomedical Instrumentation		2	-	1	3	30	30	60	80	50	100	-	100
MDT016	Elective Course (To be chosen by the student)		3	-	-	3	45	-	45	80	50	100	-	100
MDT017	Renal Pathology (Practical)	E	-	-	1	1	-	30	30	80	50	-	50	100
MDT018	Pharmacology (Practical)	F	-	-	1	1	-	30	30	80	50	-	50	100
MDT019	Nephro-Immunology (Practical)	G	-	-	1	1	-	30	30	80	50	-	50	100
MDT020	Residency - 2		-	3	-	3	-	135	135	80	100	-	50	100
Total			**20**	**3**	**4**	**27**	**300**	**255**	**555**		**500**	**600**	**200**	**1000**

MDT -011: Renal Pathology (60 Hours) L/T/P/C:4/-/-/4

Learning Objectives

1. Understand pathological changes in kidney diseases.
2. Study acute and chronic renal disorders.
3. Learn biopsy interpretation basics.
4. Correlate pathology with clinical findings.

Learning Outcomes

1. Identify pathological features of renal diseases.
2. Correlate symptoms with histopathology.
3. Interpret biopsy reports.
4. Support diagnosis and treatment planning.

1. Gross appearance, Histology of Kidney, outline and functions of kidney
2. Names of congenital anomalies and acquired cystic diseases
3. Broad outline of pathogenesis of Glomerular diseases. Immune mechanism- Types
4. Classification of glomerulonephritis – Names of the types with mention of pathogenesis

5. Clinical manifestation of glomerulonephritis
6. Glomerular lesions in systemic disease. List of disease and brief outline of lesions
7. Diseases affecting tubules and interstitium. Acute tubular necrosis etiology and clinical manifestations
8. Pyelonephritis and urinary tract infection. Etiology and clinical manifestations
9. Chronic pyelonephritis, reflux nephropathy. Etiopathogenesis and clinical manifestations
10. Drug and toxin induced nephropathy. Etiopathogenesis and clinical manifestation
11. Benign and malignant nephrosclerosis. Etiopathogenesis, clinical manifestation
12. Urolithiasis – Types of stones, pathogenesis
13. Obstructive uropathy. Etiopathogenesis clinical features
14. Acute renal failure
15. Chronic renal failure
16. Tumors of the kidney and urinary bladder classification (Names)
17. Urine analysis – Introduction
18. Physical
19. Chemical qualitative and quantitative
20. Urine analysis, Microscopic
21. Peripheral blood smear

References

1. Atlas of Renal Pathology by William F. Kern · 1999
2. Renal Pathology with Clinical and Functional Correlations - Volume 1 by C. Craig Tisher, Barry M. Brenner · 1989
3. Fundamentals of Renal Pathology by Agnes B. Fogo, Arthur H. Cohen, Robert B. Colvin · 2013
4. Text Book of Pathology - Harsh Mohan
5. Basic Pathology – pocket Robbins
6. Robbin's Basic pathology
7. Pathology illustration Macfarlare Reid, Callandra
8. Primer kidney Diseases – Arthur Green Berg
9. The Kidney – By Barry Brenner, Floyd
10. Clinical Dialysis, Dialysis Therapy- By Nissenson, Fine

MDT -012: Pharmacology (60 Hours) L/T/P/C:4/-/-/4

Learning Objectives

1. Understand drugs used in renal diseases.
2. Study pharmacokinetics in kidney failure.
3. Learn dialysis-related drug adjustments.

4. Understand adverse drug reactions.

Learning Outcomes

1. Select appropriate drugs for renal patients.
2. Adjust drug doses in dialysis patients.
3. Identify drug interactions and side effects.
4. Ensure safe medication practices.

General Pharmacological principle

1. Definitions, routes of drug administration
2. Pharmacokinetics
3. Pharmacodynamics
4. Adverse drug effects

Drugs acting on autonomic nervous system

1. ANS – general considerations
2. Cholinergic system and drugs
3. Anticholinergic drugs
4. Adrenergic system
5. Antiadrenergic Drugs

Autacoids

1. Analgesics
2. Opioid

1. Nonopioid
2. **Hormones**
3. **Steroids**
4. **Bronchodilators**

Central Nervous system

1. Local Anesthetics
2. General anesthetics
3. Ethyl and methyl alcohols
4. Sedative-hypnotics
5. Antiepileptic drugs
6. Drugs used in Mental illness

Cardiovascular drugs

1. Drugs affecting Renin- Angiotensin system and plasma kinins
2. Cardiac glycosides and drugs for CHF
3. Antiarrhythmic drugs
4. Antianginal drugs
5. Antihypertensive drugs
6. Diuret
   ics

Blood

1. Hematinic and erythropoietin
2. Drugs affecting coagulation, bleeding and thrombosis
3. Hypolipidemic drugs and plasma expanders

Gastrointestinal drugs

1. Drugs for constipation and diarrhea

Chemotherapy

1. Antimicrobial drugs: General consideration
2. Sulfonamides, clotrimazoles and quinolones
3. Beta lactam antibiotics
4. Tetracycline and chloramphenicol
5. Aminoglycoside antibiotics
6. Macrolide and other antibacterial antibiotics treatment of UTI
7. Antitubercular drugs
8. Antifungal drugs
9. Antiviral drugs
10. Anticancer drugs
11. Immuno suppressants, gene therapy,
12. Chelating agents
13. Vaccines

References

1. Katzung & Trevor's Basic & Clinical Pharmacology,
2. Rang & Dale's Pharmacology
3. Goodman and Gilman's The Pharmacological Basis of Therapeutics
4. Essence of Pharmacology by K.D. Tripathi
5. Pharmacology and Pharmacotherapeutics by Satoskar
6. Text book of Pharmacology for Allied Sciences – Padmaja Udaykumar
7. Pharmacology and pharmacotherapeutics – R.S.Sataskar.
8. Tripathi – Pharmacology
9. Medical Pharmacology – Padmaja Uday Kumar

MDT -013: Nephro-immunology (45 Hours) **L/T/P/C:4/-/-/4**

Learning Objectives

1. Understand immune mechanisms in renal diseases.
2. Study transplant immunology.
3. Learn hypersensitivity and autoimmune disorders.
4. Understand immune response in dialysis patients.

Learning Outcomes

1. Explain immune-related kidney disorders.
2. Interpret transplant rejection mechanisms.
3. Apply immunology in patient care.
4. Assist in immunotherapy management.

Nature of the Immune system

1. **Historical concepts and introduction to serological testing:**
   - Immunity and immunization
   a. Cellular verses humoral immunity
   b. Antigens and haptens
   c. Cells – mediated immunity
   - The Age of serology
   - Other historical developments

2. **Natural Immunity:**
   a. External defense system
   b. Internal defense system
      - Cellular Defense mechanism
      - Acute phase reactants
        - Inflammation
   c. Summary

3. **The lymphoid system:**
   a. Primary lymphoid organs
      - Bone marrow

- Bursa of Fabricius
- Thymus

b. Secondary lymphoid organ
   - Spleen
   - Lymph nodes
   - Other secondary organs

c. Surface marker on lymphocytes

d. Stages in B-cell differentiation
   - Pro-B cells
   - Pre– B cells
   - Immature B cells
   - Mature B cells
   - Activated B cells
   - Plasma cells

e. T cells Differentiation
   - Double– negative stage
   - Double positive stage
   - Mature T cells
   - Antigen activation

f. Third population or natural killer
   - Mechanism of cytotoxicity
   - Antibody– Dependent cell

g. Laboratory identification of lymphocytes
   - Fluorescence Microscopy
   - Cell flow cytometry
   - Other methods

h. Summary

4. Nature of Antigens and the MHC Complex

a. Factors influencing the immune response
b. Traits of Immunogens
c. Nature of epitopes
d. Haptens
e. Relationship of antigens to the Host
f. Adjuvants
g. Major Histocompatibility Complex
   - Genes coding for the HLA antigens
   - Class I Antigens
   - Class II antigens
   - Antigen presentation
   - MHC and Autoimmunity

5. Antibody structure and Function:

a. Tetra peptide structure of immunoglobulin
   - Cleavage with papain
   - Pepsin digestion

b. The Nature of Light Chains
c. Heavy chain sequencing
d. Antigen recognition unit
e. Hings region
f. IgG
g. IgM
h. IgA
i. IgD
j. Ige
k. Theories of antibody diversity
l. Genes coding for immunoglobin
m. Monoclonal antibody
n. Summary

6. Cell-Mediated Immunity
   a. Activation of T Helper cells
      - Adhesion Molecules
      - Specific Antigen recognition
      - Function of Interleukin-2
      - Triggering of Interleukin-1
      - T- Helper subsets
   b. Stimulation of B cells
   c. Activation of cytotoxic T cells
      - Role of cytokines in the inflammatory response
      - I-1, I-2, I-3, I-4, I-5, I-6, Other Interferon"s, TNF, other factors
   d. Laboratory determination of T lymphocyte function
   e. Summary

7. Complement:
   a. The classic pathway
      - The recognition unit
      - The activation unit
      - The membrane attacks
   b. The alternative pathway
   c. System controls
      - fluid phase regulators
      - cell – bound regulators
   d. Other cell membrane Receptors
   e. Biologic manifestation of complement activation
   f. Complement and Diseases states
   g. Complement Deficiencies
      - Paroxysmal Nocturnal Hemoglobinuria
      - Other complement
   h. Laboratory detection of complement abnormalities
   i. Summary

8. **Transplantation:**
   a. Review of MHC
   b. Transplantation
      - Descriptive terms
      - Graft rejection
      - Tissue matching
      - Types of tissues and organs transplanted
      - Prevention and treatment of rejections
      - Handson training in HLA typing

References

1. Oxford Textbook of Clinical Nephrology - Volume 1 by Neil Turner · 2016
2. Transplant Immunology by Xian C. Li, Anthony M. Jevnikar · 2015
3. Essential Immunology – Ivan Roitt
4. Clinical Immunology – Gupta
5. Text Book - KUBE

MDT -014: Research methodology and biostatistics (60 Hours) L/T/P/C:4/-/-/4

Learning Objectives

1. Understand research design and methodology.
2. Learn statistical tools for analysis.
3. Develop skills in data interpretation.
4. Understand ethical aspects of research.

Learning Outcomes

1. Design and conduct research studies.
2. Analyze data using statistical methods.
3. Interpret research findings.
4. Apply evidence-based practice.

Research methodology (30 hours)

Introduction

a. Meaning of research, Objectives of research, Types of research, Significance of research, Research Process, Criteria of research

Defining research problem

a. Selection of the problem, Necessity of defining the problem, Techniques in selecting a problem, Examples.

Research Design

a. Meaning of design, Need for a research design, Different research designs, Basics of experimental designs, Developing research plan.

Sampling Design

a. Sample and Universe, Sampling, Different methods of sampling, Selection of a random sample, Census and survey.

Measurement and scaling techniques

a. Measurement in research, Measurement tools, Scaling and scaling techniques.

Data collection

a. Methods of data collection, Questionnaire/schedule, Selection of appropriate method for data collection, Guidelines for constructing questionnaire, Guidelines for interviewing, Sample questionnaires

Data Analysis

a. Introduction to data analysis, Demo with SPSS software.

Dissertation/Reporting (report writing)

a. Technique of interpretation, Report writing/Dissertation writing, Steps in report writing, How to critique an article.

References

1. Essentials Of Biostatistics & Research Methodology by Indranil Saha, Bobby Paul · 2020
2. Biostatistics & Research Methodology by G Nageswara Rao · 2018 ·
3. Introduction To Biostatistics and Research Methods by P. S. S. Sundar Rao, J. Richard · 2012
4. Essentials Of Biostatistics & Research Methodology by Indranil Saha, Bobby Paul · 2020
5. Biostatistics: A Foundation for Analysis in the Health Sciences by Wayne W. Daniel, Chad L. Cross · 2018
6. Medical Biostatistics by Abhaya Indrayan, Rajeev Kumar Malhotra · 2017
7. Research Methodology Methods &Techniques (Second Edition) – C.R.Kothari
8. Research Methodology by Palaniswamy and Shanmugavel
9. Nair S K. Essential Research Methodology, Epidemiology and Biostatistics. In:

MDT -014: Biostatistics (30 hours)

1. Statistics: What is statistics – Importance of statistics in behavioral sciences – Descriptive statistics and inferential statistics – Usefulness of quantification in behavioral sciences.
2. Measurements – Scales of measurements – Nominal, Ordinal, Interval and Ratio scales.
3. Data collection – Classification of data – Class intervals – Continuous and discrete

measurements – Drawing frequency polygon – types of frequency polygon – Histogram – Cumulative frequency curve - Ogives – Drawing inference from graph.

4. Measures of central tendency – Need – types: Mean, Median, Mode – Working out these measures with illustrations.
5. Measures of variability – Need – Types: Range, Quartile deviation, Average deviation, Standard deviation, Variance – Interpretation.
6. Normal distribution – General properties of normal distribution – Theory of probability – illustration of normal distribution – area under the normal probability curve.
7. Variants from the normal distribution – skewness – Quantitative measurement of skewness – kurtosis – measurement of kurtosis – factors contributing for non-normal distribution.
8. Correlation – historical contribution – meaning of correlation – types: - Rank correlation, Regression analysis.
9. Tests of significance- need for – significance of the mean – sampling error- significance of differences between means – interpretation of probability levels – small samples – large samples - Inferential statistics – Parametric & Non parametric methods – Elements of multivariate analysis

References

1. ShobhaTandon, editor. Text Book of Pedodontics, 2~ ed. Hyderabad: Paras Publishing;
2. Armitage P, Berry G. Statistical methods in medical research, 3rd ed. London: Blackwell Scientific Publications; 1994.
3. Daniel W W. Biostatistics: A foundation for analysis in health sciences, 2nd ed. New York; John Wiley and Sons, 1987
4. Primer of Bio-statistics by Stanton A. Glantz
5. Statistics in Medicine, II edition by R.H. Riffen Burgh
6. Sundar Rao P and Richard J. Introduction to Biostatistics: A Manual for Students in
7. Health Sciences. Prentic-Hall of India Pvt. Ltd, New Delhi.
8. Mahajan BK. Methods in Biostatistics for medical students and research workers. 6th Edition, Jaypee Brothers Medical Publishers, New Delhi, 1997

MDT -015: Biophysics and biomedical instrumentation (30 Hours) L/T/P/C:2/-/1/3

Learning Objectives

1. Understand principles of medical physics.
2. Learn working of dialysis machines.
3. Study biomedical equipment safety.
4. Understand water treatment systems.

Learning Outcomes

1. Operate dialysis equipment safely.
2. Troubleshoot machine-related issues.
3. Ensure equipment maintenance.
4. Apply physics principles in dialysis.

Part A Biophysics (15 hours)

1. Properties of matter

2. Membranes

3. Cells, structure of cells, structure of membranes, membrane transport processes, electrical properties of membranes - Structure & Properties of Ion Channels Voltage, Patch Clamp Tech –Synaptic Transmission- NMJ – Signal Transduction – Signaling – Second Messenger – Neural Network–Ion Channels in Brain Pathology.

4. Biophysics of nerve transmission

5. Membrane potential and its origin, membrane conductance, resistance and capacitance, action potentials, ionic basis of resting membrane potential and action potentials, synaptic transmission, electrophysiological basis for E.E.G., E.C.G & E.M.G recordings, evoked potential sand conduction velocity

6. Biophysics of the cardiovascular system

7. Basic principles of fluid dynamics, hemodynamics, introduction to principles of electrocardiography & vector cardiography

8. Biophysics of respiration

9. Mechanics of breathing, lung compliance, airway resistance and their measurement, surface tension& surfactants, partial pressure of gases, principles of gas exchange, measurement of blood gases, pulmonary function tests.

10. Biophysics of renal function

11. Diffusion, filtration, physical basis for ion, solute and water movement, dialysis, renal function tests.

12. Radiation biophysics

13. Introduction to nuclear physics and radioactivity, biological effects of radiation, radiation detection and measurement, radioisotopes and their uses.

14. Biophysical techniques

15. Introduction to microscopic techniques, introduction to spectroscopic techniques, introduction to imaging techniques, introduction to techniques in biophysical chemistry.

References

1. Introduction to Biomedical Instrumentation: The Technology by Barbara Christe · 2009
2. Physiology, Biophysics, and Biomedical Engineering by Andrew Wood · 2016
3. Medical Instrumentation- Application and design by John G. Webster
4. Introduction to Biomedical equipment technology by Joseph J. Carr
5. Principles of Applied Biomedical Instrumentation by L.A. Geddes
6. Dialysis Technology – A Manual for Dialysis Technicians by Jim Curtis, Philip Varughese.
7. Introduction to Biomedical Equipment Technology by Joseph J.Carr, John m. Brown

MDT -015: Part B- Biomedical instrumentation (15 hours)

1. **Introduction to Biomedical Instrumentation**
   a. The Age of Biomedical Engineering
   b. Development of BM instrumentation
   c. Biometrics
   d. Introduction to the man-instrument system
   e. Components of the man-instrument system
   f. Physiological systems of the body
   g. Problems encountered in measuring a living system.
   h. Some conclusions
   i. The objectives of this book

2. **Basic Transducer principles:**
   a. The transducer and transduction principles
   b. Active transducers

c. Passive transducers
d. Transducers for Biomedical applications

3. **Sources of Bioelectric potentials:**
   a. Resting and action potentials
   b. Propagation of Action potentials
   c. The Bioelectric potentials

4. **Electrodes**
   a. Electrode theory
   b. Biopotential electrodes
   c. Biochemical transducers

5. **The computer in Biomedical Instrumentation:**
   a. The digital computer
   b. Computer Hardware
   c. Computer software

Microprocessors

a. Types of microprocessors
b. Microprocessors in Biomedical Instrumentation
   - Calibration
   - Table lookup
   - Averaging
   - Formatting and printout

Interfacing the computer and medical instrumentation and other equipment.

a. Digital interfacing requirement
b. Analog-to-digital and Digital-to-Analog conversion

Biomedical computer application

a. Data acquisition.
b. Storage and retrieval
c. Data reduction and transformation
d. Mathematical operation
e. Pattern recognition
f. Limit detection
g. Statistical analysis of data
h. Data presentation

i. Control function
- Computer analysis of the ECG
- The digital computer in the clinical chemistry laboratory.
- Digital computerized in hemodialysis machine
- Other computer application

6. **Electrical safety of Medical Equipment.**
   a. Physiological effects of electrical current.
   b. Shock hazards from electrical equipment.
   c. Methods of accident prevention
      - Grounding
      - Double insulation
      - Protection by low voltage
      - Ground – fault circuit interrupter
      - Isolation of patient – connected parts
      - Isolated power distribution systems

7. **Patient care and monitoring:**
   a. The elements of intensive – care monitoring - Patient monitoring displays
   b. Diagnosis, calibration and repairability of patient – monitoring equipment
   c. Other instrumentation for monitoring patients
   d. The organization of the hospital for patient care monitoring
   e. Defibrill

ator

Table of Contents

1. **Description of Machine Functions and Malfunction**
   a. Description of the T1Test
   b. Function description of the modules
   c. Function description of the hydraulic unit

2. **Technical safety checks and maintenance**
   a. General notes
   b. Technical safety checks and maintenance procedures
   c. VDE test 4008E, 4008H
   d. VDE test 4008B,4008S
   e. TSC and maintenance checklist

3. **Adjustment**
   a. OVERVIEW of the Dip switches in the 4008E
   b. Calibration mode

c. Hydraulics
d. Dir detector

4. **Calibration Program**

5. **Diagnostics Program**
   a. General notes
   b. Menu structure
   c. Reading the analog inputs of CPU
   d. Reading the digital inputs of CPU
   e. Writing the analog outputs of CPU
   f. Writing the digital outputs of CPU
   g. Writing/ Reading the digital output of CPU

6. **Setup Menu**
   a. Overview
   b. Main menu

7. **Miscellaneous**

8. **Circuit diagram and circuit description**
   a. Block diagram
   b. Ac diagram 4008E/H
   c. AC diagram 4008B/S
   d. Block diagram of voltage supply Block diagram of screen 4008H/S
   e. Connection layout diagram
9. **P.C.B. LP**
10. **BASICS**
    1. Basics in Electricity
       - Charge
       - AC & DC
       - Voltage, Current, Resistance, Capacitance & Inductance
       - Electrical Shock hazard including Leakage currents
       - Voltage stabilizer and Uninterrupted power supply
    2. Basics in Electronics
       - Semiconductions
       - Rectification, Amplification, Oscillation & switching
       - Digital Electronics
       - Microprocessor & micro controllers
       - Memory [RAM, ROM, EPROM]
    3. Operating microscopy, Lab microscopy, Electron microscope

4. General instrumentation for OT

References

1. Introduction to Biomedical Instrumentation: The Technology by Barbara Christe · 2009
2. Physiology, Biophysics, and Biomedical Engineering by Andrew Wood · 2016

MDT -015: Biomedical instrumentation Practical (30 Hours)

1. AC, DC
2. Measurement of Resistance, capacitance, Inductance
3. Measurement of Leakage of current
4. Amplification, Solid state, Digital
5. Trouble shooting equipment failure

References

1. Introduction to Biomedical Instrumentation: The Technology by Barbara Christe · 2009
2. Physiology, Biophysics, and Biomedical Engineering by Andrew Wood · 2016

MDT -016

Basic course in entrepreneurship (45 Hours) (Elective Course) **L/T/P/C:3/-/-/3**

LEARNING OBJECTIVES:

- To understand the fit between you and your entrepreneurial ambitions
- To find a problem worth solving
- To identify your customers
- To develop a solution for your customers' problems and problem solution
- To build and demonstrate an MVP
- To structure a business model around the problem, customer, and solution and present your Business Model Canvas

1. ORIENTATION

What is entrepreneurship – myths about entrepreneurship – impact of an entrepreneur and social entrepreneurship – wealth building and making an impact

IDEA/PROBLEM

What is a business opportunity and how to identify it - Methods for finding and understanding problems - (Observation, Questioning, DT, Jobs to be done (JTBD) - Introduction to Design Thinking - Process and Examples - Generate ideas that are potential solutions to the problem identified

2. CUSTOMER

The difference between a consumer and a customer (decision maker); Market Types, Segmentation and Targeting, Defining the personas; Understanding Early Adopters and Customer Adoption Patterns - Identify the innovators and early adopters for start-up - Basics of Lean Approach and Canvas; Types of Business Models (b2b; b2c)

3. BUSINESS MODEL AND VALIDATION

Introduction to Risks; Identify and document your assumptions (Hypotheses); Identify the riskiest parts of Plan - Develop the Solution Demo - Sizing the Opportunity - Building an MVP (Minimum Viable Product)

4. MONEY AND TEAM

Revenue Streams: Basics of how companies make money - Understand income, costs, gross and net margins - Identify primary and secondary revenue streams - Pricing and Costs - Financing Your New Venture - Team Building: Role of a good team in a venture's success; What to look for in a team; How do you ensure there is a good fit? Defining clear roles and responsibilities

5. MARKETING AND SALES

Positioning – channels and strategy – sales planning – Importance of project management to launch and track progress - Understanding time management, workflow, and delegation of tasks– Business regulation: Basics of business regulations of starting and operating a business

- Importance of being compliant and keeping proper documentation.

Basics of Hospital Management (45 Hours) (Elective Course) L/T/P/C:3/-/-/3

1. **Introduction to hospitals, functions, and managerial aspects of Hospitals Evolution of hospitals and the concept of modern hospital**

    a. Explain how hospitals originated and transformed itself throughout history.
    b. What is the role of hospitals in healthcare?
    c. Explain health delivery system in India
    d. Explain the types of hospitals and how modern hospitals are planned

2. **General functions of hospital store management Material management and Inventory control**

   a. Define basic concepts of material management.
   b. List the functions of hospital stores
   c. Explain the types of indents during the procurement process
   d. Explain various inventory management techniques

3. **Analysis of Hospital Organization**

   1. **Administration of Clinical and nonclinical services**

      a. Explain OPD and Inpatient services
      b. Interpret on hospital pharmacy services
      c. Explain Emergency Services
      d. Outline the services of Transport department in the hospital
      e. Explain Intensive Care Unit (ICU)
      f. Outlines the services of Operation Theater in the hospital
      g. Explain the various Radiological Services in the hospital
      h. Explain the Dialysis services in a hospital
      i. Explain biomedical waste management in hospital
      j. Explain the functions of CSSD & Medical gas supply
      k. What are the various Committees in hospital
      l. Outline the services of blood bank in a hospital
      m. Explain the Disaster management in a hospital

4. **Public relation and Laws in Hospital administration public relation and Laws**

   a. Explain different laws in hospital administration like, COPRA, PCPNDT ACT, POCSO ACT and RTI etc
   b. Explain the roles and responsibilities of public relations in hospital
   c. List out the various risk involved in patient care
   d. Explain the elements of disaster management
   e. Plan for a Mock drill during a disaster strike in a hospital

5. **Managerial Economics**

   Cost-benefit analysis, Cost effectiveness analysis, cost utility analysis

   a. Explain cost analysis
   b. Explain cost effectiveness
   c. Explain cost utility

Break even analysis

a. Break even analysis of CT scan
b. Break even analysis of dialysis machine

6. NABH Accreditation

a. Explain NABH accreditation as quality management

7. Strategic Management Tools

a. Explain strategic management tools

8. Staffing Principles

a. Explain Staffing

MDT -017: Renal Pathology Practical's (30 Hours) **L/T/P/C:-/-/1/1**

Learning Objectives

1. To study pathological changes in kidney diseases.
2. To examine tissue samples and slides.
3. To understand disease mechanisms.
4. To correlate pathology with clinical conditions.

Learning Outcomes

1. Identify pathological changes in renal tissues.
2. Interpret histopathological findings.
3. Correlate pathology with symptoms and diagnosis.
4. Assist in clinical evaluation of renal diseases.

1. Gross appearance, Histology of Kidney, outline and functions of kidney congenital anomalies and acquired cystic diseases
2. pathogenesis of Glomerular diseases. Immune mechanism- Types
3. Clinical manifestation of glomerulonephritis
4. Glomerular lesions in systemic disease
5. Pyelonephritis and urinary tract infection
6. Drug and toxin induced nephropathy
7. Benign and malignant nephrosclerosis
8. Urolithiasis
9. Obstructive uropathy.
10. Acute renal failure
11. Chronic renal failure

12. Tumors of the kidney and urinary bladder
13. Urine analysis
14. Peripheral blood smear

References

1. Atlas of Renal Pathology by William F. Kern · 1999
2. Renal Pathology with Clinical and Functional Correlations - Volume 1 by C. Craig Tisher, Barry M. Brenner · 1989
3. Fundamentals of Renal Pathology by Agnes B. Fogo, Arthur H. Cohen, Robert B. Colvin · 2013

MDT -018: Pharmacology Practical's (30 Hours) L/T/P/C:-/-/1/1

Learning Objectives

1. To understand drugs used in dialysis and renal care.
2. To learn dosage calculation and administration.
3. To study drug interactions and effects.
4. To develop safe medication practices.

Learning Outcomes

1. Administer drugs safely under supervision.
2. Calculate accurate drug dosages.
3. Identify adverse drug reactions.
4. Apply pharmacological knowledge in dialysis care.

1. Administration of Erythropoiesis stimulating agents (ESA)
2. IV Iron Preparation
3. Vitamin supplements
4. Crystalloids & Colloids
5. Inotropic drugs
6. Anti-pyretic drugs
7. Anti-emetic drugs
8. Heparin, LMWH and Tri-sodium citrate, Regional Anticoagulation
9. Chemicals used in dialysis unit
10. PD fluids

11. Dialysis & CRRT solutions
12. Emergency Drugs used in Dialysis

References

1. Katzung & Trevor's Basic & Clinical Pharmacology,
2. Rang & Dale's Pharmacology
3. Goodman and Gilman's The Pharmacological Basis of Therapeutics
4. Essence of Pharmacology by K.D. Tripathi
5. Pharmacology and Pharmacotherapeutics by Satoskar
6. Text book of Pharmacology for Allied Sciences – Padmaja Udaykumar

MDT -019: Nephro-immunology Practical's (30 Hours) L/T/P/C:-/-/2/1

Learning Objectives

1. To understand immune responses in renal diseases.
2. To learn immunological testing methods.
3. To study transplant immunology basics.
4. To correlate immunity with kidney disorders.

Learning Outcomes

1. Perform basic immunological tests.
2. Interpret immune-related lab results.
3. Understand rejection mechanisms in transplantation.
4. Apply immunology concepts in patient care.

Nature of the Immune system

1. serological testing
2. Immunity and immunization
3. The lymphoid system:
4. Laboratory identification of lymphocytes
    - Fluorescence Microscopy
    - Cell flow cytometry
    - Other methods
5. Genes coding for the HLA antigens
6. Laboratory determination of T lymphocyte function
7. Laboratory detection of complement abnormalities
8. Handson training in HLA typing

References

1. Oxford Textbook of Clinical Nephrology - Volume 1 by Neil Turner · 2016
2. Transplant Immunology by Xian C. Li, Anthony M. Jevnikar · 2015

MDT -020: Residency –II (135 Hours) L/T/P/C:-/3/-/3

Learning Objectives

1. To gain intermediate-level clinical exposure in various departments related to dialysis therapy.
2. To develop practical skills in patient care, diagnostic assistance, and procedural support.
3. To understand multidisciplinary coordination in managing renal and critical care patients.
4. To enhance clinical competence, communication skills, and professional ethics.

Learning Outcomes

1. Demonstrate improved competency in handling patients in dialysis-related clinical settings.
2. Assist effectively in diagnostic, emergency, and surgical procedures.
3. Coordinate with healthcare teams across departments for patient management.
4. Apply clinical knowledge, technical skills, and ethical practices in real-world scenarios.

In the residency the professional is expected to work and contribute to the Dialysis Therapy unit. Areas to be Covered.

1. Blood Bank
2. PHC, CHC
3. OPD
4. Transplant Work Up
5. Emergency Medicine
6. Radiology
7. Psychiatric
8. Operation Theater for assisting in AVF, AVG Creation, Renal Transplantation and PD Catheterization

SEMESTER - 3

Course Code	Course	Result in Group (RG) #	Credit/ Week				Hours/ Semester			Attendance %	Continuous Internal assessment CIA- Theory/ Practical (a)	End Semester		Grand Total
			Lecture	Tutorial/ Clinical	Practical/ Research	Credits	Lecture	Practical/ Tutorial	Total Hours			Theory (b)	Practical/ Viva (c)	Theory: a+(b÷2) =100 Practical: a + c =100
MDT021	Renal Disease	H	4	-	-	4	60	-	60	80	50	100	-	100
MDT022	Emergency Medicine and Renal Nutrition& Dietetics	I	3	-	-	3	45	-	45	80	50	100	-	100
MDT023	Nephro- Radiology and Imaging sciences	J	4	-	-	4	60	-	60	80	50	100	-	100
MDT024	Renal Disease (Practical)	H	-	-	1	1	-	30	30	80	50	-	50	100
MDT025	Emergency Medicine and Renal Nutrition & Dietetics (Practical)	I	-	-	1	1	-	30	30	80	50	-	50	100
MDT026	Nephro- Radiology and Imaging sciences (Practical)	J	-	-	1	1	-	30	30	80	50	-	50	100
MDT027	Residency - 3		-	5	-	5	-	225	225	80	100	-	-	100
MDT028	Seminar on Dissertation		-	-	3	3	-	90	90	80	100	-	-	100
Total			11	5	6	22	165	405	570		500	300	150	800

MDT-021: Renal diseases (60 Hours) L/T/P/C:4/-/-/4

Learning Objectives

1. Understand types of renal diseases.
2. Study CKD and acute kidney injury.
3. Learn clinical presentation and diagnosis.
4. Understand management strategies.

Learning Outcomes

1. Identify different renal disorders.
2. Interpret diagnostic findings.
3. Assist in patient management.
4. Monitor disease progression.

1. **Patient Assessment**
   a. Physical Diagnosis
   b. Urinalysis/ BUN, Creatinine
   c. Measurement of Glomerular Filtration Rate
   d. Measurement of Urinary Protein
   e. Renal Imaging Techniques
   f. Renal Biopsy
   g. Indications for Dialysis
   h. Drug Therapy in Renal Disease

2. **Clinical Syndromes**
   a. Acute Glomerulonephritis/Acute interstitial nephritis
   b. Nephrotic syndrome
   c. Etiology, Pathophysiology, and Diagnosis of Acute Renal Failure
   d. Management of Acute Renal Failure
   e. Obstructive Uropathy
   f. Asymptomatic Proteinuria
   g. Asymptomatic Hematuria
   h. Rapidly Progressive Glomerulonephritis
   i. Nephrolithiasis
   j. Urinary Tract Infection
   k. Disorders of Tubular Function

3. **Primary Glomerular Disease**
   a. Minimal Change Disease
   b. Focal Segmental Glomerulosclerosis
   c. Membranous glomerulopathy
   d. IgA Nephropathy
   e. Membranoproliferative Glomerulonephritis

4. **Secondary Glomerulonephritis**
   a. Diabetic Nephropathy
   b. Lupus nephritis
   c. Post infectious glomerulonephritis
   d. Hepatitis-Associated Glomerulonephritis
   e. HIV-Associated Renal Disorders

5. **Other parenchymal renal diseases**
   a. Renal Dysplasia
   b. Cystic Diseases of the Kidneys
   c. Other hereditary renal diseases
   d. Reflux Nephropathy
   e. Renal Vasculitis
   f. Other Vascular Renal Disorders
   g. Sickle Cell Nephropathy
   h. Renal Disease due to dysproteinemias

6. **Renal Diseases in Pregnancy**
   a. Hypertension-Essential
   b. PIH/Eclampsia
   c. HELLP Syndrome
   d. ARF in pregnancy
   e. Lupus in Pregnancy
   f. Postpartum HUS

7. **Toxic Nephropathy**
   a. Drugs: Aminoglycosides/NSAIDS/Antineoplastic drugs
   b. Radiocontrast
   c. Heavy metals- Lead, Mercury, Cadmium.
   d. Alternative medicine
   e. Snakebite–venom
   f. Drug overdose- Barbiturates, Diazepam, Beta Blockers

8. **Tropical Diseases related to Kidney**
   a. Malaria
   b. Filariasis
   c. HANSENS Diseases
   d. Leptospirosis
   e. Dengue
   f. Leishmaniasis

9. **Geriatric Kidney Diseases**
   a. Aged kidney
   b. Hypertension
   c. Atherosclerotic Kidney Diseases

10. **Chronic Kidney Diseases**
    a. KIDOQI Guidelines of definition, grading and management
    b. Epidemiology and outcomes of End-Stage Renal Diseases
    c. Uremic toxins
    d. Pathophysiology of Chronic Kidney Diseases
    e. Renal Osteodystrophy
    f. Renal Anemia
    g. Other manifestations of Uremia
    h. Malnutrition
    i. Risk factors– (Traditional and non-traditional) For Cardiovascular mortality in ESRD patients

11. **Hypertension**
    a. Essential Hypertension
    b. Renal parenchymal hypertension
    c. Renovascular Hypertension
    d. Pheochromocytoma
    e. Other Causes of Secondary Hypertension
    f. Hypertensive Emergencies

g. Childhood Hypertension

12. Acid-Base and Electrolyte Disorders

a. Metabolic Acidosis
b. Metabolic Alkalosis
c. Respiratory Acidosis
d. Respiratory Alkalosis
e. Hyponatremia and Hypernatremia
f. Hypokalemia and Hyperkalemia
g. Hypocalcemia and Hypercalcemia
h. Phosphorus
i. Magnesium

13. Approach to Patient with Renal Failure

a. Manifestations of renal failure:
b. Systemic consequence of renal failure Alterations in following including signs, symptoms etiology &management.
c. Uremia
d. Fluid balance
e. Electrolyte and ion balance (sodium, potassium, calcium, phosphate, Magnesium, hydrogen, bicarbonate, aluminum)
f. Cardiovascular system (Hyperkalemia, Hypertension, Pericarditis, Pericardial effusion, Pericardial tamponade)
g. Respiratory system
h. Gastrointestinal system
i. Hematological system (Anemia, Platelet dysfunction)
j. Endocrine function
k. Neuromuscular function & sleep problems
l. Skeletal system
m. Psycho-social function
n. Dermatological manifestations

14. End-Stage Renal Disease Management

a. Technical Aspects of Hemodialysis
b. Hemodialysis: Assessing Adequacy
c. Complications of Hemodialysis
d. Technical Aspects of Peritoneal Dialysis
e. Complications of Peritoneal Dialysis

15. Contraindications for Dialysis (Including PD)

a. Alzheimer‟s Disease
b. Multi-infract denaturation.
c. Hepatorenal syndrome
d. Advanced cirrhosis with encephalopathy
e. Advanced malignancy etc.

References

1. Management of Chronic Kidney Disease: A Clinician's Guide by Mustafa Arici · 2014
2. ABC of Kidney Disease by David Goldsmith, Satish Jayawardene, Penny Ackland · 2013
3. Chronic Kidney Disease: from Pathophysiology to Clinical by Thomas Rath · 2018
4. Kidney- Electrolyte Disorders- Chan, Gill
5. Clinical Physiology of Acid- Base and Electrolyte Disorder-Rose
6. Primer kidney Diseases – Arthur Green Berg
7. The Kidney – By Barry Brenner, Floyd

MDT -022: Emergency medicine, ACLS and Renal Nutrition & Dietetics (45 Hours)

L/T/P/C:3/-/-/3

Learning Objectives

1. Understand renal emergencies.
2. Learn nutritional requirements in CKD.
3. Study fluid and diet management.
4. Understand emergency interventions.

Learning Outcomes

1. Manage dialysis-related emergencies.
2. Plan diet for renal patients.
3. Monitor nutritional status.
4. Provide supportive emergency care.

BLS

1. **BLS in perspective**
   a. The need for medical interventions
   b. The ultimate Coronary Care Unit
   c. Emergency Cardiac Care

d. The chain of Survival
e. Role of the American Heart Association

2. **Cardio Pulmonary Function and actions for survival**
   a. The Cardiovascular and Respiratory system
   b. Action for survival

3. **Risk factors and prudent Heart living**
   a. Risk factors for Heart Attack
   b. Prudent Heart Living
   c. Summary: The role of Prevention

4. **Adult BLS**
   a. Citizen response to Cardio-pulmonary Emergency
   b. Indication for BLS
   c. The sequence of BLS; Assessment, EMS activations and the ABC of CPR
   d. CPR performed by one rescuer and two rescuers
   e. Foreign – Body airway obstruction Management
   f. CPR: The Human Dimension
   g. BLS Research Initiative

5. **Special Resuscitation Situation**
   a. Stroke
   b. Hypothermia
   c. Near – Drowning
   d. Cardiac arrest associated with Trauma
   e. Electric shock and lightning stroke
   f. Pregnancy
   g. Asphyxiation
   h. Special techniques and pitfalls and complication
   i. Unique situation

6. **Pediatric BLS**

a. Epidemiology
b. Injury prevention
c. Prehospital care
d. The sequence of Pediatric BLS - the ABC of CPR
e. Activation of the EMS system obstructive
f. Foreign Body airway
g. BLS in Trauma

7. **Ethical and Legal considerations**
   a. Values in Decision Making
   b. Instituting and Discontinuing CPR
   c. Legal mandates
   d. Conclusions

8. **Safety during CPR Training and actual rescue**
   a. Disease transmission during CPR Training
   b. Disease transmission during actual performance of CPR

9. **Automated External Defibrillation**
    a. Importance of Automated External Defibrillation
    b. Overview of Automated External Defibrillation
    c. Advantage and Disadvantage of Automated External Defibrillation
    d. Use of Automated External Defibrillation during Resuscitation attempts
    e. Automated External Defibrillation treatment algorithm
    f. Post resuscitation care
    g. Training
    h. Maintenance of Skills
    i. Medical control
    j. Quality assurance

ACLS

1. **Cardiopulmonary Resuscitation and Advanced Cardiac Life Support**
    a. Basic Life Support
    b. General Considerations of Advanced Cardiac Life Support: Arrhythmia recognition and defibrillation-ventilation and airway management-route of drug administration-IV fluids-diagnose and correct the underlying cause of the arrest- internal cardiac compression-initiation and discontinuation of resuscitation.
    c. Specific Arrest Sequences in Advanced Cardiac Life Support: VF and Pulseless VT – Systole-Bradycardia-Pulseless electrical activity (PEA)-Tachycardias
    d. Post resuscitation Management
    e. Common Medications Used in Advanced Cardiac Life Support: Epinephrine-Atropine Sulfate-Lidocaine-Procainamide hydrochloride- Bretylium tosylate- magnesium sulfate-adenosine-Diltiazem or verapamil-Isoproterenol-Sodium Bicarbonate-Calcium

2. **Critical Care**
    a. Respiratory Failure: General considerations-pathophysiology-Blood gas analysis
    b. Oxygen therapy: Nasal prongs-venturi masks-Nonrebreathing masks-A continuous positive airway pressure mask-Bilevel positive airway pressure
    c. Airway Management and Tracheal Intubation: Airway Management-Endotracheal Intubation-Surgical airways
    d. Mechanical Ventilation: Indications-Initiation of mechanical ventilation-Management of problems and complications-Weaning from mechanical ventilation-Drugs commonly used during endotracheal intubation and mechanical ventilation
    e. Shock: Resuscitative Principles-Individual shock states
    f. Hemodynamic Monitoring and Pulmonary Artery Catheterization: Indications- obtaining a pulmonary capillary wedge tracing-acceptance of PAOP readings- transmural pressure-Cardiac Output-Interpretation of hemodynamic readings

3. **Cardiac Arrhythmias**
    a. Recognition and Management: Clinical diagnosis of arrhythmias-Electrocardiographic data-Bradyarrhythmia"s-premature complexes-Tachycardia-

b. Antiarrhythmic Drug Therapy: General Principles-Antiarrhythmic agents
c. Related Topics: Syncope-Electro-Cardioversion-Cardiac Pacing-Anti-tachycardia devices

References

1. Oxford Handbook of Emergency Medicine by Jonathan P. Wyatt, Robin N. Illingworth, Colin A. Graham · 2012
2. Clinical Emergency Medicine by Scott C. Sherman, Joseph W. Weber, Michael Schindlbeck · 2014
3. Textbook of Emergency Medicine Suresh David · 2011
4. Clinical Approach Emergency Medicine – Robert, Hedges
5. Critical care – Civetta, Taylor, Kirby
6. Clinical protection of anaesthesia – Miller
7. Clinical Dialysis, Dialysis Therapy- By Nissenson, Fine
8. Clinical Approach Emergency Medicine – Robert, Hedges
9. Critical care – Civetta, Taylor, Kirby
10. Clinical protection of anaesthesia – Miller

MDT- 022: Renal Nutrition and Dietetics

1. **Part I: Foods and food groups**
   Cereals, Pulses, Fruits and Vegetables, Milk and Milk Products, Nits and oils seeds, non- Vegetarian foods, Beverages, Alcohol

2. **Part II: Energy and nutrients**
   Carbohydrates, Fats, Proteins, Fat Soluble Vitamins, Water Soluble Vitamins, Minerals (Na, K, Fe, Ca, P, Mg, Mn, I, Cu, Co, Chloride, Fluoride) Dietary Fiber and Water.

3. **Part III: Nutrition Management**

   1. Nutrition Through Life Cycle
      Pregnancy and lactation, Pediatrics, Geriatrics, Athletes.

   2. Clinical Dietetics
      Hospital diets Nutritional management for the following:

   Under Nutrition (PEM), Over nutrition, Anemia, GI disorders, Hepatic, Renal, Cardiac/ HTN, Diabetes mellitus, Gout, Enteral Nutrition, Parenteral Nutrition.

4. **Part IV: Nutritional Assessment**
   1. **Anthropometry**
      a. Methods, Interpretation, Limitation
      b. Growth and Body Composition (Fat mass and Free fat mass)

2. **Biochemical Markers of Nutritional Status**
    a. Physical Examination
    b. Medical History

3. **Evaluation of Nutrient intake data**
    a. Table of RDA
    b. Evaluation of Nutrient intake of individual
    c. Evaluation of Nutrient intake for a Population Introduction

4. **Introduction**
    a. Nutritional assessment system
    b. Methods used in nutritional assessment
    c. The design of nutritional assessment system
    d. Evaluation of nutritional assessment indices
        i. Reference distribution
        ii. Reference limits
        iii. Cutoff points

5. **Food consumption of Individual**
    a. Methods
    b. New development in measuring food consumption
    c. Selecting an appropriate method
    d. Summary

6. **Evaluation of nutrient intake data**
    a. Tables of recommended nutrient intakes
    b. Evaluating Nutrient intakes of individuals
    c. Evaluating the nutrient intakes of population groups
    d. Probability approach to evaluating nutrient intakes

7. **Anthropometric assessment**

a. Advantages and limitations of anthropometric assessment
b. Sources of error in nutritional anthropometry
c. Evaluation of anthropometric indices

8. **Anthropometric assessment of growth**

a. Growth measurement
b. Indices derived from growth measurements

9. **Anthropometric assessment of body composition**
    a. Assessment of body fat
    b. Assessment of fat-free mass

10. **Clinical assessment**
    a. Medical history
    b. Physical examination

11. **Nutritional assessment of hospital patients**

a. Methods based on single indices
b. Prognostic nutritional indices
c. Hospital prognostic indices
d. Cluster analysis
e. Subjective global assessment the prognostic value of nutritional assessment indices Food consumption of Individual
f. Medical history
g. Physical examination

12. **Nutritional assessment of hospital patients**
    a. Methods based on single indices
    b. Prognostic nutritional indices
    c. Hospital prognostic indices
    d. Cluster analysis
    e. Subjective global assessment the prognostic value of nutritional assessment indices

References:

1. Nutritional Management of Renal Disease by Joel D. Kopple, Shaul G Massry, Kamyar Kalantar-Zadeh · 2012
2. Handbook of Nutrition and the Kidney by William E. Mitch, T. Alp Ikizler · 2010
3. Nutrition in Kidney Disease by Laura D. Byham-Gray, Jerrilynn D. Burrowes, Glenn M. Chernow · 2014
4. Essential of Nutrition and dietics therapy
5. Principles of Nutrition Assessment – Gibson
6. Human Nutrition and Dietics – Davidson
7. Jelliffe, D. B.: Assessment of the Nutritional Status of the Community; World Health Organization.
8. Mahan, L.K. and Escott- Stump, S. (2000): Krause's Food Nutrition and Diet Therapy, 10th Edition, W.B. Saunders Ltd.
9. Shils, M.E., Olson, J.A., Shike, M. and Ross, A.C. (1999): Modern Nutrition in Health and Disease, 9th Edition, Williams and Wilkins.
10. Williams, S.R. (1993): Nutrition and Diet Therapy, 7th Edition, Times Mirror/Mosby College Publishing

MDT -023: Nephro-Radiological and imaging sciences (30 Hours) L/T/P/C:4/-/-/4

Learning Objectives

1. Understand imaging techniques in nephrology.
2. Learn interpretation of renal imaging.
3. Study contrast studies and risks.
4. Correlate imaging with diagnosis.

Learning Outcomes

1. Interpret ultrasound and CT findings.
2. Assist in imaging procedures.
3. Identify abnormalities in kidney imaging.
4. Support diagnostic decisions.

1. X-ray & Contrast Studies related to renal studies:

2. **Urography:** Urographic contrast media–choice–structure–contrast selection– contrast reaction rate of administered contrast material – methodology of intravenous urography – indications – contraindications – interpretation.

3. **Ultrasound:** Elementary ultrasound methodology–sonographic imaging characteristics –Doppler ultrasound – scanning techniques – ultrasound of the normal kidney – acute renal failure –surgical – medical renal disease – renal masses – cysts- solid renal masses – calculi – intra renal hematomas – renal transplant evaluation – rejection – renal infections – ultrasound versus intravenous contrast studies – percutaneous vs. guided ultra ventions – Doppler ultrasound in evaluation of renal vascular disease – evaluation of anatomic abnormalities.

4. **Radionuclide Renography:** Methodology – selection of radionuclide – the gamma camera –indications – limitations – quantifications of renal function – GFR – effective renal plasma flow –obstructive uropathy–vesicoureteralreflux– renal transplantation– acute renalfailure–Renovascular HT–captopril renography– static renal imaging.

5. **Computed Tomography of The Kidney:** Anatomy – technique – renal masses – cystic masses – solid renal masses – tumors of the renal pelvis – renal calculi – obstructive uropathy –infarction–acute renal cortical necrosis–renal vein thrombosis– renal artery stenosis–acute pyelonephritis – renal and perinephric abscess – emphysematous pyelonephritis – pylo nephrosis –xantho granulomatous pyelonephritis– tuberculouspyelonephritis–congenitalanomalies–renaltrauma–transplant kidneys

6. **Magnetic Resonance Imaging**: technical aspects – magnetic resonance with IV contrast –normal kidney–congenital anomalies–obstruction–injection– renal parenchymaldisease–hypertension and renal vascular disease – renal cysts – benign neoplasm‟s – malignancies of kidney –transplantation – magnetic resonance spectroscopy.

7. **Renal Angiography:** Indications– relative contraindications – patient preparation – basic procedure – specific techniques – abdominal aortography – selective renal arteriography

– inferior venocavagraphy–selectiver enalvenography– renalveinrenninsampling–intraarterial–digital

8. **Subtraction angiography–IV** digital subtraction angiography–Complications–out patient arteriography– Angioplasty– renal artery stunts– transcatheter embolization.

9. **Renal Biopsy:** techniques of percutaneous renal biopsy – choice of needle – biopsy technique –trans jugular renal biopsy – open renal biopsy – contraindication – complication – processing of the biopsy specimen– malignancy of specimen interpretation.

10. **Nuclear Medicine**
    a. Basic of nuclear medicine.
    b. DTPA, DMSA.
    c. Peritoneal scintigraphy.
    d. Reflux scintigraphy.
    e. Transplant renal scintigraphy

References

1. Ultrasound Imaging in Acute and Chronic Kidney Disease by M. Meola, I. Petrucci, C. Ronco · 2016
2. X-ray diagnosis and imaging –Gupta
3. Nuclear Medicine- K.O'Conner
4. Radiology of the kidney and genito urinary tract – Davidson's
5. USG – Sander's

MDT -024: Renal Disease Practical (30 Hours) **L/T/P/C:-/-/1/1**

Learning Objectives

1. To study various renal disorders.
2. To understand diagnostic procedures.
3. To observe clinical case studies.
4. To correlate symptoms with diseases.

Learning Outcomes

1. Identify common renal diseases clinically.
2. Assist in diagnostic evaluations.
3. Analyze patient case data.
4. Apply knowledge in dialysis decision-making.

1. Patient Assessment
2. Clinical Syndromes
3. Primary Glomerular Disease
4. Secondary Glomerulonephritis
5. Other parenchymal renal diseases
6. Renal Diseases in Pregnancy
7. Toxic Nephropathy
8. Tropical Diseases related to Kidney
9. Geriatric Kidney Diseases
10. Chronic Kidney Diseases
11. Hypertension
12. Acid-Base and Electrolyte Disorders
13. Approach to Patient with Renal Failure
14. End-Stage Renal Disease Management
15. Contraindications for Dialysis

References

1. Practical Nephrology by Mark Harber · 2014
2. Handbook of Chronic Kidney Disease Management by John T. Daugirdas

MDT- 025: Emergency Medicine and Renal Nutrition & Dietetics Practical's (30 Hours)

L/T/P/C:-/-/1/1

Learning Objectives

1. To recognize dialysis-related emergencies.
2. To learn emergency response techniques.
3. To understand renal diet planning.
4. To develop patient management skills.

Learning Outcomes

1. Respond effectively to medical emergencies.
2. Perform basic life support when needed.
3. Plan appropriate renal diets.
4. Provide comprehensive patient care.

3. Adult BLS
4. Special Resuscitation Situation
5. Pediatric BLS
6. Automated External Defibrillation
7. Advanced Cardiac Life Support
8. Post resuscitation Management
9. Critical Care
10. Cardiac Arrhythmias
11. Nutrition Management
12. Nutritional Assessment

References

1. Oxford Handbook of Emergency Medicine by Jonathan P. Wyatt, Robin N. Illingworth, Colin A. Graham · 2012
2. Clinical Emergency Medicine by Scott C. Sherman, Joseph W. Weber, Michael Schindlbeck · 2014
3. Textbook of Emergency Medicine Suresh David · 2011
4. Nutritional Management of Renal Disease by Joel D. Kopple, Shaul G Massry, Kamyar Kalantar-Zadeh · 2012
5. Handbook of Nutrition and the Kidney by William E. Mitch, T. Alp Ikizler · 2010
6. Nutrition in Kidney Disease by Laura D. Byham-Gray, Jerrilynn D. Burrowes, Glenn M. Chernow · 2014

MDT-026: Nephro- Radiology and Imaging sciences Practical's (30 Hours)

L/T/P/C:-/-/1/1

Learning Objectives

1. To understand imaging techniques for kidneys.
2. To interpret radiological images.
3. To learn diagnostic imaging procedures.
4. To correlate imaging with disease conditions.

Learning Outcomes

1. Interpret X-ray, CT, and ultrasound findings.
2. Assist in imaging procedures.
3. Correlate imaging results with diagnosis.
4. Support clinical decision-making.

1. X-Ray & Contrast Studies Related to Renal
2. Urography
3. Ultrasound
4. Radionuclide renography
5. Computed tomography of The Kidney
6. Magnetic resonance imaging
7. Renal Angiography
8. Subtraction angiography
9. Renal Biopsy
10. Peritoneal Scintigraphy
11. Reflux Scintigraphy.
12. Transplant Renal Scintigraphy

References

1. Ultrasound Imaging in Acute and Chronic Kidney Disease by M. Meola, I. Petrucci, C. Ronco · 2016

MDT-027: Residency part – III (225 Hours) **L/T/P/C:-/5/-/5**

Learning Objectives

1. To gain advanced clinical exposure in Nephrology OPD, wards, and intensive care units.
2. To develop skills in assessment, monitoring, and management of renal patients in different clinical settings.
3. To understand the continuum of care from outpatient to critical care in nephrology.
4. To enhance clinical decision-making, communication, and multidisciplinary teamwork skills.

Learning Outcomes

1. Demonstrate competency in managing patients in OPD, wards, and ICU settings.
2. Perform patient assessment, monitoring, and documentation effectively.
3. Assist in the management of critically ill renal patients and dialysis procedures.
4. Apply clinical knowledge, teamwork, and ethical practices in comprehensive patient care.

In the residency the professional is expected to work and contribute in the Nephrology OPD, Nephrology Ward, ICUs

MDT-028: Dissertation L/T/P/C:-/-/3/3

SEMESTER – 4

Course Code	Course	Result in Group (RG) #	Credit/ Week				Hours/ Semester			Attendance %	Continuous Internal assessment CIA- Theory/ Practical (a)	End Semester		Grand Total
			Lecture	Tutorial/ Clinical	Practical/ Research	Credits	Lecture	Practical/ Tutorial	Total Hours			Theory (b)	Practical/ Viva (c)	Theory: a+(b÷2) =100 Practical: a + c =100
MDT029	Advanced Renal Replacement Therapy	K	4	-	-	4	60	-	60	80	50	100	-	100
MDT030	Renal transplantation and coordination/Psychology	L	4	-	-	4	60	-	60	80	50	100	-	100
MDT031	Quality assurance and management of Dialysis unit	M	4	-	-	4	60	-	60	80	50	100	-	100
MDT032	Advanced Renal Replacement Therapy (Practical)	K	-	-	1	1	-	30	30	80	50	-	50	100
MDT033	Renal transplantation and coordination/Psychology (Practicals)	L	-	-	1	1	-	30	30	80	50	-	50	100
MDT034	Quality assurance and management of Dialysis unit (Practical)	M	-	-	1	1	-	30	30	80	50	-	50	100
MDT035	Residency - 4		-	4	-	4	-	180	180	80	100	-	-	100
MDT036	Dissertation and viva voce		-	-	6	6	-	180	180	80	50	-	50	100
Total			12	4	9	25	180	450	630		450	300	200	800
Grand Total			63	14	27	104	945	1440	2385		1950	1700	800	3600

MDT -029: Advanced Renal Replacement Therapy (60 Hours) L/T/P/C:4/-/-/4

Learning Objectives

1. Understand advanced dialysis techniques (CRRT, HD, PD).
2. Learn principles of extracorporeal therapies.
3. Study complications and management.
4. Understand patient monitoring.

Learning Outcomes

1. Perform advanced dialysis procedures.
2. Manage complications effectively.

3. Monitor critically ill patients.
4. Ensure quality dialysis care.

Hemodialysis

a. Vascular Access:

i. History
ii. Epidemiology
iii. Arteriovenous Grafts
iv. Arteriovenous Fistula
v. Vascular Access Monitoring and surveillance
vi. Cuffed Venous Catheters
vii. Treatment of Vascular Access Dysfunction
viii. Pharmacologic Prevention of Vascular Access Failure

b. Artificial Physiology:

i. General Principles of Hemodialysis
   1. Clearance
   2. Hemodialysis Membranes: Effects and Characteristics

ii. Components of the Extracorporeal Circuit
   1. Blood circuit
   2. Dialysate Circuit
   3. Variations in the Extracorporeal Circuit
   4. On-line monitoring
   5. Dialysate Composition
   6. Water used in Hemodialysis

iii. The Dialysis Prescription
   1. Dialyzer choice
   2. Anticoagulation for Hemodialysis
   3. Blood and Dialysate Flow
   4. Dialysis Time
   5. Dialysate composition
   6. Dialysate Temperature
   7. Ultrafiltration Rate

iv. Hemodialysis Adequacy
   1. Historical Perspective
   2. Low-Molecular-Weight Substances and Middle Molecules
   3. The national cooperative dialysis study
   4. Effect of Dialysis with High-Efficiency and High-Flux Dialysis
   5. The Hemo Study

v. Alternative Chronic Hemodialysis Prescriptions
   1. Daily Dialysis and Outcome
   2. Nocturnal hemodialysis

3. Short daily hemodialysis
4. Outcome studies

vi. Alternative approaches to quantification of Dialysis
   1. Urea reduction Ration and solute removal index
   2. Standard measure of the Dose of Dialysis: Kt/V

vii. Management of the maintenance"s hemodialysis patient
   1. Uremic syndrome
   2. Anemia
   3. Cardiovascular disease
   4. Vascular calcification
   5. Calciphylaxis
   6. Nutrition
   7. Infection and immunity

viii. Complications of Hemodialysis
   1. Hypotension
   2. Cramps
   3. Dialysis disequilibrium syndrome
   4. Arrhythmias and angina
   5. Hypoxia
   6. Hypoglycemia
   7. Hemorrhage
   8. First-use syndrome or syndrome arrhythmias and angina
   9. Problems with dialysate composition and integrity of the extracorporeal circuit

ix. Plasmapheresis
x. MARS
xi. The future of Renal Replacement Therapy

2. Peritoneal Dialysis

a. Components of the peritoneal dialysis system
   i. Catheters
   ii. Dialysis solutions
   iii. Peritoneal membrane

b. Peritoneal Catheter Implantation
   i. Surgical technique
   ii. Bedside technique

c. Peritoneum as a dialysis system
   i. Resistance to salt and water transport
   ii. Models of peritoneal transport
   iii. Physiology of peritoneal transport

d. Clinical observations of peritoneal membrane function
    i. Characterization of peritoneal membrane transport
    ii. Stability of the peritoneal membrane over time
    iii. Conclusions

e. Clinical use of peritoneal Dialysis
    i. Choice of Dialysis modality
    ii. Peritoneal Dialysis Modalities
    iii. Choice of peritoneal dialysis modality

f. Adequacy of peritoneal dialysis
    i. When to initiate dialysis
    ii. Measurement of the peritoneal dialysis dose
    iii. Adequate dose of peritoneal dialysis

g. Writing the dialysis prescription
    i. Initial prescription
    ii. Adjustments to the initial dialysis prescription
    iii. Further adjustments to the dialysis prescription
    iv. Success in achieving adequate dialysis.

h. Nutrition
    i. Malnutrition
    ii. Nutritional parameters
    iii. Nutrition guidelines
    iv. Interventions for malnutrition

i. Peritoneal dialysis in special populations
    i. Rapid transporters
    ii. Elderly patients
    iii. Patients with diabetes mellitus
    iv. Black and Hispanic patients‟
    v. Pediatric patients
    vi. Patients infected with the human immunodeficiency Virus.
    vii. Pregnant patients

j. Peritoneal dialysis in a Nonchronic setting.
    i. Acute renal failure
    ii. Nonnumeric uses of peritoneal dialysis

k. Complications of peritoneal dialysis
    i. Cardiovascular disease

ii. Comparison of hemodialysis and peritoneal dialysis
iii. Indications for switching from peritoneal dialysis to hemodialysis.
iv. Noninfectious complications
v. Infections complications

l. Future trends in peritoneal dialysis
i. Mini PET

3. Clinical considerations in the Evaluation of Dialysis Patients

a. Hypertension in Dialysis Patients
a. Left Ventricular Dysfunction in Dialysis Subjects
b. Coronary Artery Disease in End-Stage Renal Disease
c. Autonomic Function and hemodynamic stability in End- Stage Renal Disease Patients
d. Infection and immunity in End-stage renal disease
e. B2-Microglobulin- Associated Amyloidosis of End-Stage Renal Disease
a. Renal Osteodystrophy
b. Dyslipidemias of End-Stage Renal Disease
f. Selection of Therapy for Patients with End-stage renal disease
g. Malnutrition and Intradialytic Parenteral Nutrition in ESRD Subjects
a. Disorders of Homeostasis in Dialysis Patients
h. Treatment of Anemia in Dialysis Subjects
a. Acquired Cystic Kidney Disease
b. Geriatric Dialysis Patients
c. Diabetic Dialysis Patients
d. Hemodialysis and Hemoperfusion for poisoning
e. Dialysis considerations in the patient with Acute Renal Failure
i. Infections in patients on Continuous Ambulatory Peritoneal Dialysis
j. Balancing outcomes in Dialysis with Economic Realities

4. Pediatric Dialysis

a. Pediatric HD

Introduction, HD in ARF causes of ARF in children, Indication for Dialysis, principles of Dialysis in ARF, HD in acute poisonings, HD for inborn errors of metabolism, acute vascular assess.

Chronic HD

incidence and etiology of terminal renal failure in pediatric population, patient selection, facilities for treatment, indication for dialysis, technical aspects of pediatric HD, vascular access, AV fistula, bridge grafts, catheters, complication of vascular access, HD equipment

Methods of Pediatric Dialysis: -

Common problem associated with long term HD, preparation of a child for eventual kidney Transplantation.

b. Pediatric PD
Peritoneal dialysis kinetics in children, catheter placement, PD in ARF, APD for reasons others

than ARF, PD in CRF, Intermittent PD, Continuous PD, CAPD, CCPD, PD in small infants, complication of PD, supplemental therapy, the future of PD in children, transplantation of patients on PD.

c. Nutritional Management of Pediatric patients on chronic Dialysis:
Introduction, Nutritional Assessment, Anthropometrics parameters, Biochemical assessment, Radiological assessment, Dietary recommendations, Energy requirements, protein require, Lipid require, sodium, Potassium, water, renal osteodystrophy, Vit D therapy, vitamins, Trace elements: Iron, Zinc and Copper, Nutritional considerations for the infant receiving CAPD or CCPD treatment.

d. Psychosocial problems related to dialysis in pediatric patients:
Introduction, Adjustment, compliance, neuropsychological development, rehabilitation.

e. Pediatric CAV Hemofiltration:
Pediatric operational principles of CAVH, characteristics of available hemofilters, practical operational details, clinical experience in the neonate, clinical experience in older children, conclusion.

f. Preemptive Renal Transplantation in infancy: -
Introduction, indications for renal replacement therapy in infancy, renal failure in infancy, growth in infants with renal failure, neurologic development in infants with renal failure, dialysis in infants, PD in infancy, complication of PD in infancy, immunologic effects of PD in the infant hemodialysis in infancy, Renal transplantation in infancy, preparation for infant transplant, post transplantation complication, immunosuppression protocols, identification and treatment of allograft rejection, growth post-transplant in the infant, cost and (RE) hospitalization in the infant with ESRD, Summary.

g. Management of common Electrolyte Disorders in children.

h. Clinical Care Coordinator: The Pediatric Nephrology Technologist of the Future.

5. Recent Advance in Dialysis and Nephrology

a. Artificial Intelligence in Renal Sciences and Dialysis Technology

b. Machine Learning Models
c. Connected neural network
d. Convolutional neural network (CNN)
e. Recurrent neural network (RNN)
f. Generative adversarial network (GAN), and deep reinforcement learning

6. Advanced HD procedures

a. Nocturnal Dialysis
a. Online dialysis
b. Daily dialysis
a. Telemedicine in Dialysis Practice

7. Calculators

a. IV rate and dose
b. Access recirculation
c. URR
d. Concentration
e. GFR Adult/Pedi
f. Kt/V (different formulas)
g. Urea volume distribution
h. Creatinine Clearance
i. BMI
j. Weight and measures (Length, volume, weight, Fahrenheit, Celsius etc)

8. Cyber Nephrology

References

1. Continuous Renal Replacement Therapy by John Kellum, Rinaldo Bellomo, Claudio Ronco · 2009
2. 40 Years of Continuous Renal Replacement Therapy by R. Bellomo, J. A. Kellum, G. La Manna · 2018
3. Dialysis Therapy by Allen R. Nisenson, Richard N. Fine · 1993

MDT- 030: Renal transplantation and coordination & psychology (60 Hours)

L/T/P/C: 4/-/-/4

Learning Objectives

1. Understand transplant procedures and protocols.
2. Learn psychological aspects of renal patients.
3. Study pre- and post-transplant care.
4. Understand counselling techniques.

Learning Outcomes

1. Assist in transplant patient care.
2. Provide psychological support.
3. Monitor post-transplant complications.
4. Educate patients and families.

1. Renal transplantation and coordination

1. History of Transplantation
2. Characteristics of the allogenic immune response
3. Tolerance and immunity:
    a. Self – non-self-discrimination
    b. Antigen recognition
    c. Immune tolerance
4. Transplantation antigens:
    a. ABO, Monocyte and Endothelial cells Ag
    b. Major + Minor Histocompatibility Ag
5. Major Histocompatibility Complex
    a. HLA GI and HLA GII
    b. Nature of Allorecognition
    c. Inheritance of HLA.
6. Tissue typing:
    a. HLA typing, short term vs long term/ quality of typing
    b. Matching for split Ags, relative strengths of HLS cocci
    c. Effects of blood transfusion
7. Regulation of the Immune response –
    a. Role of Ag prescribing cell.
    b. T Cell receptor recognition of AgCD4/CD8 cells subsets
    c. Accessory molecules
    d. T Cell activation
    e. T Cell energy
    f. Lymphokines and lymphokine receptors
    g. Th1 + Th2 cell subsets
8. Graft rejection
    a. Hyperacute / acute/ accelerated/chronic
    b. Mechanisms – Ab mediated/T cell mediated/ Delayed Type/ hypersensitivity – mediated NK cell mediated.
9. Mechanisms of Immunosuppression – Corticosteroids/ Azathioprine/FK506/ Rapamycin/Polyclonal immune Globulins/MAb
10. Donor specific immune tolerance/ Tolerance induction by blockade of co stimulation
11. Evaluation of the donor + recipient – special issued + consideration prior kidney Transplantation /Age/Diabetes mellitus/cardiovascular disease/ infections/Malignant neoplasms / metabolic bone disease GI disease/ pulmonary/ urologic evaluation/ systemic disease /psychiatric problems/ vascular disease.
12. Immunological evaluation of the Transplant recipient – typing + Ag matching

13. Screening of Humoral sensitization
14. Cross matching – techniques
15. ABO Blood group matching/ family testing to determine haplotypes/ Cellular assays for HLA testing/ Analysis of survival data.
16. Kidney donation – live donation – non related / related donors, cadaver.
    a. Cadaver organ harvesting and preservation
    b. Kidney preservation – solutions
17. Transplant surgery + potential complications – Pre-OP care/Surgical technique, post OP management/ potential complications.
18. Immunosuppressive therapy – Induction protocols/ maintenance protocols.
    a. AZA/ Steroids/ CSA – Pharmacology – drug interactions
19. Antirejection therapy – Pulse corticosteroids / ALS / OKT3
20. Clinical Approach to Allograft dysfunction – ATN/ CSA/hyperacute rejection
    a. Ace or Acute rejection / other causes of DGF/ late chronic dysfunction.
21. Pathological diagnosis of Allograft dysfunction
22. Recurrent Glomerulonephritis
23. Denovo injury
24. Medical complications – Infection's disease – Time table – viral infections – CMV/EBV
    a. Bacterial Infection– UTI – Opp. Bact. Infections/ Fungal Infection
    b. Cardiovascular disease – HT
    c. Lipid disorders
    d. Liver disease – HBV/HCV
    e. Malignancy
    f. M,
    g. Diabetes Mellitus, hematological problems
25. Pancreatic – Kidney transplantation
26. Pediatric transplantation – problems.

References

1. Kidney Transplantation: Principles and Practice Peter J. Morris · 1984
2. Renal Transplantation - Page 429 by Nicholas Torpey · 2010
3. Current Issues and Future Direction in Kidney Transplantation by Thomas Rath · 2013
1. Kidney Transplantation- Morris
2. Danovitch, Manual of Renal Transplantation, 6e,
3. Clinical urologic practice- Stein
4. Techniques in endourology- Clayman
5. Kidney transplantation rejection-Racusen, Splez.
6. Psychological testing – Kaplan
7. Dialysis and transplantation in psychiatry – Lange.

MDT-030: Psychology

1. **Psychiatric Assessment**
    a. Introduction to clinical assessment
    b. The Psychiatric interview
    c. The mental status Exam
    d. Physical Exam and laboratory evaluation
    e. Intelligence testing and neuropsychological assessment
    f. Personality assessment

2. **Psychiatric Aspects of Renal Care**
    a. Introduction
    b. Psychiatric problems: uncooperativeness-cause of uncooperativeness
    c. Depression and Suicide, anxiety, rehabilitation problems, sexual problems
    d. Psychiatric fitness for Transplantation
    e. Treatment of psychiatric problems- preventive therapy-group therapies-environmental Manipulations-psychotherapy-pharmacotherapy-behavioral sexual techniques

3. **Rehabilitation and Psychosocial Issues**
    a. Endurance Exercise training in hemodialysis patients
    b. Psychosocial rehabilitation of Adult dialysis patients
    c. Ethical Dilemmas in Dialysis: To initiate or withdraw Therapy

4. **Mental Disorders**
    a. Diagnosis and classification in psychiatry
    b. Psychiatry history and examination
    c. Organic (Including Symptomatic) mental disorders
    d. Psychoactive substance uses disorders
    e. Schizophrenia
    f. Mood Disorders, Anxiety and personality
    g. Other psychotic Disorders
    h. Neurotic, stress-related and somatoform disorders
    i. Disorders of Adult personality and behavior
    j. Sexual disorders
    k. Sleep disorders
    l. Behavioral syndromes associated with psychological disturbances and physiological factors
    m. Mental retardation
    n. Child psychiatry
    o. Psychopharmacology
    p. Biological methods of treatment
    q. Psychoanalysis
    r. Psycho treatment
    s. Emergency psychiatry

t. Legal and ethical issues in psychiatry
u. Common psychiatry

References

1. Introduction to Psychology by Jennifer Walinga, Charles Stangor
2. The Little Book of Psychology: An Introduction to the Key ...by Caroline Riggs, Emily Ralls · 2019
3. The Everything Psychology Book: Explore the Human Psyche and ...by Kendra Cherry, Paul G Mattiuzzi · 2010

MDT -031: Quality Assurance and Management of Dialysis Unit (60 Hours)

L/T/P/C:4/-/-/4

Learning Objectives

1. Understand dialysis unit management.
2. Learn quality control and safety standards.
3. Study infection control policies.
4. Understand healthcare administration.

Learning Outcomes

1. Maintain quality standards in dialysis units.
2. Implement infection control protocols.
3. Manage dialysis unit operations.
4. Ensure patient safety and compliance.

Introduction

1. The Basics of Quality Assurance
   a. Definition
   b. Quality Assurance Methods
   c. The JCAHO 10-Step Process for Monitoring and Evaluation
   d. Comprehensive Quality Assurance Program
   e. Quality Control
   f. Continuous Improvement Concepts

2. Water Treatment
   a. Risks And Hazards

b. Quality Assurance for Water Treatment Systems
c. Policies and Procedures.
d. Staff Training and Education
e. Monitoring and Evaluation.
f. Daily Monitoring
g. Monthly Monitoring
h. Patient Monitoring
i. Home Dialysis Monitoring
j. Other Monitoring
k. Prevention

3. **Dialysis Delivery System**
   a. Technical description of device
   b. Risks and hazard
   c. Quality assurance for dialysis delivery systems
   d. policies and procedures
   e. staff training and education
   f. monitoring and evaluation

4. **Dialysate and Dialysate Concentrate**
5. **Hemodialyzers**
6. **Ancillary Devices and Equipment**
7. **Anticoagulation**
8. **Vascular Access Devices**
9. **Hemodialyzer Reuse**
10. **Infection Control**
11. **Handling of Toxic Chemicals**
12. **Basics of Management of health care organization include administrative aspects of dialysis unit**
13. **Patient education & health patient with RRT**
    - Patient Education
    - Communication
    - Patient communication problems
    - Explanation of examinations
    - Interacting with terminally ill patient
    - Informed Consent
    - Patient counseling on
      - Living with CKD
      - Life with HD and CAPD
      - Living with a transplanted kidney.
    - Evolution of Quality management
    - Quality assurance methods
    - Patient satisfaction

- Standard operating procedure
- Quality certification
- Accreditation to national agencies

References

1. Quality Assurance in Dialysis L.W. Henderson, R.S. Thuma · 1999
2. Patient safety and quality issues in end stage renal disease- United States. Congress. House. Committee on Ways and Means · 2007

MDT -032: Advanced Renal Replacement Therapy Practical's (30 Hours)

L/T/P/C:-/-/1/1

Learning Objectives

1. To understand advanced dialysis techniques.
2. To learn CRRT and other therapies.
3. To develop hands-on procedural skills.
4. To manage critically ill patients.

Learning Outcomes

1. Perform advanced dialysis procedures.
2. Monitor critically ill patients effectively.
3. Handle complex dialysis equipment.
4. Manage complications in advanced therapies.

Hemodialysis

1. Alternative Chronic Hemodialysis Prescriptions

- Daily Dialysis and Outcome
- Nocturnal hemodialysis
- Short daily hemodialysis
- Outcome studies

2. Alternative approaches to quantification of Dialysis

- Urea reduction Ration and solute removal index

- Standard measure of the Dose of Dialysis: Kt/V

3. Management of the maintenance's hemodialysis patient

- Uremic syndrome
- Anemia
- Cardiovascular disease
- Vascular calcification
- Calciphylaxis
- Nutrition
- Infection and immunity

4. Plasmapheresis

5. MARS

6. The future of Renal Replacement Therapy

7. Peritoneal Dialysis

a. Peritoneal dialysis in special populations
   i. Rapid transporters
   ii. Elderly patients
   iii. patients with diabetes mellitus
   iv. Black and Hispanic patients‟
   v. Pediatric patients
   vi. Patients infected with the human immunodeficiency Virus.
   vii. Pregnant patients

b. Peritoneal dialysis in a Nonchronic setting.
   i. Acute renal failure
   ii. Nonnumeric uses of peritoneal dialysis

c. Management of Complications of peritoneal dialysis
   i. Cardiovascular disease
   ii. Comparison of hemodialysis and peritoneal dialysis
   iii. Indications for switching from peritoneal dialysis to hemodialysis.
   iv. Noninfectious complications
   v. Infections complications

d. Future trends in peritoneal dialysis
   i. Mini PET

8. Pediatric Dialysis

- Pediatric HD
- Pediatric PD
- Nutritional Management of Pediatric patients on chronic Dialysis:
- Pediatric CAV Hemofiltration:
- Management of common Electrolyte Disorders in children.
- Clinical Care Coordinator: The Pediatric Nephrology Technologist of the Future.

9. Recent Advance in Dialysis and Nephrology

- Artificial Intelligence in Renal Sciences and Dialysis Technology
- Machine Learning Models
- Connected neural network
- Convolutional neural network (CNN)
- Recurrent neural network (RNN)
- Generative adversarial network (GAN), and deep reinforcement learning

10. Advanced HD procedures

- Nocturnal Dialysis
- Online dialysis
- Daily dialysis
- Telemedicine in Dialysis Practice

11.Calculators

- IV rate and dose
- Access recirculation
- URR
- Concentration
- GFR Adult/Pedi
- Kt/V (different formulas)
- Urea volume distribution
- Creatinine Clearance
- BMI
- Weight and measures (Length, volume, weight, Fahrenheit, Celsius etc)

12.Cyber Nephrology

References

1. Continuous Renal Replacement Therapy by John Kellum, Rinaldo Bellomo, Claudio Ronco · 2009
2. 40 Years of Continuous Renal Replacement Therapy by R. Bellomo, J. A. Kellum, G. La Manna · 2018
3. Dialysis Therapy by Allen R. Nisenson, Richard N. Fine · 1993
4. Complications of dialysis- By Norbert Lemeire, Ravindra Mehta
5. Dialysis technology- By Jim Curtis, Philip Varughese
6. Hand book of dialysis – By Daugirdas, Peter Gerard Blake

MDT -033: Renal transplantation and coordination & psychology Practical's (30 Hours)

L/T/P/C:-/-/1/1

Learning Objectives

1. To understand transplant procedures.
2. To learn patient preparation and follow-up.
3. To study psychological aspects of patients.
4. To develop counseling skills.

Learning Outcomes

1. Assist in transplant coordination.
2. Monitor post-transplant patients.
3. Provide psychological support to patients.
4. Apply ethical and professional practices.

1. Renal transplantation and coordination
2. Tissue typing:
3. Screening of Humoral sensitization
4. Cross matching
5. ABO Blood group matching/ family testing to determine haplotypes/ Cellular assays for HLA testing/ Analysis of survival data
6. Kidney donation – live donation – non related / related donors, cadaver
7. Clinical Approach to Allograft dysfunction
8. Psychiatric Assessment
9. Rehabilitation and Psychosocial Issues
10. Grief Counselling

References

1. Kidney Transplantation: Principles and Practice Peter J. Morris · 1984
2. Renal Transplantation - Page 429 by Nicholas Torpey · 2010
3. Current Issues and Future Direction in Kidney Transplantation by Thomas Rath · 2013

MDT -034: Quality assurance and management of Dialysis unit Practical's (30 Hours)

L/T/P/C:-/-/2/1

Learning Objectives

1. To understand quality standards in dialysis units.
2. To learn management and administration.
3. To study safety and audit systems.
4. To develop leadership skills.

Learning Outcomes

1. Implement quality assurance protocols.
2. Manage dialysis unit operations efficiently.
3. Ensure patient safety and compliance.
4. Conduct audits and improve service quality.

1. Quality Assurance Methods
2. JCAHO 10-Step Process
3. Quality Control
4. Quality Assurance For Water Treatment Systems
5. Quality certification
6. Accreditation to national agencies

References

1. Quality Assurance in Dialysis L.W. Henderson, R.S. Thuma · 1999
2. Patient safety and quality issues in end stage renal disease- United States. Congress. House. Committee on Ways and Means · 2007
3. Principles of Management by Koonz 'o' Donnel
4. Hospital planning Administration by B.M. Shakar
5. Brenner- The kidney
6. Kidney disease in primary care and K. Mandal, Stanly
7. The disease of Kidney –Schrier
8.
9. Renal Nursing – By Nicola Thomas
10. Review of HD – By C.F. Butch, Martha H Stoner, Anna L. Corea
11. Shailendra K. Singh: Safety & Risk Management, Mittal Publishers
12. J. H. Diwan: Safety, Security & Risk Management, APH
13. Stephen Ayers & Garmvik: Text Book of Critical Care, Holbook and Shoemaker

MDT- 035: Residency part – IV (180 Hours) **L/T/P/C:-/4/-/4**

Learning Objectives

1. To gain advanced clinical exposure in Nephrology OPD, wards, and ICUs.
2. To develop skills in assessment, monitoring, and management of renal patients.
3. To understand the continuum of care from outpatient to critical care settings.

4. To enhance clinical decision-making, communication, and teamwork skills.

Learning Outcomes

1. Demonstrate competency in managing patients across OPD, wards, and ICU.
2. Perform patient assessment, monitoring, and proper documentation.
3. Assist in managing critically ill renal patients and dialysis procedures.
4. Apply clinical knowledge, teamwork, and ethical practices in patient care.

In the residency the professional is expected to work and contribute in the Nephrology OPD, Nephrology Ward, ICUs & Dialysis Therapy unit.

MDT -036: Project / Thesis/ Dissertation (180 Hours) **L/T/P/C:-/-/6/6**

Learning Objectives

1. To develop knowledge and skills in conducting research related to dialysis and nephrology.
2. To understand research methodology, data collection, and analysis techniques.
3. To enhance critical thinking and problem-solving abilities in clinical research.
4. To learn scientific writing and presentation of research findings.

Learning Outcomes

1. Conduct an independent research project under faculty guidance.
2. Collect, analyze, and interpret clinical or experimental data effectively.
3. Prepare and present a structured dissertation as per academic standards.
4. Apply research findings to improve clinical practice and patient care.

Each candidate will have to carry out of a dissertation on the related subject. The dissertation will be guided by one or two members of the faculty of the department. The dissertation will be evaluated by the External/Internal Examiners. The final dissertation duly approved by the External/Internal examiners will be submitted to the Dean‟s office with the result.