Government of Karnataka

PARA MEDICAL BOARD

Revised Syllabus
of
II & III Year Diploma in Dialysis Technology
(Previously first/second year certificate course/ I year DDT/II DDT)

2017

Model Curriculum Handbook

Ministry of Health and Family Welfare

DIALYSIS THERAPY TECHNOLOGY

Who is an Allied and Healthcare Professional?

The Ministry of Health and Family Welfare, accepted in its entirety the definition of an allied and healthcare professional based on the afore-mentioned report, though the same has evolved after multiple consultations and the recommended definition is now as follows-

'Allied and healthcare professionals (AHPs) includes individuals involved with the delivery of health or healthcare related services, with qualification and competence in therapeutic, diagnostic, curative, preventive and/or rehabilitative interventions. They work in multidisciplinary health teams in varied healthcare settings including doctors (physicians and specialist), nurses and public health officials to promote, protect, treat and/or manage a person('s) physical, mental, social, emotional, environmental health and holistic well-being.'[1]

Since the past few years, many professional groups have been interacting and seeking guidance on all those who would qualify under the purview of "allied and healthcare professionals". In the healthcare system, statutory bodies exist for clinicians, nurses, pharmacists and dental practitioners; but a regulatory structure for around 50 professions is absent in India. Currently, the Government is considering these professions (as listed Annex-1) under the ambit of the allied and healthcare system. However, this number is subject to changes and modifications over time, particularly considering how quickly new technologies and new clinical avenues are expanding globally, creating newer cadres of such professionals.

Scope and need for allied and healthcare professionals in the Indian healthcare system

The quality of medical care has improved tremendously in the last few decades due to the advances in technology, thus creating fresh challenges in the field of healthcare. It is now widely recognized that health service delivery is a team effort involving both clinicians and non-clinicians, and is not the sole duty of physicians and nurses.[1] Professionals that can competently handle sophisticated MODEL CURRICULUM HANDBOOK OF DIALYSIS THERAPY TECHNOLOGY (Intellectual property of Ministry of Health and Family Welfare) Page **14** of **143**

machinery and advanced protocols are nowin high demand. In fact, diagnosis is now so dependent on technology, that allied and healthcare professionals (AHPs) are vital to successful treatment delivery. Effective delivery of healthcare services depends largely on the nature of education, training and appropriate orientation towards community health of all categories of health personnel, and their capacity to function as an integrated team. For instance in the UK, more than 84,000 AHPs, with a range of skills and expertise, play key roles within the National Health Service, working autonomously, in multi-professional teams in various settings. All of them are first-contact practitioners and work across a wide range of locations and sectors within acute, primary and community care. Australia's health system is managed not just by their doctors and nurses, but also by the 90,000 university-trained, autonomous AHPs vital to the system.[2,3]

As the Indian government aims for Universal Health Coverage, the lack of skilled human resource may prove to be the biggest impediment in its path to achieve targeted goals. The benefits of having AHPs in the healthcare system are still unexplored in India. Although an enormous amount of evidence suggests that the benefits of AHPs range from improving access to healthcare services to significant reduction in the cost of care, though the Indian healthcare system still revolves around the doctor-centric approach. The privatization of healthcare has also led to an ever-increasing out-of-pocket expenditure by the population. However, many examples assert the need of skilled allied and healthcare

professionals in the system, such as in the case of stroke survivors, it is the support of AHPs that significantly enhance their rehabilitation and long term treatment ensures return to normal life. AHPs also play a significant role to care for patients who struggle mentally and emotionally in the current challenging environment and require mental health support; and help them return to well-being.[2] Children with communication difficulties, the elderly, cancer patients, patients with long term conditions such as diabetes people with vision problems and amputees; the list of people and potential patients who benefit from AHPs is indefinite.

Thus, the breadth and scope of the allied and healthcare practice varies from one end to another, including areas of work listed below:

- Across the age span of human development from neonate to old age;
- With patients having complex and challenging problems resulting from systemic illnesses such as in the case of diabetes, cardiac abnormalities/conditions and elderly care to name a few;
- Towards health promotion and disease prevention, as well as assessment, management and evaluation of interventions and protocols for treatment;
- In a broad range of settings from a patient's home to community, primary care centers, to tertiary care settings; and
- With an understanding of the healthcare issues associated with diverse socio-economies and cultural norms within the society.

Learning goals and objectives for allied and healthcare professionals

The handbook has been designed with a focus on performance-based outcomes pertaining to different levels. The learning goals and objectives of the undergraduate and graduate education program will be based on the performance expectations. They will be articulated as learning goals(why we teach this) and learning objectives (what the students will learn). Using the framework, students will learn to integrate their knowledge, skills and abilities in a hands-on manner in a professional healthcare setting. These learning goals are divided into nine key areas, though the degree of required involvement may differ across various levels of qualification and professional cadres:

1. Clinical care
2. Communication
3. Membership of a multidisciplinary health team
4. Ethics and accountability at all levels (clinical, professional, personal and social)
5. Commitment to professional excellence
6. Leadership and mentorship
7. Social accountability and responsibility
8. Scientific attitude and scholarship (only at higher level- PhD)
9. Lifelong learning

Integrated structure of the curriculum

Vertical integration, in its truest sense, is the interweaving of teaching clinical skills and knowledge into the basic science years and, reinforcing and continuing to teach the applications of basic science concepts during the clinical years. (Many efforts called 'vertical integration' include only the first half of the process).

Horizontal integration is the identification of concepts or skills, especially those that are clinically relevant, that cut across (for example, the basic sciences), and then putting these to use as an integrated focus for presentations, clinical examples, and course materials. e.g. Integration of some of the basic science courses around organ systems, e.g., human anatomy, physiology, pathology; or incorporating ethics, legal issues, finance, political issues, humanities, culture and computer skills into different aspects of a course like the Clinical Continuum.

The aim of an integrated curriculum is to lead students to a level of scientific fluency that is beyond mere fact and concept acquisition, by the use of a common language of medical science, with which they can begin to think creatively about medical problems.19

This innovative new curriculum has been structured in a way such that it facilitates horizontal and vertical integration between disciplines; and bridges the gaps between both theory & practice, andbetween hospital-based practice and community practice. The amount of time devoted to basic and laboratory sciences (integrated with their clinical relevance) would be the maximum in the first year, progressively decreasing in the second and third year of the training, making clinical exposure

and learning more dominant.[11] However it may differ from course to course depending on the professional group. **Learning methodologies**

With a focus on self-directed learning, the curriculum will include a foundation course that focuses on communication, basic clinical skills and professionalism; and will incorporate clinical training from the first year itself. It is recommended that the primary care level should have sufficient clinical exposure integrated with the learning of basic and laboratory sciences. There should also be an emphasis on the introduction of case scenarios for classroom discussion/case-based learning.

Healthcare education and training is the backbone of an efficient healthcare system and India's education infrastructure is yet to gain from the ongoing international technological revolution. The report '*From Paramedics to Allied Health: Landscaping the Journey and way ahead*', indicates that teaching and learning of clinical skills occur at the patient's bedside or other clinical areas such as laboratories, augmented by didactic teaching in classrooms and lecture theatres. In addition to keeping up with the pace of technological advancement, there has been a paradigm shift to outcome-based education with the adoption of effective assessment patterns. However, the demand for demonstration of competence in institutions where it is currently limited needs to be promoted. The report also mentions some of the allied and healthcare schools in India that have instituted clinical skill centres, laboratories and high-fidelity simulation laboratories to enhance the practice and training for allied and healthcare students and professionals. The report reiterates the fact that simulation is the replication of part or all of a clinical encounter through the use of mannequins, computer-assisted resources and simulated patients. The use of simulators addresses many issues such as suboptimal use of resources and equipment, by adequately training the manpower on newer technologies, limitations for imparting practical training in real-life scenarios, and ineffective skills assessment methods among others.[1] The table mentioned below lists various modes of teaching and learning opportunities that harness advanced tools and technologies.

Table 1 Clinical learning opportunities imparted through the use of advanced techniques[1,20]

Teaching modality	Learning opportunity examples
Patients	Teach and assess in selected clinical scenarios
	Practice soft skills
	Practice physical examination
	Receive feedback on performance
Mannequins	Perform acquired techniques
	Practice basic procedural skills
	Apply basic science understanding to clinical problem solving
Simulators	Practice teamwork and leadership
	Perform cardiac and pulmonary care skills
	Apply basic science understanding to clinical problem solving
Task under trainers	Monitor and terminate dialysis treatment, etc.

Assessment methods

Traditional assessment of students consists of the yearly system of assessments. In most institutions, assessments consist of internal and external assessments, and a theory examination at the end of the year or semester. This basically assesses knowledge instead of assessing skills or competencies. In competency-based training, the evaluation of the students is based on the performance of the skills as per their competencies. Hence, all the three attributes – knowledge, skills, and attitudes – are assessed as required for the particular competency.

Several new methods and tools are now readily accessible, the use of which requires special training. Some of these are given below:

- Objective Structured Clinical Examination(OSCE), Objective Structured Practical Examination (OSPE), Objective Structured Long Examination Record(OSLER)
- Mini Case Evaluation Exercise(CEX)

- Casebased discussion(CBD)
- Direct observation of procedures(DOPs)
- Portfolio
- Multi-source feedback
- Patient satisfaction questionnaire

An objective structured clinical examination (OSCE) is used these days in a number of allied and healthcare courses, e.g. Optometry, Physiotherapy, and Radiography. It tests the performance and competence in communication, clinical examination, and medical procedures/prescriptions. In physiotherapy, orthotics, and occupational therapy, it tests exercise prescription, joint mobilization/manipulation techniques; and in radiography it tests radiographic positioning, radiographic image evaluation, and interpretation of results. The basic essential elements consist of functional analysis of the occupational roles, translation of these roles ("competencies") into outcomes, and assessment of trainees' progress in these outcomes on the basis of demonstrated performance. Progress is defined solely by the competencies achieved and not the underlying processes or time served in formal educational settings. Most methods use predetermined, agreed assessment criteria (such as observation check-lists or rating scales for scoring) to emphasize on frequent assessment of learning outcomes. Hence, it is imperative for teachers to be aware of these developments and they should suitably adopt them in the allied and healthcare education system.

Chapter 3: Background of the profession

Statement of Philosophy– Why this profession holds so much importance?

Historically, dialysis treatment has been viewed as a life-sustaining therapy that aims to extend survival and improve the quality of life. However, the rigors of dialysis treatment, psychosocial and vocational adjustments, loss of independence and functional status, and metabolic derangements as a result of kidney disease are now significant contributors to the decrease in health-related quality of life (HRQOL).

Patients with limited health literacy – the ability to obtain, process, and understand health information in order to make appropriate health decisions – may not fully understand written medical information, may not be able to communicate effectively with healthcare providers, or navigate the increasingly complex healthcare system. Studies suggest that limited health literacy may negatively affect patients' wellbeing and increase healthcare costs. Health literacy is particularly important for kidney patients undergoing dialysis. They must attend treatment sessions several days a week, follow dietary and fluid restrictions, and adhere to complex medication regimens, all of which require patients to understand and act on complicated health-related information. [22,23,24,25,26]

About Dialysis Therapy Technology

Dialysis is intended to keep the body running as normal as possible while the kidneys are under repair or while a person waits for a kidney transplant. Without working kidneys or dialysis, salts and other waste products would accumulate in the blood and poison the person. Typical haemodialysis treatments (using an artificial kidney) last about four hours and are needed about three times a week.[23]

Scope of practice

Dialysis Assistants work with the Dialysis Therapy Technologist to plan implementation of the dialysis prescription, perform hemodialysis, manage various intra-dialytic complications and document patient data.

The Dialysis Therapy Technologist works with the Head of Department/ Senior Dialysis Therapy Technologist to supervise the hemodialysis assistants and auxiliary personnel, manage intra-dialytic complications, documents and maintains dialysis patient records.

Recognition of Title and qualification

Within the multidisciplinary team, the professional responsible for the direct monitoring of the patient and machine during the course of dialysis is the Dialysis Therapy Technologist also at times referred to as the hemodialysis technologists or patient care technologists (PCTs).

The recommended title thus stands as the Dialysis Therapy Technologist for this group of professionals.

It is a known fact that with the career advancement, the nomenclature will also vary and will also depend on the sector and profile of the professional. Considering the 10 NSQF levels designed by the ILO, the following level progression table has been proposed by the taskforce to map the nomenclature, career pathways and progression in different sectors of professional practice for Dialysis Therapy Technologist. **The proposed progression is for further discussion and** MODEL CURRICULUM HANDBOOK OF DIALYSIS THERAPY TECHNOLOGY (Intellectual property of Ministry of Health and Family Welfare) Page **32** of **143**

deliberation, the implementation time of the same may vary depending on the current system and regulations in place.

The table 2 below indicates the various channels of career progression in three distinct sectors such as clinical setting, academic and industry (management/sales or technical) route. It is envisaged that the Dialysis Therapy Technologist will have two entry pathways – students with diploma or baccalaureate. The level of responsibility will increase as the career progresses and will starts with level four (4) for diploma holders and level five (5) for baccalaureate holders. The table also indicates the corresponding level of qualification with experience required by the professional to fulfill the requirements of each level. Considering the degree of patient dealing in case of Dialysis Therapy Technologist and such other professions, government aims to phase out the Diploma and PG Diploma level courses and promote Bachelors' and Masters' degree courses. In the academic front, as per UGC guidelines, to work at the position of a Lecturer/Assistant Professor the candidate must attain master degree. At present as there are limited master degree seats in Dialysis Therapy Technology, it has been decided that eventually provisions will be made to provide bridge courses for PG Diploma holders for certain number of years to bring them at par with the master level courses and universities will be promoted to start master degree courses. Although the table indicates that the career progression of a dialysis therapy technologist is upto level 10, it needs to be stated that the ultimate signatory authority on patient prescription stands with the Nephrologist. The director of the dialysis therapy technology unit (clinical route) will be the ultimate authority for the management responsibilities, and the final authority for the clinical decisions will be with the Nephrologist.

Second Year Diploma in Dialysis Technology

SECTION-A Q P Code : 5151

Subject: Applied Pharmacology

Teaching hours:40hrs

1. Introduction a. Definition and terminology

Pharmacology, Drug (WHO Definition),

Pharmacokinetics, pharmacodynamics,
Pharmacotherapeutics, chemotherapy,
Clinical pharmacology, Toxicology and Pharmacopeias.

b. Drug nomenclature.
c. Concept of essential Medicines list
d. Sources of drugs.

Renal excretion of drugs, dose adjustments in renal diseases

2. Dosage forms of drugs
3. Routes of drug administration
4. Adverse drug reactions (ADR) , Definition and types, with emphasis on side effects, hypersensitivity reactions and their management, nephrotoxic drugs
5. Analgesics – Definition and types,

Commonly used NSAIDS- their uses, adverse effects & precautions, Diclofenac, Aceclofenac, Paracetamol, Opioids –Morphine, Pethidine, Buprenorphine, Tramadol and Pentazocine, Opioid Antagonists .

6. Sedative hypnotics- Definition, uses, adverse effects of diazepam, lorazepam
7. Local anesthetics- definition, classification and in detail of commonly used drugs like Lignocaine, bupivacaine, eutectic mixture, Techniques of LA
8. General anaesthetics—Basic concepts

Halothane, Isoflurane, Sevoflurane, Thiopentone sodium, Propofol, Ketamine and pre- anaesthetic medication

9. Corticosteroids- definition, classification, uses, adverse effects, contraindications, and emphasis on hydrocortisone and dexamethasone
10. Antiseptics and disinfectants –commonly used drugs
11. Anti-emetics metoclopramide, ondansetron, domperidone
12. Peptic ulcer disease—Ranitidine, Pantoprazole, Antacids
13. Vaccines and serums –Emphasis on Hepatitis B, Hepatitis C, Influenza and Pneumococcal vaccines
14. Drug use and precautions in renal failure and hepatic failure patients
15. Drugs eliminated by Dialysis (Hemo and peritoneal)
16. Drugs—used during Dialysis
17. Vitamin D and calcium preparations –

18. Hematinics must know preparations, use and precautions of Iron, Folic acid and Vitamin B 12
19. Erythropoietin
20. Anti-coagulants: Commonly Used Oral/ Parenteral drugs - Heparin, Low molecular weight Heparins,Warfarin / Dicoumarol - Mechanism, uses, adverse effects, precautions & contraindications
21. Drugs used in treatment of metabolic acidosis and metabolic alkalosis & common electrolyte disturbances
22. Intravenous fluids - Crystalloids and Colloids
23. Drugs used in emergencies

- Atropine
- Adrenaline
- Nor-adrenaline
- Dopamine & Dobutamine
- Chlorpheneramine maleate
- Promethazine
- Vasopressin
- Deriphyllin &Aminophylline
- Frusemide and Mannitol
- Sodium bicarbonate
- Hydrocartisone & dexamethasone
- Mephenteramine
- Esmolol, labetalol
- Verapamil, amiodarone, lignocaine
- Diazepam, lorazepam
- Sodium nitroprusside, nitroglycerine
- Anti-fibrinolytics
- Styptics
- Emphasis on management of Medical/ surgical emergencies—anaphylactic shock, hypotension,seizures, acute adrenal crisis, acute asthma, haemorrhage & hypovolemia, arrhythmias, hypoglycemia, hypertensive crisis

21. Drugs used in acid peptic disorders ranitidine and pantoprazole
22. Immunosuppressant Drugs
23. Antimicrobial drugs -General considerations-
    Beta Lactam Antibiotics, Fluroquinolones, Aminoglycosides, Metronidazole
    Antiretroviral drugs used in post exposure prophylaxis

SECTION-B **Q P Code : 5152**

I Basic physiology of dialysis

- Diffusion
- Osmosis
- Transmembrane Pressure(TMP)
- Venous Pressure(VP)
- Ultrafiltration(UF)

Body composition of fluids

II Patient related

1, Vital Signs Normal / Abnormal
Pulse Rate BP
Respiration Temperature
- Conscious Level

2. Renal failure & its consequences
3. Introduction to Haemodialysis(HD) /Peritoneal Dialysis(PD)
Principles - Application to HD/PD (Diffusion / Osmosis)
4. Vascular *Access*
- Temporary indications
- Permanent

Advantage/Disadvantage PD Cath
- Temporary indications
- Permanent

5. Anticoagulation :
Heparin - Types (Regular &LMWH)
Contraindication
Type of heparanization - Regular / Rigid / Free

Monitoring of heparin activity

6. Common tests done for dialysis patients - BUN, serum creatinine, electrolytes, hemoglobin, serology

III Equipment related

1. **Water**
   - **Quantity**
   - Quality – Advancement of Medical Instrumentation(**AAMI)** standards Pre-treatment / Maintenance of individual monitoring components RO water / Deionised water

RO Plant - Maintenance
Monitoring quality of water - How frequently
Ultrapure water
Online hemodiafiltration

2, HemoDialysis Machine

Monitoring parameters *Alarm* Management Disinfection :

Internal

- Regular patients
- Positive patients

Surface Cleaning

Electrical Circuit

Mixing of water & dialysate

3. Concentrate ; (Dialysate)

Acid, Bicarbonate, Citrate, Composition, Preparation

Dialyzer :

- *Anatomy*
- Types of dialyzer :
  - Low Flux
  - High Flux
- - -Surface area

KUF (Ultrafiltration Coefficient of a dialyser)

- Reuse
  - Manual in regular and
  - Automated positive patients
- Bundle volume measurement

When to discard dialyzer

- Storage of dialyzers
- Residual activity of formalin assessment

5. Blood Tubing ; Reuse

6. CAPD Catheter : Parts : Cath, Titanium Adapter, Transfer Set, CCPD Machine - introduction

EXAMINATION PATTERN

Theory Max -100 marks (Section-A 50 marks & Section-B 50 marks)

1. Short notes- answer any four 4*5=20marks
2. Short answers 10*3=30 marks

Total 50 marks

BIOCHEMISTRY SECTION-A **Q P Code : 5153**

Unit I. ***Acids, bases, salts and indicators***

- ***Acids and Bases*** – Definition, physical and chemical properties with examples. Arrhenius concept of acids and bases, Lowry – Bronsted theory of acids and bases classification of acids and bases. Concepts of acid base reaction, hydrogen ion concentration, Ionisation of water, buffer, pH value of a solution, preparation of buffer solutions using pH meter.
- ***Salts*** – Definition, classification, water of crystallization – definition and different types, deliquescent and hygroscopic salts.
- ***Acid-base indicators:*** Definition, concept, commonly used indicators, and their pH range, suitable pH indicators used in different titrations, universal indicators.
- In brief about acid base disorders.

Unit II : Basic Biochemistry

- Carbohydrates:
  - Classification, Definition & properties of monosaccharides, disaccharides, and polysaccharides.
- Proteins:
  - Proteins – Definition, classification, properties.
  - Amino acids - Definition, classification, essential & non essential amino acids. Reactions of amino acids.
  - Plasma proteins – Definition, classification and reference values.
- Lipids
  - Definition, classification and properties of lipids and lipoproteins.
- Nucleic acid chemistry
  - Definitions of DNA, RNA, purines and pyramidines, nucleosides and nucleotides.
- Enzymes- Definition, classification and factors affecting enzyme activity. Isoenzymes – Definition, classification and significance.
- Vitamins and Minerals: in brief about reference values in blood.
- Normal and Abnormal Constituents of Urine.

Unit III. Photometry

Definition, laws of photometry, absorbance, transmittance, absorption maxima, instruments, parts of photometer, types of photometry–colorimetry, spectrophotometry, choice of appropriate filter, measurements of solution, calculation of formula, applications.

Unit IV. Liver Functions & their Assessment

Tests for 1) Carbohydrate metabolism 2) Protein metabolism 3) Lipid metabolism 4) Measurements of serum enzyme levels, Bile pigment metabolism, Jaundice, its types and their biochemical findings.

Unit V. Different methods of Glucose Estimation-

Principle advantage and disadvantage of different methods

Unit VI. Renal Function Tests-

GFR & Clearance tests, Various Tests in detail.

Unit VII. Cardiac Profile -

In brief Hypertension, Angina, Myocardial Infarction, Pattern of Cardiac Enzymes in heart diseases. Different methods of Cholesterol Estimation- Principle, advantage and disadvantage of different methods. Lipid profile.

Unit VIII. Electrolytes, Blood Gases and pH

pH Regulation, Disturbance in acid Base Balance, Metabolic acidosis & alkalosis, Respiratory acidosis & alkalosis.
Basic Principles and estimation of Blood Gases and pH,
Basic principles and estimation of Electrolytes

Unit IX : Water

Quality of water, different types RO water, deionised water, ultrapure water.
Monitoring the quality of water AAMI standard.
RO plant components and maintenance.

PRACTICALS

<u>For Demonstration only</u>

1. Blood urea estimation
2. Serum creatinine estimation
3. Serum uric acid estimation
4. Serum glucose estimation
5. Use of pH Meter

EXAMINATION PATTERN

Theory Max -50 marks

1.	Short notes- answer any four	4*5=20marks
2.	Short answers	10*3=30 marks
	Total	50 marks

No practical examination

SECTION-B **Q P Code : 5154**

SUBJECT: MICROBIOLOGY

Theory: (20 hrs) 50 Marks

Introduction and History of Microbiology Lewis Pasteur, Robert Koch, Lister, Edward Jenner, Normal Flora of skin / body	5 marks
Sterilization and disinfection: Dry and moist heat of sterilization O.T. / Dialysis room sterilization Sterilization of mask, endotracheal tube **Respirator** / Dialysis unit / Other equipment Sterility testing	20 marks
Bacteriology – Classification, Morphology of Bacteria Immunity – Active, Passive, Hypersensitivity (Immunisation) Reaction of the body – local, specific effects to certain organism	15 marks
Common diseases caused by different types of organisms Staph, Strepto, C. tetanus, and, Mycobacterium tuberculosis, E. coli, Pseudomonas (Candida) Virology – Hepatitis, HIV, etc. Nosocomial infections, Line infections & infections control Universal precautions Waste disposal	10 marks

EXAMINATION PATTERN

Theory Max -50 marks

1. Short notes- answer any four 4*5=20marks
2. Short answers 10*3=30 marks

   Total 50 marks

NO PRACTICAL EXAMINATION IN MICROBIOLOGY

SECTION-A **Q P Code : 5155**

SUBJECT: Anatomy

"Must know"

General Anatomy:

1. Introduction to Anatomy:
   a. Definition of Anatomy
   b. Anatomical position
      - Supine, prone, lithotomy → positions
   c. Different parts of human body: Axial / Appendicular

      →Head and neck, Thorax and abdomen, pelvis and perineum, upper and lower limbs.
   d. Anatomical planes and sections: Median, sagittal, coronal, transverse, longitudiual, horizontal, oblique.

   e. Anatomical terms:
      Anterior, posterior, superior, inferior, medial, lateral, proximal, distal, superficial, deep, ventral, dorsal, cephalic, caudal, interior, exterior, invagination, evagination, ipsilateral, contralateral.
   f. Terms for describing muscles:
      Origin, insertion, Belly, tendon, aponeurosis, raphe.
   g. Anatomical movements:
      Flexion, extension, adduction, abduction, Medial rotation, lateral rotation, circumduction, pronation, supination, protraction, retraction, elevation, depression.

2. Basic tissues: Definitions of
   Epithelium, connective tissue (including cartilage and bone), muscle, nerve.

3. Systemic anatomy:
   The student should be able to identify and understand the anatomical components of each system with functional co-relation. (Diagrams, models, specimens from the dissected cadavers and colour photographs, 2D and 3D animation techniques can be used to teach.)

Identification of parts and structures in each system with functional correlation.

a. Cardiovascular system:
   Heart, Arterial and Venous systems. Superficial vessels of upper limb, lower limb and neck are to be studied (must know)
b. General arrangement of lymphatic system with functional correlation.
c. Endocrine system – Hypothalamus, Pituitary, Thyroid, Parathyroid, Adrenal and Pancreas → parts with functional correlation.
d. Urinary system- Kidney, Ureter, Urinary Bladder, Urethra → Parts and brief description of structures with functional correlation.
e. Nervous system – parts and functions briefly.
f. Respiratory system → Nasal cavity, larynx, trachea, lungs → identification and study of functional significance.
g. Peritoneum, pleura, pericardium
   → location and functional significance.
h. Quadrants of abdomen and approach to peritoneal cavity.

Practicals

→ Gross anatomy (including surface anatomy) only.
The students should maintain practical records and submit the same to the HOD of Anatomy for scrutiny.

→ Basic tissues to be demonstrated for identification.

→ Identification of parts of each system and structure mentioned in theory syllabus.

→ Upper limb, lower limb and neck → Blood vessels are to be identified and their use in practical procedures of dialysis, to be practiced on models and/or mannequins / cadavers.

→ Quadrants of abdomen and approach to peritoneal cavity to be practiced on models and / or mannequins / cadavers.

EXAMINATION PATTERN

Theory Max 50 marks

Short notes- answer any four	4*5=20marks
Short answers	10*3=30 marks
Total	50 marks

SECTION-B Q P Code : 5156

GENERAL PHYSIOLOGY (Duration of Teaching - 3 Hrs)

Introduction:-

Physiology - Homeostasis

Cell:-

Structure Of A Cell, Intracellular Organelles, Cell Junctions, Stem Cells, Cell Aging & Death

Transport through cell membranes:-

Mechanisms Of Transport Across Cell Membrane

BODY FLUIDS AND COMPARTMENTS (Duration of Teaching - 2 Hrs)

Compartments of Body Fluid, And Measurement Of Body Fluids, Electrolyte concentration

BLOOD (Duration of Teaching - 7 Hrs)

Composition & Functions Of Blood

Plasma:-

Composition And Functions Of Plasma Proteins

Cellular Components Of Blood:-

(RBC, WBC, PLATELETS) Morphology, Physiological Values, Functions, Formation Of Hemopoietic Cells, Life Span & Applied Aspects

Hemoglobin:-

Formation, Functions, Physiological Values, Destruction Of RBC, Applied Aspects

ESR, PCV, Blood Indices & Anemia

Blood Groups:-

ABO Blood Grouping, Rh Typing, Landsteiner's Law, Cross Matching, Storage Of Blood, Indications And Contraindications Of Blood Transfusion.

Hemostasis:-

Clotting Factors, Anticoagulants, Applied Aspects

THE CARDIOVASCULAR SYSTEM (Duration of Teaching - 3 Hrs)

Anatomy Of The Heart, Structure And Function Of Cardiac Muscle, Conducting System Of Heart, Systemic And Pulmonary Circulation, Over View -Heart Rate, Stroke Volume, Cardiac Output, Heat Sounds, Pulse, BP &ECG And Recording Of ECG.

RENAL SYSTEM (Duration of Teaching - 10 Hrs)

Overview of Anatomy of kidneys, renal blood flow, structure of Nephrons.

Renal and non renal functions of kidney.

General principles of formation of urine, GFR, auto regulation of GFR, Measurement of GFR and Renal blood flow, estimation of GFR, Counter Current Mechanisms

Renal regulation of acid base balance

MICTURATION , Cystometry applied physiology, Dialysis – types in detail, Renal function tests, Diuresis, RAS.

ENDOCRINE SYSTEM (Duration of Teaching - 5 Hrs)

An overview of all endocrine hormones & functions, and must know **Erythropoietin, Parathormone & Calcitonin, ADH, Adrenocortical, Insulin And Glucagon Hormones**

EXAMINATION PATTERN

Theory Max -50 marks

1. Short notes- answer any four 4*5=20marks
2. Short answers 10*3=30 marks
   Total 50 marks

Paper	SUBJECT	SECTION	Question paper Code	MAX. MARKS
Paper 1	Applied Pharmacology	Section A	**5151**	50
	Theory of Dialysis	Section B	**5152**	50
Paper 2	Biochemistry	Section A	**5153**	50
	Microbiology	Section B	**5154**	50
Paper 3	Anatomy	Section A	**5155**	50
	Physiology	Section B	**5156**	50

III DIPLOMA IN MEDICAL. DIALYSIS TECHNOLOGY

PAPER-I **SECTION-A** **Q P Code: 6151**

I Patient related

a) Renal Failure
- Acute
- Chronic Kidney Disease

b) Starting HD ; Patient assessment

Vascular *Access:*
- Temporary *access*
- Permanent access
- Identification of malfunction of access

H D Circuit

Preparation of HD machine for starting

Check list

HD

Regular

Sustained low efficiency dialysis (SLED)

Continuous renal replacement therapy(CRRP)

c) Monitoring patient during HD

During regular HD

During emergency HD

Vitals, *Access,* Monitoring, Machine monitoring

Record Maintenance - -1 hourly blood pressure, VP, TMP, OF pre/post

d) Closing HD

Regular
- Temporary
- Permanent access

Emergency

Method
- Saline
- *Air*

Tests required

Medications required

Post HD instructions

e) Medical problems in HD patients

Access related

- Sepsis / pseudoaneurysm
- Clotting
- Management of same

Patient related

- Hypotension
- Dialyzer reaction
- Vomiting
- Chest pain
- Headache
- Seizure
- Cramps Chills

Hypertension

-Hepatitis

- Anemia
  - Blood use
  - Erythropoietin use
  - Iron use

f) Adequacy of HD

- Clinical assessment - solute / fluid
- Kt/V / urea reduction ratio(URR)
- Recirculation of *Access*

g) Universal precaution to be taken

II Equipment Related

a) Dialyzer reuse
   1. Manual
   2. Automated

b) Dialysate
   1. Regular HD
   2. CRRT
   3. PD / CAPP

Dialysate in special situation

1. High potassium can
2. Potassium free can
3. Low calcium can

c) Machine

Alarms identification & rectification

Conductive

1. Low
2. High

Temperature Blood Leak Air alarm IMP

III Chemistry of HD

- Molecular weight of BU, creatinine
- Concept of middle molecules
- Hardness of water

IV Infection in HD

- Cannula site
  Temporary access site
  Common organisms
  Hepatitis - B & *C*
  HIV
  Prevention

- Hand hygiene
- Surface cleaning machine
- Disinfection of machine
- Disposal of materials

V Ultra filtration - Dry Weight

HD

PD

CRRT

Role of OF profiling

vi Patient Education

Access care

Do's (Si don'ts on HD (pre and post) Diet

CAPD

EXAMINATION PATTERN

Theory Max -100 marks (Section-A 50marks & Section-B 50 marks)

1.	Short notes- answer any four	4*5=20marks
2.	Short answers	10*3=30 marks
	Total	50 marks

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PAPER-II SECTION-A Q P Code: 6153

I Dialysis for poisoning

- Drugs - common indication
- Envenomation

Monitoring during these for poisoning

Ventilators
Ionotropes

Types of dialysis

HD Merits
Haemoperfusion
PD Demerits

II Intermittent PD

Anatomy of peritoneum, physiology of PD

- Diffusion
- Osmosis
- OF

PD catheter, kit set, PD fluid composition Indication
Contraindication Monitoring of Pb
Problems associated with PD & management (bleeding, flow problem, infection)
Closing of acute PD

III CAPD

- Difference between acute PD & CAPD

Fluid prescription

Peritonitis - management
Non infection complications & Management (flow problem, increase blood sugar, hernias)

IV CCPD / An)

Advantage and indications
Machine component / malfunction management CCPD fluid composition
Adequacy of dialysis in CAPD

V CRRT

- Indications
  Setting up for CRRT
  Fluid replacement
  Heparin management
  Common test during CRRT

VI SLED

Indications Advantage
Adjustment in machine for SLED

VII Plasmapheresis

Access
Indication Filter
Replacement
solution
Monitoring

VIII Monitoring dialysis in ICU

CVP / central line
Ionotropes
Ventilator
Cardiac monitor IV fluids
Catheter - urinary Arterial lines
Anticoagulation

IX Dialysis team & duties

- Composition
  Responsibilities

X Psychosocial problem in chronic HD patients

XI Dialysis of patient - pre and post transplant

- Monitoring
- Drugs
  Heparin usage
  Asepsis

FINAL YEAR ***PRACTICAL*** SYLLABUS

1. Vitals monitoring of patients
2. Starting of HD
    a. AVF / *AVG*
    b. Temporary access
3. Closing HD
4. Priming of dialyzer
5. bialysate preparation
6. Reprocessing dialyzer
    a. Manual
    b, Automated
7. Bundle volume measurement
8. Machine disinfection
9. RO plant / pre filter measurement
10. Spotters
    a. Double lumen dialysis catheter
    b. Transducer protector
    c. Intermittent Pb catheter
    d. CAN) catheters
    e. Iron injection
    f. Erythropoietin injection
    g- Adrenaline / Atropine
    h. CCPD machine
    i. Heparin injection

EXAMINATION PATTERN

Theory Max 100 marks(Part A-50 marks & Part B-50 marks)

1.	Short notes- answer any four	4*5=20marks
2.	Short answers	10*3=30 marks
	Total	50 marks

Practicals 100 marks

Pattern of practicals :
10 spotters 2 mark each - 20 marks (2 mins each)
Two special procedures to be described 30 marks each – 60 marks (I hour)
Practical Record -10 marks
Viva voce -10 marks

SUBJECT	SECTION	Question paper Code	MAX. MARKS
PAPER-I	Section A	**6151**	50
	Section B	**6152**	50
PAPER-II	Section A	**6153**	50
	Section B	**6154**	50
Practical			100

RECOMMENDED TEXT BOOKS & REFERENCES

A. **ANATOMY**:

1. Singh (Inderbir)
   Text book of Histology
   J.P. Brothers, New Delhi
2. Difore Atlas of normal Histology
   Ed. 6 Lea & Febiger - 1989
3. Anatomy & Physiology for nurses

Reference Books:

1. Human Anatomy -- Chaurasia Vol. I, II & III
2. Human Anatomy -- A.K. Dutta Vol. I, II & III
3. Cunningham's Manual of Practical Anatomy -- Vol. I, II & III

B. PHYSIOLOGY:

1. Anatomy and Physiology for Nurses by Evelyn Pearle -- 16th Edition Jay Pee brothers Publications -- Rs. 90/-

2. Anatomy and Physiology for Nurses by Gupta & Gupta AITBs Publications -- Rs. 110/-

3. Basic Anatomy & Physiology by N. Murgesh 5th Edition-- Satya Publishers Rs. -- 70

4. Anatomy and Physiology illustrated by S.S. Nadakarni

1. Fundamentals of Physiology - A text book for Nursing students by R.L. Bijalani -- Jay Pee Brothers Publications

2. Human Physiology and Biochemistry by Prof. A.J.Jain, Arya Publications Rs. 390/-

B. MICROBIOLOGY:

1. Text Book of Microbiology by Anantha Narayan
2. Text Book of Microbiology by Rajesh Bhatia

D. BIOCHEMISTRY :

Text Books:

1. Text book of Biochemistry for Dental Students– Pattabhiraman
2. Text book of Biochemistry for Dental Students, Harbans lal
3. Text book of Chemistry prescribed for II P.U.C. (students may need the basic knowledge of chemistry)

Practical Books:

1. Practical manual of Biochemistry – Rajagopal
2. Practical manual of Biochemistry – Shivananda Nayak
3. Practical manual of Biochemistry - Pattabhiraman

E. DIALYSIS:

Sl. No	Name	Author	PUblisher
1	Dialysis Therapy (New Ed.) (1 copy)	Nissenson Fine	Jay Pee Brothers Medical Publishers (P) Ltd.
2	Review of Haemodialysis for Nurse and Dialysis Personnel (1 copy)	C.F. Gutch	-
3	Principle and Practices of Haemodialysis (1 copy)	William C.M. Meulean	-
4	Principles of Dialysis (1 copy)	Trunne Dipittiod	-
5	Haemodialysis Nursing (1 copy)	Juanne Dippittiod	-
6	Hand book of Dialysis (2 copies)	Daugirdas	-