

Curriculum
for the
Two Years' Post Matric Competency Based
Diploma For
Haemodialysis Technicians
(New Scheme)



Punjab Medical Faculty
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Preface

After introduction of the new service structure for Allied Health Professionals (AHPs) in 2012 the qualification requirement for entry in service has been changed to a diploma of two years' duration. This decision has necessitated the development of curricula for the new scheme of studies. The evolving health needs of the community, exponential advances in medical and allied technologies and changes in health services provision, functions and structure also demand continual and responsive changes in education and training programs meant for AHPs. The revised curricula would carry out the following important functions:

- link pre-service education and training with actual tasks AHPs have to perform after being employed, especially in the public sector
- modernize training program by weeding out subjects that have become obsolete and including subjects that are currently considered essential
- provide clarity on subjects and topics to be taught delimiting the breadth and depth of teaching
- give clarity to examiners on what is to be tested and how
- stimulate critical faculties of both teachers and students to conceptualize topics rather than memorizing them.

Focus of the new curricula would be on integration of tasks and multi-skilling of students. Thus there would be a common knowledge base for all courses in the form of a *Core Course* which would provide insight into essential technical knowledge besides providing base for development of the education for Allied Health Sciences up to post graduate level.

The new curriculum for Dialysis Technicians replaces and augments the previous curriculum of one year duration. The goal of this document has been to outline a common body of knowledge that is essential for entry-level radiography technicians. Combined with the Core Course it will provide a broad knowledge base for the technicians and provide opportunities for practical skill development in the relevant field. This needs based curriculum places practical skills development at high priority. Content and apprenticeship experiences is designed to sequentially develop, apply, critically analyze, integrate, synthesize and evaluate concepts and theories in the performance of radiologic procedures.

General Outline

Aim of this curriculum is to equip students with the relevant professional knowledge, skills and techniques to enable them to apply their acquired expertise for efficient health service delivery. At the end of training the student should be able exhibit the following general and specific competencies:

A. General learning objectives

1. Act upon his / her job description ethically keeping in mind the requirements of community and people at large.
2. Demonstrate empathy and humane approach towards communities and exhibit interpersonal behavior in accordance with the societal norms and expectations.
3. Demonstrate sufficient understanding of basic sciences related to the technology and be able to integrate such knowledge in his / her work.

B. Specific learning objectives

The primary focus of the Clinical Haemodialysis Technician is to undertake haemodialysis treatment for patients with acute and end stage renal failure and to provide technical expertise, equipment monitoring and machine maintenance.

The two years training course is designed to prepare trainees for the role of Clinical Haemodialysis Technician. It provides a clinically focused educational opportunity that fosters the development of the clinical and theoretical knowledge and skills necessary to undertake haemodialysis.

This course requires trainees to apply theory to practice, particularly in regard to the management of dialysis patients and the maintenance and monitoring of dialysis and water treatment equipment. The course meets the requirements of the Punjab Medical Faculty, prepares trainees for practical and theoretical purposes.

Graduates of the course are expected to develop the ability to assess their own practice using the clinical dialysis technician competencies, as the guide for practice development. This dialysis course provides a career development pathway by which practice development is supported, and it is recognized and valued.

This course requires trainees to apply theory to practice, particularly in regard to the management of dialysis patients and the maintenance and monitoring of dialysis and water treatment equipment.

On successful completion of the course the trainee will:

- Have a basic knowledge of haemodialysis principles and practice
- Be able to undertake haemodialysis treatment on patients with end stage and acute renal failure.
- Provide care that is patient centered, culturally sensitive and evidence based
- Be able to undertake operational and preventative maintenance and troubleshooting of dialysis and water treatment equipment

C. Distribution of Training Time

The two years' program would be divided in three distinct parts (Papers). There will be a 'Core Course' which would be common for all technologies. The examination for this component will be taken at the end of first academic year. The teaching for specific aspect of this technology will be divided in two sections; examination for these will be held at the end of second academic year – however, teaching for specific techniques will start from the first year.

A typical training day for students at training institutions routinely comprises of five hours. Keeping a generous allowance of holidays and weekends, an academic year for students would be 200 days. Therefore, 1000 teaching hours would be available in 12 months. In the new scheme of studies, for the Core Course the proportion of classroom teaching and practical training (applied learning activities) would be 60:40; whereas this proportion for the specific techniques would be 40:60 and the time allocations for dividing teaching time between various topics, units and sub-units will be done accordingly as depicted below:

Core Course	500
Section I (Paper I)	750
Section II (Paper II)	750
Total	2000

The marks distribution for this diploma would be:

Subject	Marks
First Year	
Core Course	100
Viva	100
Second Year	
Section I	100
Section II	100
Practical / Viva Section I	100
Practical / Viva Section II	100
Total:	600

D. Essential Teaching Requirements

I. Training requirements/instructional methodologies (Process)

- a. Teaching staff will be given in-service training as recommended by PMF from time to time.
- b. Teachers will use a combination of interactive programmed instructions (non-IT), class teaching with exercises using audiovisual aids, mini-lectures, group discussions, simulations and case studies as instructional/teaching methodologies.
- c. IT will be employed for teaching where necessary.
- d. A combination of English and Urdu languages will be used as medium of instruction.
- e. Teachers will encourage students to ask questions; they will encourage debate and discussion in class to inspire and hone thinking skills of students. Students will be given the opportunity to engage in activities that promote divergent thinking skills. Students will be encouraged to work independently, as well as in small groups and as a whole class, to form creative associations of ideas across discipline lines.

II. Practical learning component

As prime objective of the training program is to develop practical skills, an extended clinical attachment is its essential part. The student will work in the Haemodialysis Unit and his/her attendance will be recorded on a logbook to be signed by supervisors. Teachers will ensure that students are given chance to practice activities under supervision that are relevant to the topic being taught in class in order for them to develop relevant practical skills.

The detail of specifications for the institution imparting education according to the new scheme of studies – including the facilities for practical attachment – is available in ‘New Affiliation Criteria’ for such institutions.

F Organization of Units of Curriculum

The different units presented in the subsequent sections would comprise of the following components, not essentially in the sequence depicted below:

- a. Learning Focus (contents, hours, weightage for assessment)
- b. Rationale
- c. Scope
- d. Learning Objectives (aims and learning outcomes)
- e. Practical Learning Component (where applicable)

G Revisions and Updating of Curriculum

The curricula are ever evolving organic documents. Regular reviews and revisions are, therefore, essentially required to keep them in pace with modern needs; topics that are required now might outlive their utility in a few years. Updating curricula therefore forms the basis for quality teaching as well as professional competence of AHPs. This would be ensured by technology-wise panels of experts notified by the Health Department.

SECTION 1

Paper I

Unit 1	Normal Functions of Human Kidney and Impact of Renal Impairment
Unit 2	Principal of Dialysis
Unit 3	Water Treatment
Unit 4	Haemodialysis Devices

Unit 1

Normal Functions of Human Kidney and Impact of Renal Impairment

1. Rationale

The Dialysis Technician should know the structure and functions of a normal kidney to properly understand his assigned roles. An understanding of the impairment processes and affects of malfunctioning is also a prerequisite for further training in the field.

2. Scope

The content will build upon the knowledge of excretory system gained during the Core Course. The diagnosis, management and treatment of acute and chronic renal failure will also be briefly described.

3. Learning Objectives

After completing this section the students will be able to:

- i. Describe the structure and functions of kidney
- ii. Understand the pathophysiology of acute, chronic and end stage renal failure
- iii. Outline the major renal diseases
- iv. Describe the systemic impact of renal impairment
- v. Describe the diagnosis of acute and chronic renal failure
- vi. Describe the management of acute and chronic renal failure

4. Learning Focus	
Gross anatomy of human kidney	03 hours
Nephron – structure and function	03 hours
Impairments in renal functions – major causative factors	06 hours
Acute and Chronic Renal Failure – clinical manifestations	08 hours
Class Room Teaching	20 hours
Total Teaching	20 hours
Weight-age for assessment	10%

Unit 2

Principle of Dialysis

1. Rationale

The Dialysis Technician has a very significant role in management of end stage renal disease patients. He should have basic knowledge of principal of haemodialysis for better and effective haemodialysis.

2. Scope

The content will prepare student in the issues related to care renal failure patients during and after haemodialysis. The focus would also be on development of correct attitudes with patients in Dialysis Unit.

3. Learning Objectives

After completing this section the students will be able to:

- i. Discuss how dialysis therapy is initiated
- ii. How to improve the quality of dialysis
- iii. Describe the ways that dialysis technician can demonstrate professional behavior with patients.

Unit 2 – Principle of Dialysis ... (cont...)

4 - Learning Focus	
Objective	06 hours
Introduction	06 hours
Scientific principal used in Dialysis	
Solutions	10 hours
Semi permeable membrane	10 hours
Diffusion	06 hours
Osmosis	06 hours
Applying scientific principals to dialysis	
Fluid compartment	06 hours
Fluid dynamic in dialysis	06 hours
Diffusion in dialysis	06 hours
Osmosis in dialysis	06 hours
UF In Dialysis	06 hours
Convection in dialysis	06 hours
Class Room Teaching	80 hours
Practical Attachments	115 hours
Total Teaching	195 hours
Weight-age for assessment	30%

Unit 3

Water Treatment

1. Rationale

The good quality water is necessary for effective haemodialysis. Dialysis Technician must have the knowledge and skill to manage Reverse Osmosis System.

2. Scope

The content will provide a thorough understanding of the machinery employed in Reverse Osmosis Plant; this will also include maintenance and minor repairs of the plant.

3. Learning Objectives

After completing this section the students will be able to:

- i. Discuss the purpose of water treatment for dialysis
- ii. List the components of water treatment of dialysis unit
- iii. Discusses the disadvantage of water softeners, carbon tanks, Reverse Osmosis, Deionization and ultraviolet irradiation and treatment of water for dialysis.
- iv. Describe the method for microbiological testing of the water treatment system.
- v. Describe a typical water treatment monitoring schedule.

Unit 3 Water Treatment . . . (cont...)

4 - Learning Focus	
Objective	06 hours
Introduction	06 hours
Water Supply	
Component of water treatment system	10 hours
Feed water component	10 hours
Reverse Osmosis Process and System	06 hours
Deionization	06 hours
Distribution system	06 hours
Disinfection of water treatment system	06 hours
Monitoring of water treatment system	06 hours
Monitoring of system components	06 hours
Chemical Monitoring	06 hours
Patient monitoring	06 hours
Class Room Teaching	80 hours
Practical Attachments	110 hours
Total Teaching	190 hours
Weight-age for assessment	30%

Unit 4

Haemodialysis Devices

1. Rationale

Knowledge about the devices of haemodialysis is important for the difference types of the treatment modalities like haemodialysis, ultra-filtration, isolated ultra-filtration, continuous venovenous haemodialysis scope.

2. Scope

The content will cover the concepts of haemodialysis, peritoneal dialysis and other modalities of dialysis. The student will build upon the knowledge gained during the core course and will be enabled to employ different dialysis modalities in appropriate manners.

3. Learning Objectives

After completing this subsection, the students will be able to:

- i. Identify the purpose and characteristics of dialyzers.
- ii. Describe the purpose and chemical composition of dialysate.
- iii. Describe dialysate preparation and the three monitoring functioning of the dialysate delivery system.
- iv. Describe the extracorporeal blood circuit functions and monitoring systems.

Unit 4 - Haemodialysis Devices ... (cont...)

4 - Learning Focus	
Objective	06 hours
Introduction	06 hours
Dialyzers	06 hours
Function and components	06 hours
Dialyzer Characteristics	
Dialyzer design	10 hours
Membranes	10 hours
Measuring Dialyzer effectiveness	
Dialysate	06 hours
Purpose of dialysate	06 hours
Composition of dialysate	06 hours
Haemodialysis delivery system	
Dialysate delivery system	06 hours
Extracorporeal circuit	06 hours
Sorbent dialysis	06 hours
Class Room Teaching	80 hours
Practical Attachments	115hours
Total Teaching	195 hours
Weight-age for assessment	30%

SECTION 2

Paper II

Unit 5 Haemodialysis Procedure and complications

Unit 6 Dialyzer Reprocessing

Unit 7 Vascular Access

Unit 5

Haemodialysis Procedures and Complications

1. Rationale

Haemodialysis is an invasive procedure and any kind of complications may occur due to this procedure. Therefore, the dialysis technician must understand and know complications during dialysis so that immediate measures can be taken to solve the problem.

2. Scope

The student will be apprised about different complications during dialysis. Emphasis would be on the knowledge about diagnosis and solving the complications during dialysis.

3. Learning Objectives

After completing this sub-section, the students will be able to:

- i. Describe the predialysis set up of the haemodialysis machine and extracorporeal circuit.
- ii. Explain the start, monitoring, and end of a routine treatment.
- iii. Identify the vital signs that should be monitored before, during and after treatment.
- iv. Discuss the basics of infection control.
- v. Explain how to draw up and give intravenous medications.
- vi. Describe how to draw a blood sample.

Unit 5 - Haemodialysis Procedures and Complications ... (cont...)

4- Learning Focus	
Objective	10 hours
Introduction	10 hours
Patient and staff safety	10 hours
Pre-dialysis treatment procedure	10 hours
Initiation of dialysis	10 hours
Monitoring during dialysis	10 hours
Haemodialysis complications	10 hours
Post dialysis procedures	10 hours
Class Room Teaching	80 hours
Practical Attachments	120 hours
Total Teaching	200 hours
Weight-age for assessment	40%

Unit 6

Dialyzer Reprocessing

1. Rationale

Haemodialysis is a very expensive treatment modality. We can save money of patients by reusing dialysis devises. This amount can be used in other medications of dialysis patients.

2. Scope

The content provides basic knowledge of dialyzer reprocessing methods. It also gives understanding of first use of dialyzer, cleaning of dialyzer and further reuse.

3. Learning Objectives

After completing this unit, the students will be able to:

- i. Discuss the history of dialyzer reprocessing
- ii. List the reasons why dialysis center reprocess dialyzers.
- iii. Explain the steps involved in dialyzer reprocessing.
- iv. Discuss the hazards to patients and staff that can occur with dialyzer reprocessing.
- v. List the required documentation for dialyzer reprocessing.

Unit 6 - Dialyzer Reprocessing ... (cont...)

4- Learning Focus	
Objective	10 hours
Introduction	10 hours
Dialyzer reprocessing procedures	10 hours
Preparing for the first use of dialysis	10 hours
After dialysis	10 hours
Preparing for next use	10 hours
Potential hazards	10 hours
Documentation	10 hours
Class Room Teaching	80 hours
Practical Attachments	120 hours
Total Teaching	200 hours
Weight-age for assessment	35%

Unit 7

Vascular Access

1. Rationale

A good vascular access in the form of AV Fistula, Graft, or venous catheter is necessary for effective haemodialysis. The dialysis technicians should know the type of AV Fistula, Graft, or venous catheter so that the vascular access can be maintained and used for longer period of time.

2. Scope

Content will cover the basics of vascular access. Students will be acclimatized with the use of vascular access and how to make sure the care of vascular access. The dialysis technician will be able to do aseptic measure before use of vascular access.

3. Learning Objectives

After completing this unit, the students will be able to:

- i. Describe the three main types of vascular access.
- ii. Identify the predialysis assessments for all types of vascular access.
- iii. Describe the methods of needle insertion for AVFs and grafts.
- iv. Describe the predialysis assessment, accessing procedure, exit site care, and monitoring of catheters.

Unit 7 - Vascular Access ... (cont ...)

4 - Learning Focus	
Objective	06 hours
Introduction	06 hours
Fistula	
Accessing maturity of fistula	10 hours
Initiating dialysis with fistula	10 hours
Fistula care post-dialysis	06 hours
Fistula Complications	06 hours
Graft	
Starting dialysis with graft	06 hours
Graft care post-dialysis	06 hours
Graft complications	06 hours
Central venues catheter	06 hours
Types of catheter	06 hours
Care of catheter	06 hours
Class Room Teaching	80 hours
Practical Attachments	120 hours
Total Teaching	200 hours
Weight-age for assessment	25%

Practical Attachment

The extensive internship will reinforce the classroom learning and enable the student to understand how to handle the workload in dialysis unit. It is this aspect of the course that will determine the level of professionalism students will display after employment. This period will be interspersed with learning of theory.

During the two years of this program the students will be placed on a roster basis in different part of haemodialysis unit, ICU, Medical Wards on a roster basis to gain practical experience in relevant areas under supervisions of senior technicians and doctors of haemodialysis.

Students will maintain a record of their attachment in the 'Practical Note Books' (one for each section), the last portion of which would be designed as a 'Log Book' which shall be a work diary and record. Special mention shall be made of the procedures, if any, conducted by the candidate. This diary shall be scrutinized and certified by the Head of the Department and Head of the Institution, and presented in the practical /viva examination.

The scope of practical attachment would be:

A. Practical Coaching by Mechanical Engineers

After the completion of class room teaching of two years a three days practical coaching program by the mechanical engineers (of Fresenius Medical Care Company) will be held in Class Room. In this practical session the haemodialysis student technicians will be taught;

1. How to operate the machine?
2. How to take care of different tubing and pipelines?
3. To take care and change different filters.
4. To deal with different troubleshooting.
5. To take care of reverse osmosis water treatment plant.

After this short course a practical assessment of each student dialysis technician will be taken before appearing in the final examination.

B. Identification of Instruments and Preparations of Trolleys

i. Emergency

1. Emergency trolley
2. Endotracheal tube
3. Laryngoscope
4. Cardiac monitor
5. Defibrillator

ii. Elective

1. Dialyzers
2. Blood tubing's
3. AV Fistula needles
4. AV Graft
5. Venous Catheter
6. Peritoneal Dialysis Catheter
7. Peritoneal Dialysis solutions backs

C. IDENTIFICATION OF MATERIALS

- Different Type of Fluids
 - Isotonic Fluids -5% D/W
 - NaCl
 - D/S
 - Ringers
 - Plasma Expander
 - Haemaccel
 - Gelatundin
 - Albumin
- Hypodermic needles, syringes and cannulas
- Appliances
 - Endotracheal Tubes
 - Air Way
 - Ambu Bag

- Nasogastric Tube
- Foley's catheter
- Intra-venous cannulae
- Nelaton's Catheter
- Surgical Gloves

D. Basic Handling of Machines / Instruments

- Haemodialysis machines
- Continuous venovenus dialysis machine
- CAPD exchanger
- Ventilator
- Suction
- Monitors

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