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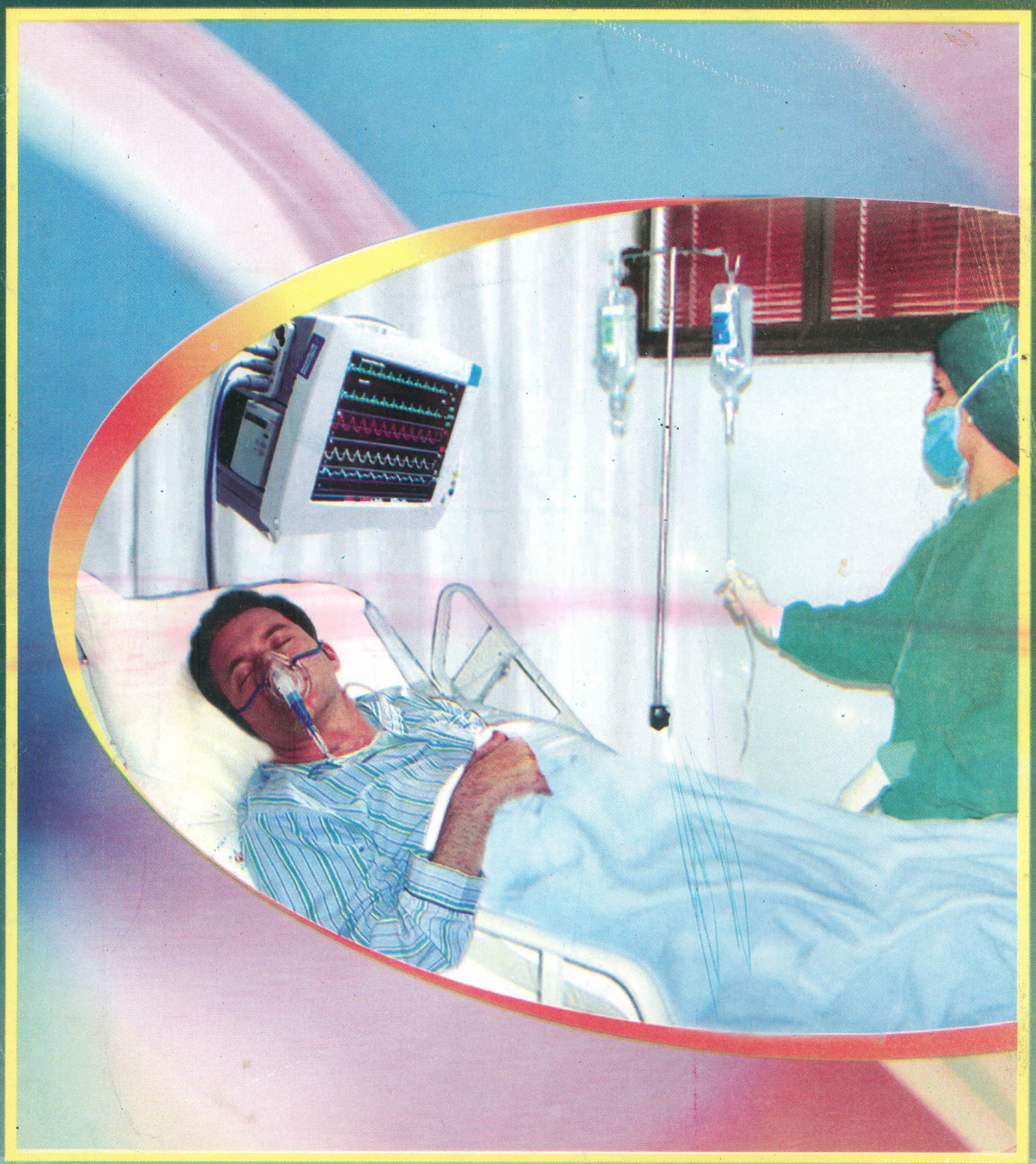
BNSL – 033
Clinical Nursing Practice
in Critical Care-1



Role of Nurse In Diagnostic of Therapeutic Procedures In Critical Care Nursing–Renal System

5

"शिक्षा मानव को बन्धनों से मुक्त करती है और आज के युग में तो यह लोकतंत्र की भावना का आधार भी है। जन्म तथा अन्य कारणों से उत्पन्न जाति एवं वर्गगत विषमताओं को दूर करते हुए मनुष्य को इन सबसे ऊपर उठाती है।"

– इन्दिरा गांधी

"Education is a liberating force, and in our age it is also a democratising force, cutting across the barriers of caste and class, smoothing out inequalities imposed by birth and other circumstances."

– Indira Gandhi

Indira Gandhi
National Open University
School of Health Sciences

BNSL-033
Clinical Nursing Practice in Critical Care-I

Block

5

ROLE OF NURSE IN DIAGNOSTIC OF THERAPEUTIC PROCEDURES IN CRITICAL CARE NURSING – RENAL SYSTEM

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BLOCK INTRODUCTION

You have learnt in theory about nursing care of various critical care conditions of the patient with problems of the renal system. In this practical the emphasis has been placed on the role of the critical care nurse in assessing and providing nursing care to the patient with renal condition requiring critical care nursing. The focus has been placed on various diagnostic and therapeutic procedures of renal system which will enable you to review and update your knowledge and skills in care of the patients undergoing the various procedures.

At the end of the practical, list of self-activities and supervised activities has been given for your reference. You will have to perform self-activities at your work place with the help of the practical manual and supervised activities under the supervision of the clinical supervisors at the programme study centre during your contact sessions.

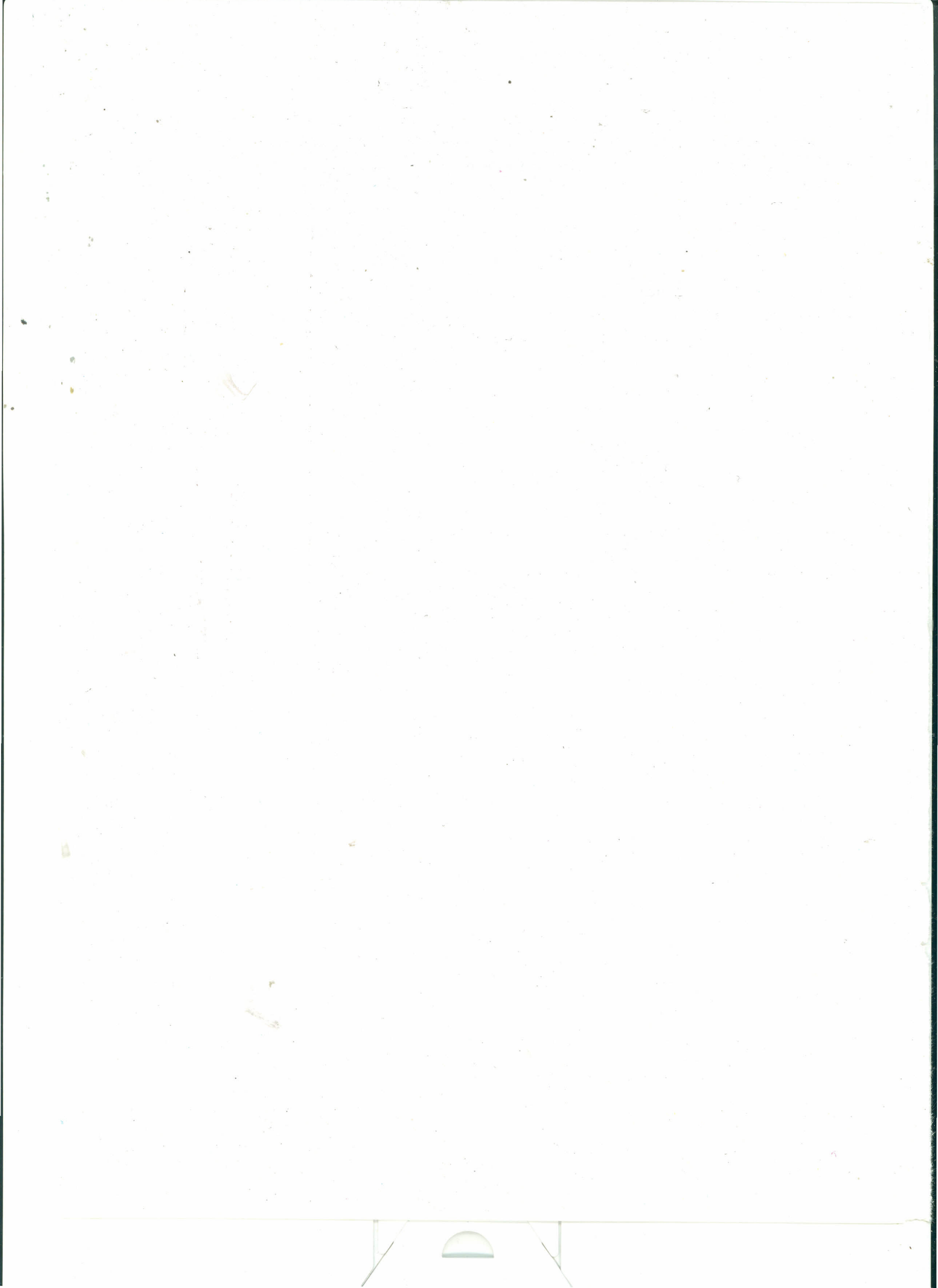
This block is organized in four practicals:

Practical 1 deals with assessment of Renal System

Practical 2 focuses on non-invasive Procedures

Practical 3 describes invasive Procedures

Practical 4 explains therapeutic Procedures.



PRACTICAL 1 ASSESSMENT OF RENAL SYSTEM

Structure

1.0 INTRODUCTION

Assessment is the most important step to collect data from the patient which helps in framing the diagnosis. You have also learnt in the nursing process (BNS-031 unit 2) that assessment is one of the most important and foremost step in nursing care. For good assessment sound knowledge of anatomy, physiology and related symptoms is essential. Accurate diagnoses of renal problems depends upon complete and thorough assessment. Discussing urinary problems may be embarrassing to patents so while assessing the patient, you should ensure that the patients is comfortable and use good communication skills to obtain complete and accurate information. In this practical we shall focus on various methods of assessment of renal system which will include history taking, physical examination and assessment of laboratory values.

1.1 OBJECTIVES

After completing this practical, you will be able to:

- observe the patients for signs and symptoms of urinary and renal problems;
- interpret the observations appropriately;
- recognize common manifestation of the patient with kidney failure; and
- differentiate between common symptoms and fatal symptoms.

1.2 REVIEW OF RENAL SYSTEM

As you have learnt anatomy and physiology of renal system in GNM, we will briefly review it. Urinary tract consist of four organs (i) Kidneys (ii) Ureters (iii) Bladder (iv) Urethra.

Kidneys are located retroperitoneally in posterior aspect of abdomen. They lie between 12^{th} Thoracic vertebrae to 3^{rd} lumber vertebrae. Each kidney has three major parts; Cortex, Medulla, and Pelvis. Functioning unit of kidney is nephron.

Each kidney contains more than one million nephrons. Nephron is a microscopic structure consisting of a glomerulus (Bowman's capsule) and tubular system that empty into renal pelvis and the ureter (Fig. 1.1).

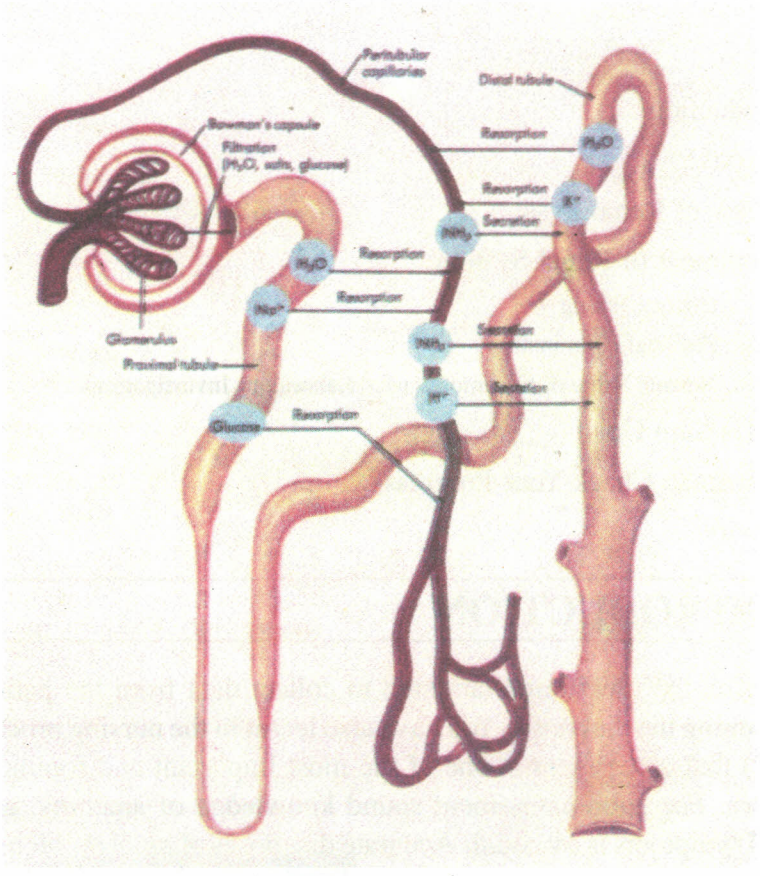


Fig.1.1: Nephron

Function of Kidney

The function of normal kidneys are as follows:

- Excretion of nitrogenous waste products.
- Maintenance of water balance of the body.
- Regulation of acid base balance and electrolyte balance of the body.
- Excretion of drugs, poisons and unwanted chemicals from the body.
- Regulation of blood pressure of the body.
- Erythropoiesis (make blood)
- Make active Vitamin D which is necessary for bone function.

Physiology of renal system

Urine is formed by nephron by three processes such as **Filtration, Reabsorption** and **Secretion.**

Filtration is the passage of liquid through a filtering membrane as a result of a pressure differential. **Reabsorption** takes back fluids and other substances through body tissues. **Secretion** involves the active transport of certain chemicals from the bloodstream in to tubules. Body regulates fluid and electrolyte balance with these processes. Kidney also maintains acid-base balance by excreting phosphoric, keto, uric acid, and sulfuric acid as they are formed. In the presence

of acid base imbalance, kidneys excrete either hydrogen or bicarbonate ions to restore balance. Kidneys also produce rennin which helps in blood pressure regulation.

1.3 ASSESSMENT OF RENAL SYSTEM

There are various ways by which a patient with renal disease can present the problems. Some patients can present with incidental hematuria and/or proteinuria. Symptoms generally vary but are more commonly noted with advanced stages of chronic kidney disease. A systematic, well organized approach is of utmost necessity in collecting correct information and helping in proper diagnosis.

1.3.1 History Taking

Note the Chief Complains of the patient

- Present illness
- Past illness
- Family History
- Social History
- Sexual History.

Note the Key signs and Symptoms of the patient

Edema Fluid retention and electrolyte imbalance may produce edema which can vary from mild to severe form.

Steps to evaluate Edema Fig.1.2.

- Press firmly for 5 to 10 sec. over a bony surface such as subcutaneous part of tibia, fibula, sacrum or sternum.
- Remove your finger and note how long the depression remains.
- Documents your observation on a scale from +1(barely detectable) to +4 (a persistent pit as deep as 1" [2.5 cm]).

Fig. 1.2: Evaluating pitting edema

Pain: Pain in renal system can present in many forms.

You will look and ask for

- Is it associated with any precipitating factor. For example, in benign prostatic hyperplasia, pain is associated with unability to pass urine and retention of urine?
- Is it with fever or any other symptom e.g, in Urinary tract infections it is associated with fever and chills?
- Is it radiating to any other area or is it localized e.g, it renal, ureteric stone pain descends downwards?
- Quality of pain is severe, dull pain e.g. severe in renal colic and dull in hydronephrosis.
- Is it intermittent, continuous ?

Hematuria: If patient has hameturia you have to look for the following:

- If it is associated with pain e.g, may be colic.
- Is it gross painless hameturia e.g, in carcinoma of bladder.
- Are few RBCs present then may be some glomerular disease.

Dysuria: Is there any difficulty in passing urine?

- It may be associated with pain as in Benign prostatic hyperplasia.
- It may be associated with fever as in UTI.

Pruitus: You will ask the patient for itching in the following manner.

- Is it localized or all over the body?

Urine output: You will ask the patient how much urine he had passed in last 24 hours.

- Polyuria indicates a stage in acute renal failure.
- Oliguria – up to 500ml in 24 hours, it indicates decreased renal function.
- Anuria – less than 30 ml per day it may be due to severe obstruction, advance stage of renal failure.

Urgency: Urgency is urge to pass urine immediately.

- Does the patient feel urgency to pass urine?

Frequency: How many times a patient passes urine?

- Is frequency more in day or night?
- Is it associated with dysuria?

Fever and chills: Fever indicates infection in genitourinary system.

- Check whether patient is having fever
- Check for the grade of fever.
- High grade indicates Urinary Tract Infection (UTI), pyelonephritis.

1.3.2 Physical Examination

You will perform the physical examination by following methods:

- Inspection
- Palpation
- Percussion
- Auscultation.

Inspection

Steps of examining the abdomen for renal problems:

- Place the patient in supine position with his arms relaxed at his sides.
- Expose the patients abdomen from xiphoid process to symphysis pubis.
- Inspects the abdomen for gross enlargements.
- Note any asymmetrical areas.
- Note for scars, lesions, bruises, and discolorations.

Palpation

Palpation of the kidneys and bladder is the next step in the physical examination. You should check for any lumps, masses or tenderness.

Steps for palpation of kidney are given below (Fig.1.3):

- Place the patient in supine position.
- Expose the patients abdomen from xiphoid process to symphysis pubis.
- Stand on right side.
- Place left hand under the back midway between the lower costal margin and the iliac crest.
- Place your right hand on patients abdomen, directly above your left hand.
- Angle this hand slightly toward the costal margin, to palpate the right lower edge of the right kidney.
- Press your right fingertips about 1 ½″ (4 cm) above the right iliac crest at the midinguinal line.
- Press your left fingertips upward into the right costovertebral angle.

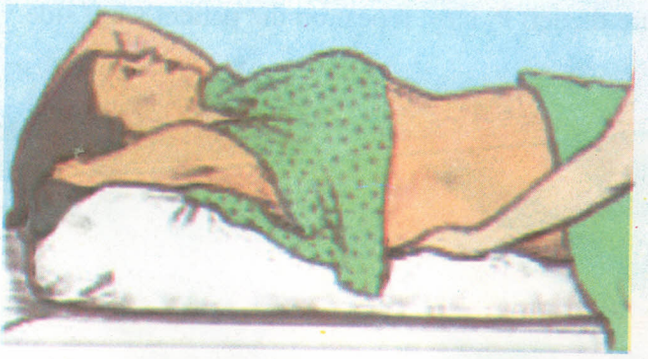


Fig.1.3: Palpation of kidney

Steps for palpation of bladder are given below (Fig. 1.4):

- Make the patient to empty the bladder.
- Locate the edge of bladder by pressing deeply in the midline about 1″ to 2″ (2.5cm to 5cm) above the symphysis pubis.
- Note its size and location and check for lumps, masses, and tenderness.
- During deep palpation, the patient may report urge to urinate – a normal response.

Fig. 1.4: Palpation of bladder

Steps of palpation for capturing kidney (Fig. 1.5a and 1.5b)

i) To capture the right kidney, position your hands as for bimanual palpation.

ii) Place your left hand under the patient midway between lower costal margin and iliac crest.

iii) Place your right hand on the abdomen, directly above your left hand.

iv) Angle your right hand slightly toward the costal margin.

v) Instruct the patient to inhale deeply.

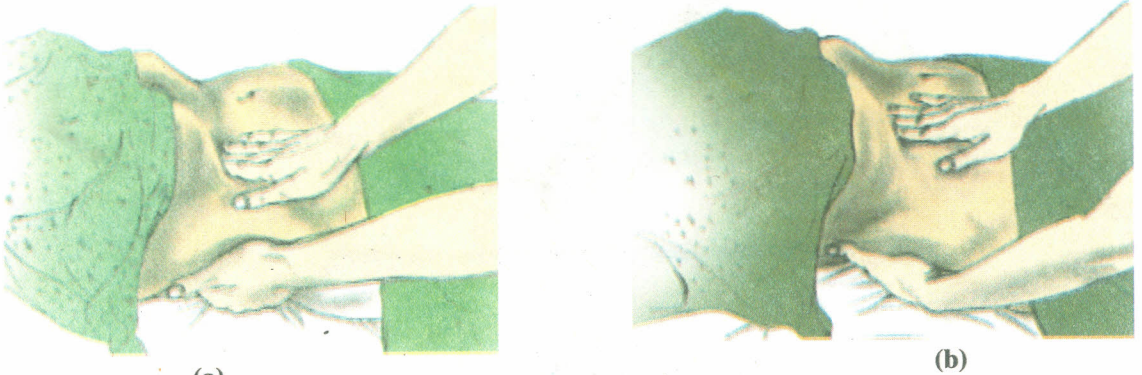
vi) At the peak of inhalation, quickly press your hands together to capture the kidney.

vii) If the kidney can be palpated, note its contour and size and check for lumps, masses, and tenderness.

viii) Ask the patient to exhale slowly as you release your hands.

ix) If the kidney was captured, it will slide back into place.

x) To capture the left kidney, repeat on the patient's left side.



(a) (b)

Fi 1.5(a&b): Capturing kidney

Percussion

Kidney percussion (Fig.1.6)

With the patient sitting upright, percuss each costovertebral angle (the angle over each kidney whose borders are formed by the lateral and downward curve of the lowest rib and the vertebral column). To perform mediate percussion, place your left palm over the costovertebral angle, and gently strike it with your right fist. To perform immediate percussion, gently strike your fist over each costovertebral angle. Normally, the patient will feel a thudding sensation or pressure during percussion.

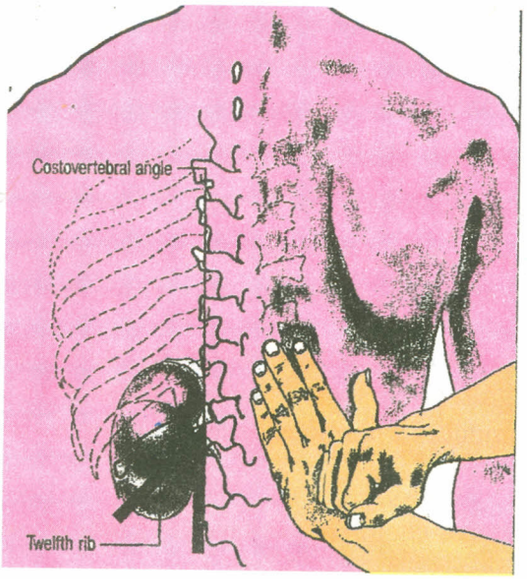


Fig. 1.6: Percussion of kidney

Bladder percussion

Using mediate percussion, percuss the area over the bluffer, beginning 2″ (5cm) above the symphysis pubis. To detect differences in sound, percuss toward the bladder's base. Percussion normally produces a tympanic sound. (Over a urine-filled bladder, it produces a dull sound. Fig. 1.7)

Fig. 1.7: Percussion of bladder

1.3.3 Normal Values of Commonly used Laboratory Investigations

Following is the list of commonly used investigations in renal system with their normal values. For urine examination refer practical 2 of this block.

Blood investigations are summarized below:

Serum Creatinine

The normal serum creatinine range in men is 0.5-1.5 mg/dL.

The normal range for women is 0.6-1.2 mg/dL.

Creatinine Clearance: Creatinine clearance is a test sometimes used to estimate filtering capacity of the kidneys. The amount of creatinine in urine is compared to the amount of creatinine in blood.

Normal creatinine Clearance for healthy men is 97-137 mL/min.

Normal creatinine clearance for healthy women is 88-128 mL/min.

Glomerular Filtration Rate (GFR): GFR is a more accurate way to measure kidney function. Normal GFR is more than 90 ml/ minute.

Hemoglobin level: The normal Hb level for healthy individuals is 14 to 18 g/dL for men and 12 to 16 g/dL for women. In kidney diseases, patients have anemia because renal tissue produces a hormone called erythropoietin which stimulates blood formation.

The normal values of other chemical substance is given below:

Serum uric acid –

Serum proteins —2.5 to 3.5

Serum calcium 8 to 11 mg %

Serum phosphorus 3 to 5 mg

Serum sodium 120 to 135 MEq/l

Serum potassium 3.5 to 5.2 MEq/l

Check Your Progress 1

i) List the major functions of kidney.

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1.4 LET US SUM UP

In this practical we have discussed about assessment and examination of renal system. We have discussed history taking, physical examination including inspection, palpation percussion. We have also focused on normal values of commonly used laboratory investigation.

1.6 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1

The function of normal kidneys is:

- Excretion of nitrogenous waste products.
- Maintenance of water balance of the body.
- Regulation of acid base balance and electrolyte balance of the body.
- Excretion of drugs, poisons and unwanted chemicals from the body.
- Regulation of blood pressure of the body.
- Erythropoiesis (make blood)
- Make active Vitamin D which is necessary for bone function.

1.5 ACTIVITY

Visit a nephrology unit and take the history of five renal patients.

PRACTICAL 2 NON-INVASIVE PROCEDURES

Structure

2.0 INTRODUCTION

In practical 1 you have learnt about the studied assessment of renal system. In this practical you will learn about various investigations done for renal patients in a non-invasive way. The word non-invasive is defined as, when there is no break in the skin and there is no contact with the mucosa, or internal body cavity beyond a natural or artificial body orifice. In modern medicine, value of non-invasive investigations and surgeries have increased as it has many advantages than invasive procedures. Non-invasive procedures benefits the patient by reducing duration of hospitalization, minimizing pain and is economical. In the non-invasive investigations urine analysis is the most important because it gives many clues for diagnosis. In this practical we shall discuss about routine and microscopic examination, of urine, culture and sensitivity and 24 hour urine examination, we shall also discuss about KUB and ultrasonography.

2.1 OBJECTIVES

After completing this practical, you will be able to:

- define non-invasive procedure;
- list the non-invasive procedures commonly done in renal conditions;
- prepare the patients for various non-invasive procedures; and
- provide care to patients undergoing various investigations.

2.2 URINE ANALYSIS

We shall begin with definition and purposes of urine analysis.

2.2.1 Definition and Purposes

A urine anlysis is a group of manual and/or automated qualitative and semi-quantitative tests performed on a urine sample. A routine urine anlysis usually

includes the following tests: color, transparency, specific gravity, pH, protein, glucose, ketones, **blood**, bilirubin, nitrite, urobilinogen, and leukocyte esterase. Some laboratories include a microscopic examination of urinary sediment with all routine urine analysis tests. If not, it is customary to perform the microscopic examination, if transparency, glucose, protein, blood, nitrite, or leukocyte esterase is abnormal.

Purpose

Routine urine analysis is performed for several reasons:

- general health screening to detect renal and metabolic diseases
- diagnosis of diseases or disorders of the **kidneys** or urinary tract
- monitoring of patients with diabetes.

Although its value is often underestimated, urinalysis provides a wealth of important clinical information and is indispensable part of any clinical case. Urine is easy to collect, test and analyse. Presence of RBCs, proteins in urine indicates many renal problems which can be investigated further.

2.2.2 Types of Urine analysis

The types of urine analysis include following :

1) Routine and microscopic examination
2) Urine for culture sensitivity
3) 24 hours urine collection and testing.

Routine and microscopic examination

This can give a lot of information especially in renal diseases. e.g., Colour, Turbidity, pH, Specific gravity, Protein, Glucose, Ketone, RBC / WBC etc. can aid in diagnosis of renal problems. A complete comparison of normal and abnormal findings are listed in the Table 2.1.

While Collecting urine sample for routine and microscopic examination following should be considered:

- Fresh specimen should be collected it can also be refrigerated at 4 °C.
- First voiding of the day is better for sample.
- Urine collection should be collected from the patient by means of clean catch midstream technique using a wide mouthed container.

Urine Culture And Sensitivity

Urine cultures are performed to isolate and identify the pathogenic microorganism(s) responsible for causing a urinary tract **infection** (UTI). Urinary tract infections are more common in females and in children than in adult males. The most commonly encountered urinary tract pathogen is *E. coli*. *Enterococcus faecalis* is the most common gram positive organism which causes urinary tract infection (UTI). Infections with *Klebsiella, Proteus;* and other *Enterobacteriaceae* are also common. Urine is normally sterile and there should be no growth. The value greater than 100,000 CFU/mL of any single colony type is considered as evidence of UTI. Any growth from a catheter or suprapubic sample or growth of *S. aureus* is considered significant. Patients receiving antibiotic treatment prior to collection may have negative culture results.

Drinking a glass of water 15-20 minutes before the test is helpful if there is no urge to urinate at the time of collecting the sample.

Preparation

Technique of urine collection for culture and sensitivity.

Urine collection technique for women

- Wash hands with soap and water
- Spread labia with 1 hand and hold apart for collection
- Use three povidone-iodine swabs to clean area
  - Wipe down one side, front to back, with one swab
  - Wipe down other side, front to back, with second swab
  - Wipe down center, front to back, with last swab
- Dry area with sterile gauze
- Allow the women to void into toilet for a few seconds and then collect the sample in sterile container
- Avoid stopping urine flow while positioning cup/ container
  - As the stopping flow increases risk of contaminated sample
- Cap the container and avoid touching inside of container

Urine collection technique for men

- Wash hands with soap and water
- Retract foreskin if needed
- Use povidone-iodine swabs to clean tip of penis
  - Clean glans penis
  - Clean urethral opening
- Dry area with sterile gauze
- Void into toilet for a few seconds and then collect the urine in sterile container.
- Avoid stopping urine flow while positioning cup as it increases the risk of contaminating the sample
- Cap the container and avoid touching inside of container.

Urine collection technique for culture and sensitivity in catheterized patient

Equipments

Disposable Gloves, container, label, specimen bag, betadine /spirit/ alcohol swab, 10 ml syringe, Sterile specimen container.

Steps of procedure

- Explain the procedure to the patient
- Wash hands
- Put on gloves
- Clamp the catheter
- Clean site with spirit swab.

- Insert needle above the V point of the catheter and get the sample slowly.
- Transfer urine from syringe to container.
- Label it and send to laboratory
- Dispose off things as per policy of ward.

24 Hours Urine Sample

Many quantitative and analytic tests are carried out on specimens of urine collected over a 24 hour period.

Indications

- To measure the creatinine level in urine and to calculate estimated glomerular filtration rate.
- To measure the extent of proteinuria
- To measure Adrenomedullary hormone such as epinephrine, norepinephrine, and dopamine. This group of tests also includes urine tests for the catabolic products (break-down products) of these hormones, known alternately as metabolites. Epinephrine, norepinephrine, and dopamine, collectively are called catecholamines. Total normal range of catecholamines in urine is 14 to 110 mcg/24 hrs.

Procedure

- On day 1, tell the patient to urinate into the toilet in the morning at specific time such as 8am.
- Afterwards, collect all urine in a special container for the next 24 hours.
- On day 2, urinate at 8 am and collect this sample into the container.
- Keep it at a cool place during the collection period.
- Label the container with name, the date, and the time of completion.

Table 2.1: Comparison of normal and abnormal findings in urine analysis

Test	Normal values or finding	Abnormal findings	Possible cause of abnormal findings
Color and odor	Straw color	Clear to black	Dietary changes; use of certain drugs. Metabolic, inflammatory, of infections diseases
	Slightly aromatic odor	Fruity odor	Diabetes mellitus, starvation, dehydration
	Clear appearance	Turbid appearance	Renal infection
Specify gravity	Between 1.005 and 1.020, with slight variations from one specimen to the next	Below-normal specific gravity	Diabetes insipidus, glomerulonephritis, pyelonephritis, acute renal failure, alkalosis
		Above normal specific gravity	Dehydration, nephrosis
		Fixed specific gravity	Serve renal damage

pH	Between 4.5 and 8.0	Alkaline pH (above 8.0)	Fanconi's syndrome (choronic renal diseases), urinary tract infection, metabolic or respiratory alkalosis
		Acidic pH (below 4.5)	Renal tuberculosis, phenylketonuria, acidosis
Protein	No Protein	Proteinuria	Renal diseases (such as glomerulosclerosis, acute or chronic glomerulonephritis, nephrolithiasis, polycystic, kidney diseases, acute or chronic renal failure)
Ketones	No ketones	Ketonuria	Diabetes mellitus, starvation, conditions causing acutely increased metabolic demands and decreased food intake (such as vomiting and diarrhea)
Sugars	No sugars	Glycosuria	Diabetes mellitus
		Fructosuria	Rare hereditary metabolic disorder, excess fructose ingestion
		Galactosuria	Rare hereditary metabolic disorder
		Pentosuria	Rare hereditary metabolic disorder, excess pentose ingestion
Red Blood cells (RBCs)	0 to 3 RBCs/ high-power field	Numerous RBCs	Urinary tract infection, obstruction, inflammation, trauma, or tumor, glomerulonephritis; renal hypertension; lupus nephritid; renal tuberculosis; renal vein thrimbosis; hydronephrosis; pyelonephritis; parasitic bladder infection; polyarteritis nodasa; hemorrhagic disorder.
White Blood cells (WBCs)	0 to 4 WBCs/ high-power field	Numerous WBCs	Urinary tract inflammation, especially cystitis or pyelonephritis
		Numerous WBCs and WBC casts	Renal infection (such as acute pyelonephritis and glomerulonephritis, nephrotic syndrome, pyogenic infection, and lupus nephritis)
Epithelial cells	Few epithelial cells	Excessive epithelial cells	Renal tubular degeneration

Test	Normal values or finding	Abnormal findings	Possible cause of abnormal findings
Casts	No casts (expect occasional hyaline casts)	Excessive casts	Renal Diseases
		Excessive hyaline casts	Renal parenchymal diseases, inflammation, glomerular capillary membrane trauma
		Epithelial cells	Renal tubular damage, nephrosis, eclampsia, chronic lead intoxication
		Fatty, waxy casts	Nephrotic syndrome, chronic renal diseases, diabetes mellitus
		RBC casts	Renal parenchymal diseases (especially glomerulonephritis), renal infarction, subacute bacterial endocarditis, voscular disorders, sickle cell anemia, scurvy, blood dyscrasias, malignant hypertension, collagen diseases, acute inflammation
Crystals	Come crystals	Numerous calcium oxlate crystal	Hypercalcemia
		Cystine crystals (crystinuria)	Inborn metabolic error
Yeast cells	No yeast cells	Yeast cells in sediment	Genitourinary tract infection, external genitalia contamination, vaginits, urethritis, prostatovesiculitis
Parasites	No parasites	Parasites in sediment	Genitourinary tract infection, external genitalia contamination
Creatinine clearance	Males (age 20): 90mg/min/ 1.73 m of body surface Females (age 20) 84 ml/min/ 1.73 m of body surface Older patients: Concentrations normally decrease by6 ml/ min/decade	Above-normal creatinine clearance	Little diagnostic significances
		Below-normal creatinine clearance	Reduced renal blood flow (associated with shock or renal artery obstruction), acute tubular necrosis, acute or chronic glomerulonephritis, advanced bilateral renal lesions (as in polycystic kidney diseases, renal tuberculosis, and cancer), nephrosclerosis, congestive heart failure, serve dehydration.

2.3 KIDNEY, URETER AND BLADDER XRAY

Let us discuss definition, purposes and procedure as given below:

Definition

A kidney, ureter, and bladder (KUB) x-ray is an AP (anteroposterior) abdominal x-ray. Despite its name, KUB does not show the ureters and only sometimes shows the **kidneys** and bladder. A KUB study is a preliminary screening test for kidney stones, and should be followed by a more sophisticated series of diagnostic tests [such as an **abdominal ultrasound**, **intravenous urography**, or computed tomography scan (CT scan)], if kidney stones are suspected.

Purpose

- The KUB is used to detect **kidney stones.**
- **To detect foreign bodies** in children.
- To diagnose some gastrointestinal disorders.
- It is also used as a preliminary film for an intravenous pyelogram and **barium enema.**
- **It is also done as a** follow-up x-ray after the placement of devices such as ureteral stents.

Preparation

Patient is instructed to take light diet on previous night. Sometimes charcoal tablets are given on previous night to absorb gas for better visualization.

The patient is typically required to wear a hospital gown.

In case of female patient rule out pregnancy because of the risks of radiation exposure to the fetus.

Procedure

- Explain the procedure to patient. (A KUB is typically a single x-ray procedure.)
- Make the patient to lie supine (face-up) on the x-ray table and help him to flex the knees if it is more comfortable.
- The x-ray technologist centers on the iliac crest, making sure the pubic symphysis will be visualized.
- The radiographic technique of the film should demonstrate peritoneal fat lines, psoas muscles, and both renal (kidney) outlines.
- The patient is asked to hold his or her breath on expiration. Sometimes a second film is obtained with the patient standing.
- During x-ray you as a nurse must advise the patient to remain still and follow breathing instructions so that a detailed image of the abdomen may be taken.

2.4 ULTRASONOGRAPHY

Ultrasonography is also a non-invasive technique which gives a view of kidney and ureters. It can visualize kidney and bladder and is helpful in estimating residual volumes of urine in bladder. Ultrasound is a quick, safe, simple, way to obtain views of internal organs. Renal size can be measured as well as the visualization of hydronephrosis, cysts, tumors, and renal calculi. Small stones in the ureters are not as well visualized and the function of the kidneys can not be determined. The following steps need to followed:

- Explain the procedure to the patient / attendant
- Maintain privacy
- Help the patient to wear gown
- Make him comfortable in the examining table/ bed to allow the view of the area of examination
- Assist the physician while performing the procedure
- Clean the area after the procedure with gauze pieces
- Please make the patient comfortable after procedures.

2.5 LET US SUM UP

In this practical we have discussed about the non-invasive procedures used in renal system such as urine analysis for routine and microscopic examination, culture sensitivity and 24 hour urine collection. We have also discussed KUB and ultra sonography. In non-invasive procedures as you have learnt. There is no break in the skin and no contact with the mucosa or internal body cavity.

2.6 ACTIVITY

Assess and interpret the result of urine examination of 5 patients in critical care nephrology unit.

PRACTICAL 3 INVASIVE PROCEDURES

Structure

3.0 INTRODUCTION

In practical 2 you have learnt about non invasive procedures. In this practical we shall discuss about invasive procedures involved in care of renal patients. The word *invasive* means when there is break in the skin and there is contact with the mucosa. For the purposes of invasive investigations the patient some times require hospitalization. These procedure may be painful because it involves break in skin. These procedures need to be performed with caution because there is a risk of infection. In this practical we shall review and discuss about the intravenous pyelography and renal scans.

3.1 OBJECTIVES

After completing this practical, you will be able to:

- define invasive procedure;
- list the invasive procedures commonly done in renal conditions;
- prepare the patients for intravenous pyelography and renal scans; and
- provide care to patients undergoing various invasive procedures.

3.2 INTRAVENOUS PYELOGRAM (IVP)

Intravenous Pyelogram (IVP) or excretory urogram permits visualization of kidneys ureter and bladder. A radio-opaque contrast medium is administered intravenously and is cleared from the bloodstream and concentrated by the kidneys. A nephrotomogram may be carried out as part of the study to visualize different layers of the kidneys and the diffuse structures within each layer and to differentiate solid masses or lesions from cysts in the kidneys or urinary tract.

Purposes and indications

- Intravenous pylography is conducted as part of the initial assessment of any suspected urologic problem, especially in the diagnosis of lesions in the kidneys and ureters.
- An intravenous urogram is ordered to demonstrate the structure and function of the kidneys, ureters and bladder.
- IVP also provides a rough estimate of renal function.

- Patients complaining of abdominal pain radiating to the back may require this examination rule out **kidney stones**.
- Patients with high blood pressure (hypertension) and recurrent bladder infections may also require an intravenous urogram (but hypertension usually is imaged with MRI or nuclear medicine imagery and this examination is done when renal artery stenosis is the suspected cause of refractory hypertension).
- Sometimes this test is ordered to evaluate the function of the kidney in a renal transplant patient. The transplanted kidney is located in the iliac fossa, so special films of the pelvis area are done instead of the normal routine views.
- Multiple films are taken serially to visualize drainage structures.

Equipments

- Intravenous Injection Tray.
- The dye (e.g., Sodium diatrizoate or Sodium Lodide).
- 20 cc syringe and I/V needle.
- Emergency drugs – epinephrine/adrenaline corticosteoids, vasopressors as well as oxygen, tracheostomy and other equipment in case of anaphylactic reaction.

Procedure

- Explain the procedure to the patient.
- Ask if there is history of allergy to iodine.
- Take Consent before taking the patient for the procedure.
- Make the patient comfortable and give supine position on the table.
- Establish an Intravenous line.
- Help the physician to inject a dye into vein.
- Several x-rays are taken at 0, 5, 10, 15, 30 minutes.
- Help the patient to lie still during the procedure.
- Advise the patient to drink a lot of fluids after the test to flush out the dye from the body.

After Care

- You should explain to the patient that a warm, flushed feeling or a metallic **taste** in the mouth are normal reactions in some patients.
- Sometimes an emergency patient with renal colic (acute abdominal pain) is asked to urinate through a special filter used to trap small stones.
- Patient is told to take plenty of fluids to flush out the dye.

Complications

Serious complication of an intravenous urogram is an allergic reaction to the iodine-containing contrast agent. Severe reactions are rare, but can be dramatic and even lethal. For this reason all radiology departments performing this examination should be equipped with emergency drugs and oxygen in the x-ray room itself.

Check Your Pprogress 1

i) List the purposes and indications of intravenous pyelography.

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3.3 RENAL SCANS

Renal Scans

Nuclear renal scans rely on the radiation given off by certain atoms (isotopes), which are injected into the bloodstream. They reach the kidneys, where images are constructed by measuring the radiation emitted. The radiation is no more dangerous than standard x-rays. This test has limited applications, including the evaluation of reflux, chronic obstruction, and renal function.

Definition

A renal scan is a nuclear medicine examination in which a small amount of radioactive material (radioisotope) is used to measure the function of the kidneys.

Indications

- To determine function of kidney, to calculate GFR (Glomerular Filtration Rate).
- It is indicated in patient who are allergic to dye.
- Helps in diagnosis of pyelonephritis.
- It is also used to evaluate high **blood pressure** that is refractory to treatment.
- It is commonly used to evaluate the kidney of a renal transplant patient for early rejection where renal artery stenosis is suspected as the cause.

Pre-procedure care

- Preparation of patient — Psychological preparation
- Take consent
- Rule out any allergy
- Prepare the unit and keep the articles such as crash cart / emergency tray and ready.

- Injection tray to establish I /V line.
- Keep the Contrast ready – its strength, expiry should be checked before infusion.

Procedure

- Help the patient to lie on the scanner table.
- Establish an Intravenous line.
- A small amount of radioisotope is usually injected into veins.
- When radioisotope reaches blood circulation, several images are taken each lasting for 1 or 2 seconds.
- Total time taken is usually 30 minutes to one hour.
- Advise Patient to lie still during the procedure.
- Advise Patient to drink a lot of fluids after the test to flush out the radio active material from the body.

3.4 LET US SUM UP

In this practical we have discussed about the intravenous pyelogram and renal scan. Intravenous pyelography is carried out as part of initial assessment or any suspected urological problems especially in the diagnosis of lesion in the kidney and ureters. In renal scan radio active material radioisotope is used to measure the functions of the kidneys.

3.5 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1

i) **Purposes and indications**

- Intravenous pylography (IVP) is conducted as part of the initial assessment of any suspected urologic problem, especially in the diagnosis of lesions in the kidneys and ureters. An intravenous urogram is ordered to demonstrate the structure and function of the kidneys, ureters, and bladder.
- Patients complaining of abdominal pain radiating to the back may require this exam activities to rule out **kidney stones**.
- IVP also provides a rough estimate of renal function.
- Patients with high blood pressure (hypertension) and recurrent bladder infections may also require an intravenous urogram (but hypertension usually is imaged with MR or nuclear medicine imagery and this exam is done when renal artery stenosis is the suspected cause of refractory hypertension).
- Sometimes this test ordered to evaluate the function of the kidney in a renal transplant patient. The transplanted kidney is located in the iliac fossa, so special films of the pelvis area are done instead of the normal routine views.
- Multiple films are taken serially to visualize drainage structures.

PRACTICAL 4 THERAPEUTIC PROCEDURES

Structure

4.0 INTRODUCTION

Chronic or irreversible renal failure is a progressive, reduction of functioning renal tissues such that remaining kidney mass can no longer maintain body's internal environment. It can occur slowly over many years or as a result of Acute Renal Failure (ARF) suddenly. Pathogenesis involves deterioration and destructions of nephrons with progressive loss of renal function; its number of functioning nephrons decline, the body becomes unable to rid itself of water, salt and other waste products through the kidneys. When the Glomerular filtration rate (GFR) is less than 10 to 20 ml, clinical uremia is evident, patient need dialysis to save life and prevent further deterioration of condition. In this unit we shall discuss about definition meaning principles and types of dialysis. We shall focus on meaning, indication, contra-indication and procedure of hemodialysis and peritoneal dialysis in detail including nursing management.

4.1 OBJECTIVES

After completing this practical, you will be able to :

- explain dialysis, types of dialysis and its principles;
- prepare a hemodialysis unit, patient and dialysis machine;
- take care of vascular access for hemodialysis;
- differentiate between hemodialysis and peritoneal dialysis;
- initiate, monitor and terminate the procedure of hemodialysis;
- list the steps of peritoneal dialysis.
- take care of peritoneal catheter;

- list the complications of hemodialysis and peritoneal dialysis;
- teach the patient to take care of themselves in hemodialysis or peritoneal dialysis; and
- plan nursing process for a patient getting dialysis.

4.2 DEFINITION AND PRINCIPLES OF DIALYSIS

Dialysis is an artificial method to remove water, waste products and toxins etc. from the body. There are two types of dialysis; Hemodailysis and Peritoneal Dialysis.

Principles

There major principles of dialysis are given below:

Diffusion: Movement of solvent from higher concentration to lower concentration. Rate of diffusion is influenced by various factors. In Hemodialysis blood and dialysate are replaced by semi permeable membrane so diffusion occurs.

Osmosis: It is passage of solvent through semi-permeable membrane from low concentration of solute to high concentration of solute. Rate of osmosis depends on the pressure gradient, permeability of membrane and electrical potential across the membrane.

Filtration and ultra filtration: Water volume may be removed by applying positive and negative pressure.

Let us now turn our attention to hemodialysis.

4.3 HEMODIALYSIS

We shall discuss about definition, indications, contraindications, types and nursing responsibilities in the following subsections.

4.3.1 Definition Indications and Contraindications

Definition

Hemodialysis involves extracorporeal passage of client's blood through a semi-permeable membrane that serves as an artificial kidney (Dialyser). Hemodialysis is one of several renal replacement therapies used for treatment of renal failure. (Fig. 4.1)

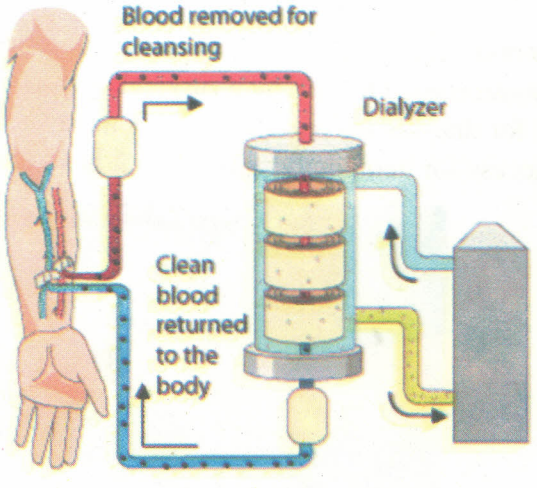

Fig. 4.1: Hemodialysis

Indications

- Acute poisoning
- Ac. and Chronic renal failure
- Severe edema state
- Metabolic acidosis
- Hypercalamia
- Transfusion reactions
- Postpartum insufficiency
- Fluid overload.

Contraindications

- No vascular access.
- Extremes of age.
- Inability to co-operate with treatment regime.

4.3.2 Types of Hemodialysis and Blood Access

Types

Acute dialysis: It is Indicated in emergency situations e.g., Pulmonary edema, hypercalcemia, hyperkalemia, drug toxicity.

Chronic or maintenance Dialysis (where patients chose this therapy for life long): It is indicated in Endstage renal disease (ESRD) when transplantation or continuous ambulatory peritoneal dialysis (CAPD) is not possible.

High Flux Dialysis: Blood flow center around 500-800 ml/Min. It increases efficacy and reduces duration and need for heparin. Disadvantage of these dialysis are that these are costly.

Low Flux Dialysis: These are used in India mainly. Blood flow rate is approximately 150-300 ml/ mt.

4.3.3 Blood Accesses

Blood access for hemodialysis are given below:

Arterio venous fistula (AVF): It is an opening created in artery and a vein. Artery is anastomosed to vein by a surgical operation (Fig. 4.2). It will be ready to be used for dialysis for one month. It is most successful and desired method of blood access for hemodialysis because it has lower infection rates.

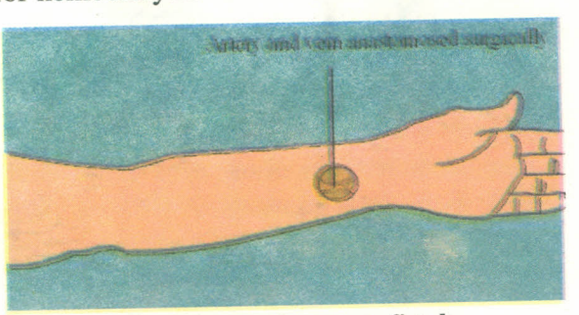

Fig. 4.2: Arterio venous fistula

General Care for AVF

- Do not record B.P. on that extremity.
- Do not perform vein punctures on that extremity.
- Do not carry loads with this extremity
- Keep dressing dry till the time it is there.
- Do the exercise of that extremity as it is crucial for viability of fistula
- Analgesics as ordered are given oftenly
- Mostly antihypertensive drugs are stopped for one day.
- Asses for bruit or thrill.

Arterio venous shunt: It is a Teflon tubing which joins artery to a vein by a surgical procedure (Fig.4.3).

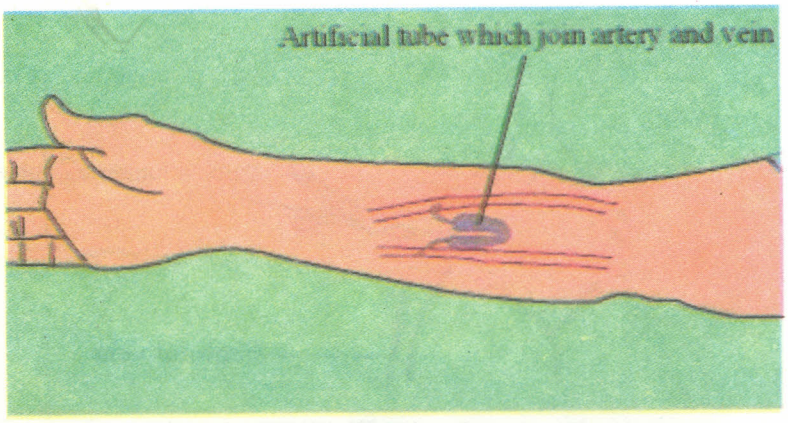

Fig. 4.3: Arterio venous shunt

Arterio venous graft: An artificial graft is inserted in artery and a vein (Fig.4.4).

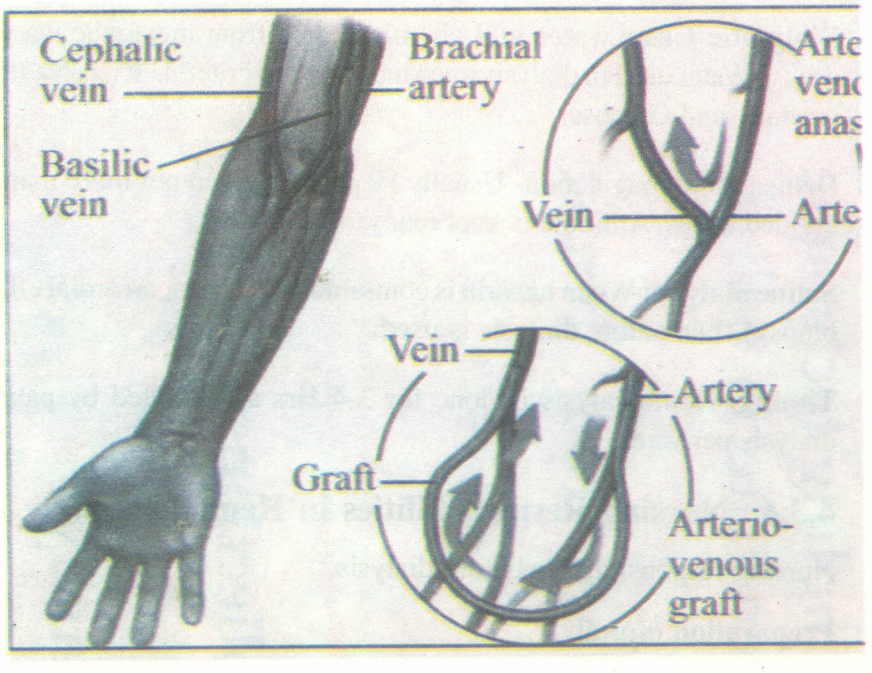

Fig. 4.4: Arterio venous graft

Catheters: These are temporary methods which can be used in emergency. They may include–

- Subclavin catheters (Fig. 4.5a)
- Internal jugular catherters.
- Femoral catherters (Fig. 4.5b).

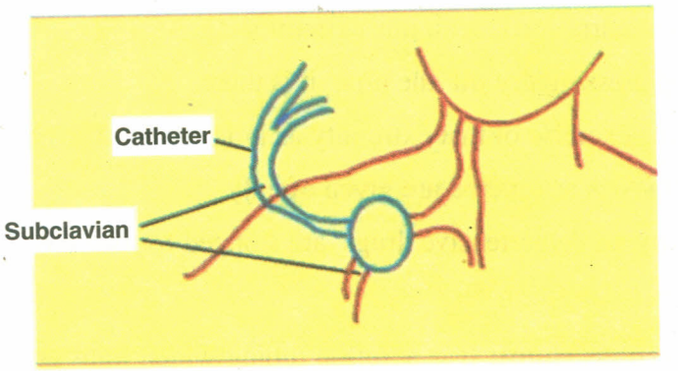

Fig. 4.5a: Double lumen subclavian catheter

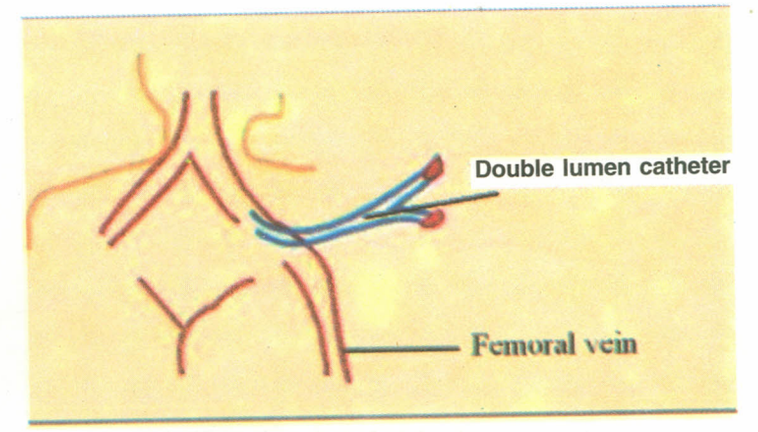

Fig. 4.5b: Double lumen femoral catheter

Arterio venous fistula

Dialysate: Clear water and chemical free from metabolic waste products or drugs. Water used in dialysis must meet certain criteria. It has Na+, K+, Calcium, Acetate and Glucose.

Drugs: Anti-coagulation- Usually Heparin is given not more than 5,000 I.U. in divided doses. Antidote is kept ready.

Saline dialysis: When heparin is contraindicated (pericarcardial effusion, Kidney biopsy) **then saline dialysis is used.**

Timing: Hemodialysis is done for 3-4 Hrs as tolerated by patient. Ideally 3 dialysis per week.

4.3.4 Nursing Responsibilities in Hemodialysis

Nursing responsibilities before dialysis.

Preparation of unit

- Unit should be isolated as Operation theatre area.
- No relatives, visitors should be allowed inside dialysis room during procedure to reduce the risk of infection.

- Keep crash cart ready to tackle any emergency.
- Biomedical waste segregation guidelines should be followed strictly as it involve a lot of blood handling.

Equipments: Keep all the equipments ready for preparing the hemodialysis machine:

- Hemodialysis machine with appropriate dialyzer (Fig. 4.6)
- I.V. solution, administration sets, lines, and related equipment
- Dialysate.

Optional: Heparin, 3-ml syringe with needle, medication label, hemostats.

- Check complete functioning of all the equipments before starting the case.
- Set conductivity.
- Temperature of machine should be 37°C.
- Air Sensor should be free from air bubbles.
- Dialysis machine should be in dialysis made before patient is started with dialysis.

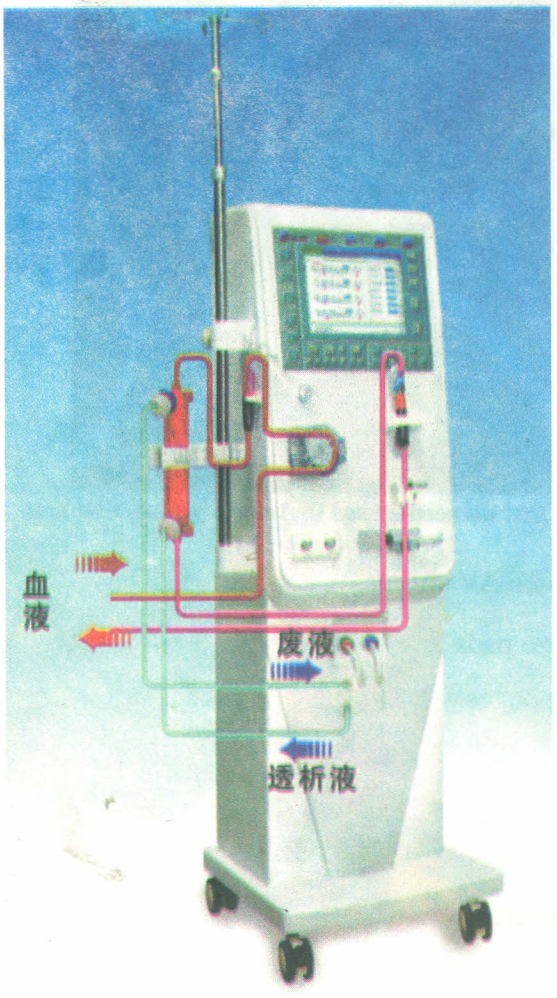

Fig. 4.6: Haemodialysis Machine

Preparation of Patient

- Measure weight
- Check Vitals to asses baseline data
- Perform Renal Function Test (RFT)
- Test for HIV, HCV, Hbs Ag status is mandatory
- Assess the vein access
- Asses any contraindications for heparin use.

For hemodialysis with an AV fistula:

- Two winged fistula needles (each attached to a 10-ml syringe filled with heparin flush solution Fig.4.7)
- Linen-saver pad
- Povidone-iodine sponges
- Sterile 4″ × 4″ gauze pads
- Tourniquet
- Clean gloves
- Adhesive tape.

Fig. 4.7: Fistula needle used in Arterio venous fistula

For hemodialysis with an AV shunt:

- Sterile 4″ × 4″ gauze pads
- Povidone-iodine sponges
- Alcohol sponges
- Sterile gloves
- Two sterile shunt adapters
- Sterile Teflon connector
- Two bulldog clamps
- Two 10-ml syringes
- Normal saline solution

- Four short strips of adhesive tape
- Optional: sterile shunt spreader.

For hemodialysis with a double-lumen catheter:

- Povidone-iodine sponges
- Two sterile 4″ × 4″ gauze pads
- Two 3-ml two 5-ml syringes
- Tape
- Heparin bolus syringe
- Clean gloves.

Nursing responsibility During dialysis

Procedure

Steps of procedure (Initiation and Termination of Hemodialysis)

Priming – It is a procedure to remove the disinfectant from the dialyzer by normal saline.

- Wash hands, and wear gloves
- Wash access arm for 1 full minute with antiseptic soap and a sterile gauze pad and place arm on sterile barrier.
- Access catheter, graft or fistula.
- Connect arterial access to arterial blood line.
- Place the venous dialyzer tube line into the retaining clamps of the fluid catch-all of the dialysis machine.
- Tape arterial cannula connections securely.
- Remove clamp from arterial line.
- Adjust blood pump to 100 ml/min until blood reaches the venous drip chamber.
- Turn off blood pump.
- Clamp the end of the venous tubing below the drip chamber with a bulldog clamp.
- Remove venous line tubing from fluid catch-all and connect to the venous patient cannula.
- Tape venous connections securely.
- Remove clamp from venous tubing.
- Turn on blood pump and adjust blood flow rate.
- Immediately turn on foam detector switch from bypass to alarm position.
- Adjust the blood level in the arterial and venous drip chambers to three quarters full.
- If patient is receiving systemic heparinisation, set parameters on heparin infusion pump as prescribed.
- Secure cannula connections and blood.

- Slowly increase blood pump speed to prescribed rate while continuing to assess patient (level of consciousness, complaints of chest pain, dysrhythmias, and changes in Haemodynamic variables).
- Set arterial and venous alarm parameters.
- Observe the patient's transmembrane pressure (TMP) display.
- Set TMP negative pressure.
- Wash hands.

Care of patient during dialysis

- Check Vitals especially B.P. half hourly.
- Watch diligently for complications.
- Monitor Blood flow rates.

Patient may have vomiting, muscle cramps, hypotension, giddiness so vigilant observation and presence of nurse near each patient is must.

Care of Machine

- Watch for alarms that can be related to Transmembrane pressure TMP. TMP varies with fluid removal from the patient. TMP can be increased or decreased as per need for fluid removal. It should not be more than 500mmHg.
- Air sensors should be filled with blood.
- Continuously monitor patient status and machine function throughout treatment.

4.3.5 Nursing Responsibility During Termination of Dialysis

Keep following equipments ready before termination of dialysis.

For discontinuing hemodialysis with a double lumen catheter collect following:

- Sterile 4" × 4" gauze pads
- Povidone-iodine sponge
- Precut gauze dressing
- Clean and sterile gloves
- Normal saline solution
- Alcohol sponge
- Heparin flush solution
- Luer-lock injection caps
- Optional: transparent occlusive dressing, skin barrier preparation, tape, materials for culturing drainage.

For discontinuing hemodialysis with an AV fistula:

- Clean gloves
- Sterile 4" × 4" gauze pads
- Two adhesive bandages

- Hemostats
- Optional: sterile absorbable gelatin sponges (Gelfoam).

For discontinuing hemodialysis with an AV shunt

- Sterile gloves
- Two bulldog clamps
- Two hemostats
- Povidone-iodine solution
- Sterile 4" × 4" gauze pads
- Alcohol sponges
- Elastic gauze bandages.

Termination

- Wash hands and wear sterile gloves and goggles (FOR HBsAG/HCV/HIV positive patient).
- Move the arterial, venous and dialysate pressure alarms to the maximum low/high limits.
- Turn TMP or negative pressure off.
- Turn off the heparin infusion pump.
- Decrease the blood pump flow rate.
- Check amount of Normal saline ; hang a new bag necessary.
- Maintain the blood level in the arterial and venous drip chambers at three quarters full.
- Turn off the blood pump.
- Clamp the arterial tubing between patient and blood pump.
- Disconnect tubing from vascular access device.
- Turn on blood pump; simultaneously unclamp the patient end connector of the arterial chamber.
- Unclamp the NS IV line.
- Clear the blood tubing and dialyzer with saline until rinse-back is achieved.
- Turn off blood pump.
- Clamp venous access.
- If using a central venous catheter, flush the catheter with heparin or NS.

AV fistula/ AV graft: When fistula needles are used, remove both cannulas from patient's access site, one at a time. Using a sterile gauze pad, apply moderate pressure to access site until bleeding has stopped.

- Dress access site(s) with remaining sterile gauze pad and bandages.
- Dispose of soiled material and equipment in appropriate disposal receptacle.
- Sanitize single-patient machine according to established procedure.
- Wash hands.

Care of the patient after dialysis

Do not carry out any invasiye procedure for 4- 6 hours.

- Record Weight
- Records Vitals
- Assess Viability of fistula, shunt
- If, catheter then heparnise it properly
- Carry out Disinfection of machine
- Carry out Disinfection of dialyser
- Record all the procedures.

Complications

- Disequilibrium syndrome
- Dialysis dementia
- Infectious diseases
- Bleeding
- Infection
- Aneurysm
- Thrombosis
- Ischemia (steal syndrome)
- Heart failure
- Air embolism
- Anemia.

Limitation of Hemodialysis

- It can prolong the life, but cannot alter the underlying kidney disese.
- It does not replace whole complete kidney function.

Checklist for the care of a patient receiving hemodialysis treatment.

Vital signs

Respiratory Rate

- Quality
- Pulse
- Rate
- Character
- Rhythm
- Blood pressure (sitting and standing)
- Weight
- Temperature
- Level of consciousness.

Access site

- Redness
- Pain
- Swelling
- Drainage
- Catheter dressing
- Bruit/Thrill

Patient's response to treatment

- Anxiety
- Disturbed self-concept
- Fear of death
- Adaptive.

Patient Education

- Hemodialysis principles
- Hemodialysis procedure
- Current treatment prescription
- Signs and symptoms of complications
- Anticoagulation
- Vascular access
- Laboratory tests
- Monitoring of hemodialysis adequacy
- Medications
- Diet and fluid prescription including sodium restriction and thirst management
- Reporting of symptoms, illnesses, injuries, or hospitalizations since last treatment
- Emergency procedures while on hemodialysis

Check Your Progress 1

i) List the different vascular access for hemodialysis.

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ii) Write the nursing care of Arterial venous fistula.

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iii) Write the nursing care of patient before, during and after the dialysis.

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4.4 PERITONEAL DIALYSIS

Peritoneal Dialysis

Peritoneal Dialysis involves repeated cycles of instilling dialysate into peritoneal cavity, allowing time for substance exchange, and then removing the dialysate. Dialysate is usually run into peritoneal cavity by gravity flow (Fig.4.8). Dialysate is Warmed slightly to prevent chilling.

Principles are same as Hemodialysis see 4.2:

Indications

- Peritoneal Dialysis is useful for both Acute renal failure (ARF) and End stage renal failure (ESRD).
- Clients with heart disease, hypotension are better dialyzed by Peritoneal Dialysis.
- Indicated in children with renal failure because hemodialysis needs vascular access which is difficult in children.
- Peritoneal Dialysis is better tolerated by diabetic patients than hemodialysis.

Contraindications of Peritoneal Dialysis:

- Adhesion and scarring of Peritoneal Membrane.
- Recurrent episodes of Peritoneal Dialysis.
- Respiratory disease because Peritoneal Dialysis requires the abdomen to be filled with 2 liter dialysate which may cause dyspnoea.

Types of Peritoneal Dialysis

- Continuous Ambulatory Peritoneal Dialysis (CAPD)
- Automated Peritoneal Dialysis (APD).

Peritoneal Dialysis has 3 Phases

1) **Fill in Phase:** In this phase, Dialysate is usually allowed to run in peritoneal cavity by gravity or by machine (in automated PD). Two rules are usually instilled in adults. Air should not enter the peritoneal cavity during the entire procedures.

2) **Dwell Phase:** Dwell phase time period during which dialysate is left in the peritoneal cavity. In this phase, equilibrium between dialysate and the body fluids occurs e.g., toxic substances urea, creatinine, salts, water, will flow from peritoneum into dialysate.

   Dwell time differs in different types of Peritoneal Dialysis for example, in manual Peritoneal Dialysis, dwell time is 30 to 45 minutes where as it is 10 to 20 minutes when machine in used.

   In Continuous ambulatory peritoneal dialysis (CAPD), Dwell time is 4 to 8 hours with a solution that allows continuous exchange.

3) **Drain Phase:** In this phase, dialysate is allowed to move out of the body.

Peritoneal Dialysis Catheter Insertion: Catheter insertion may be performed in the operating room or bedside under local anesthesia. Site is 3 to 5 cm below the umbilicus. This area is less vascular and has less logical resistance. Catheter can be a acute rigid stylet catheter used for acute purpose.

There are soft catheters which are prepared for chronic peritoneal dialysis. Now day soft catheters are inserted for acute conditions also. Catheters are tunneled under the skin before they enter the peritoneal cavity. It stabilizes the catheter and reduces the risk of infection.

These Dacron culls will have in growth of fibroblasts and blood versels into the culls which fix the catheter in place and provide an effective barrier against dialysate leakage and bacterial invasion.

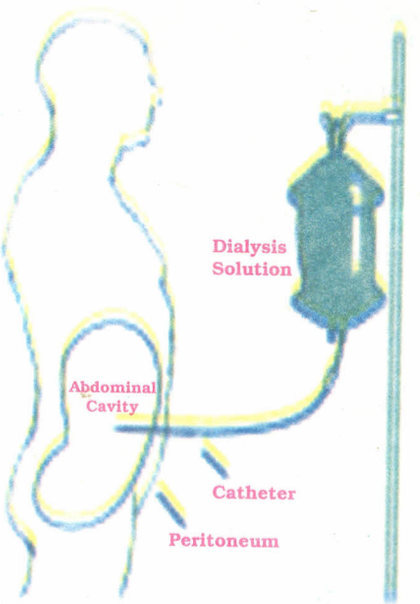

Fig. 4.8: Peritoneal Dialysis

Equipment

To infuse dialysate:

- Prescribed amount of dialysate (usually in 2-L bags)
- Basin of hot water or commercial warmer

- Three face masks
- 42" (106.7-cm) connective tubing with drain clamp
- Six to eight package of sterile 4" × 4" gauze pads
- Medication, if ordered
- Povidone-iodine sponges
- Hypoallergenic tape
- Plastic snap top container
- Povidone-iodine solution
- Sterile basin
- Container of alcohol
- Sterile gloves
- Belt of fabric pouch
- Two sterile water proof paper drapes (one fenestrated)
- Optional: syringes, labeled specimen container.

To discontinue dialysis temporary:

- Three sterile water proof paper barriers (two fenestrated)
- 4" × 4" gauze pads (for cleaning and dressing the catheter)
- Sterile basin
- Hypoallergenic tape
- Two face masks
- Povidone-iodine solution
- Sterile gloves
- Sterile rubber catheter cap.

All equipment for infusing the dialysate and discontinuing the procedure must be sterile. Commercially prepared sterile Continuous Ambulatory Peritoneal Dialysis kits are available.

Preparation of equipment:

- Check the concentration of the dialysate against the doctor's order. Also check the expiry date and appearance of the solution—it should be clear, not cloudy.
- Warm the solution to body temperature with a heating pad or a commercial warmer if one is available.
- Don't warm the solution in a microwave oven because the temperature is unpredictable.
- To minimize the risk of contaminating the bag's port, leave the dialysate container's wrapper in place. This also keeps the bag dry, which makes examining it for leakage easier after you remove the wrapper.

- Wash your hands and put on a surgical mask. Remove the dialysate container from the warming setup, and remove its protective wrapper.
- Squeeze the bag firmly to check for leaks.
- If ordered, use a syringes to add any prescribed medication to the dialysate, using sterile technique to avoid contamination. (The ideal approach is to add medication under a laminar flow hood). Disinfect multiple-dose vials in a 5-minute povidone-iodine soak.
- Insert the connective tubing into the dialysate container. Open the drain clamp to prime the tube. Then close the clamp.
- Place a povidone-iodine sponge on the dialysate container's port. Cover the port with a dry gauze pad, and secure the pad with tape. Remove and discard the surgical mask. Tear the tape so that it will be ready to secure the new dressing. Commercial devices with povidone-iodine sponges are available for covering the dialysate container and tubing connection.

Implementation: Weigh the patient to establish a baseline level. Weigh him at the same time every day to help monitor fluid balance.

Infusing dialysate

- Assemble all equipment at the patient's bedside, and explain the procedure to him.
- Prepare the sterile field by placing a water proof, sterile paper drape on a dry surface near the patient.
- Take care to maintain the drape's sterility.
- Fill the snap-top container with povidone-iodine solution, and place it on the sterile field.
- Place the basin on the sterile field. Then place four pairs of sterile gauzepads in the sterile basin, and saturate them with the povidone-iodine solution.
- Drop the remaining gauze pads on the sterile field. Loosen the cap on the alcohol container, and place it next to the sterile field.
- Put on a clean surgical mask and provide one for the patient.
- Carefully remove the dressing covering the peritoneal catheter and discard it. Be careful not to touch the catheter or skin. Check skin integrity at the catheter site, and look for sign of infection, such as purulent drainage. If drainage is present, obtain a swab specimen.
- Put it in a labeled specimen container, and notify the doctor.
- Put on the sterile gloves and palpate the insertion site and subcutaneous tunnel route for tenderness or pain.
- If these symptoms occur, notify the doctor.

CAPD can be done with machine called cycler or automated peritoneal dialysis. Fig 4.9. Underlying principles are same. Only difference is that patient need not to infuse the dialysate manually, it can be done with the help of a programmed cycler or machine which is provided by companies at additional cost.

Fig. 4.9: Automated peritoneal dialysis

Complications

Peritonitis: When the dialysate white blood cell count is greater than 100/mm3 and neutrophils are greater than 50%.

Catheter related Complications

- Catheter Displacement
- Catheter Plugging
- Fluid Leakage

Dialysis related Complications

- Pain during dialysis from rapid instillation.
- Hernia
- Over hydration
- Hypoalbuminemia
- Hyperlycemia
- Weight gain.

Check Your Progress 2

i) Differentiate between hemodialysis and peritoneal dialysis.

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ii) List indications of Peritoneal dialysis.

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iii) List complications of Peritoneal dialysis.

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4.5 LET US SUM UP

In this practical we have discussed about definition and principles of dialysis. Dialysis as you have studied is an artificial method to remove water, waste products and toxin from the body. We have also discussed about hemodialysis and peritoneal dialysis. Emphasis has also been given on nursing care of patient with hemodialysis and peritoneal dialysis.

4.6 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1

i) Vascular access are

Permanent – ArterioVenous Fistula, ArterioVenous shunt ArterioVenous graft

Temporary- Double lumen Internal jugular catheter.

Double lumen Sublavin catheter.

Double lumen femoral catheter.

ii) NO B.P. recording on that extremity.

NO vein puncture on that extremity.

Not to carry loads with this extremity

Dressing to kept dry till the time dressing is there.

Exercise of that extremity is crucial for viability of fistula

Analgesics are often given

Mostly antihypertensive are stopped for one day to ensure good supply to fistula.

Asses for bruit or thrill.

iii) Nursing care in preparation of Patient for hemodialysis

1) Measure weight
2) Vitals to asses baseline data
3) Pre RFT
4) HIV, HCV, Hbs Ag status is mandatory
5) Asses the access.
6) Asses any contraindications for heparin use.

Check Your Progress 2

i) **Peritoneal Dialysis**

Peritoneal Dialysis involves repeated cycles of instilling dialysate into peritoneal cavity, allowing time for substance exchange, and then removing the dialysate. Dialysate is usually run into peritoneal cavity by gravity flow. Dialysate is Warmed slightly to prevent chilling.

Hemodialysis

Hemodialysis involves extracorporeal passage of client's blood through a semi-permeable membrane that serves as an artificial kidney (Dialyser). Hemodialysis is one of several renal replacement therapies used for treatment of renal failure.

ii) **Indications**

Peritoneal Dialysis is useful for both Acute renal failure (ARF) and End stage renal failure (ESRD).

Clients with heart disease, hypotension are better dialyzed by Peritoneal Dialysis.

Indicated in children with renal failure because hemodialysis needs vascular access which is difficult in children.

Peritoneal Dialysis is better tolerated by diabetic patients than hemodialysis.

iii) **Peritonitis:** When the dialysate white blood cell count is greater than 100/ mm3 and neutrophils are greater than 50%.

Catheter related Complications

- Catheter Displacement
- Catheter Plugging
- Fluid Leakage

Dialysis related Complications

- Pain during dialysis from rapid instillation.
- Hernia
- Over hydration
- Hypoalbuminemia
- Hyperlycemia
- Weight gain.

4.7 ACTIVITY

Visit five patients who are receiving hemodialysis using. Record the condition of the patient using the check list given in the practical.

4.8 REFERENCE

Burrows-Hudson, S., Prowant, B. American Nephrology Nurses Association Nephrology Nursing Standards of Practice and Guidelines for Care. (2005). Pp.71-72. Pitman NJ: Anthony J. Jannetti, Inc.

List of Self Activities

SN.	Practical	Title of the Activity	Hours	Marks
1.	**Block 1 Practical 2**	Select a patient who is undergoing computed tomography of the abdomen. • Prepare the patient for procedure • Provide the nursing care for this patient, during and after the procedure. • Monitor the patient's condition following the procedures. • Record the findings and procedure	5	2
2.	**Block 1 Practical 3**	Select two patients undergoing upper Gastrointestinal endoscopy /colonoscopy. • Prepare the patient for the procedure. • Observe the patient during the procedure. • Provide the nursing care during and after the procedures. • Record the nursing action and the patient's condition following the procedure.	5	5
3.	**Block 1 Practical 4**	Select a patient receiving nasogastric feeding. • Give nasogastric feed the to patient and document the nursing action, type of enteral feed and its indications.	5	5
4.	**Block 1 Practical 4**	Select a patient undergoing abdominal paracentesis • Prepare the patient and collect the required articles • Assist the physician during the procedure. • Provide the nursing care during and after the procedure. • Observe the characteristics of the drainage and condition of the patient • Send the sample for the investigation as prescribed • Record the procedure and findings	5	3
5.	**Block 2 Practical 3**	Select a patient undergoing Bronchoscopy • Prepare the patient for the procedure • Assist the physician during the procedure • Observe the condition of patient during the procedure • Give pre and post procedure care to the patient • Record the procedure and condition of the patient	5	3

6.	**Block 2 Practical 2**	Select two patients (one with pulmonary tuberculosis and the other with pneumonia) • Collect sputum from these patients • Observe and compare the two specimen with respect to the difference in consistency, color and characteristics of sputum. • Record the findings and write a report	5	2
7.	**Block 2 Practical 4**	Select two unconscious patients with ineffective airway patency. • Apply laryngeal mask airway or place combitube • Observe the patient • Record the procedure and the status of the airway.	10	5
8.	**Block 2 Practical 4**	Select one patient with endotracheal intubation / Tracheostomy • Perform endotracheal suctioning / Tracheostomy suctioning in a patient with E T tube/ Tracheostomy tube. • Assess the patient during the procedure. • Check the consistency and color of secretions • Record the procedure and condition of the patient. • Practice endotracheal tube insertion in the simulated setting/simulator/dummy	10	7
9.	**Block 2 Practical 7**	Select a patient requiring chest physiotherapy o Check for the presence of any contraindications for the procedure o Perform chest physiotherapy using the methods as given in the practical 7.1 o Record the procedure and findings	5	3
10.	**Block 2 Practical 7**	Select a patient undergoing chest tube drainage or is planned for chest tube drainage. • Collect the articles for chest tube drainage. • Prepare the patient for the procedure and assist in the procedure. • Observe the patient during the procedure • Carry out the nursing action, during procedure. • Observe outcome of the procedure in terms of colour, amount of drainage and condition of the patient. • Record / document the findings	10	5

11.	**Block 3 Practical 2**	Select a patient requiring electrocardiographic monitoring • Obtain a 12 lead ECG tracing of the patient • Observe the tracing and the patient's condition • Record the findings • Demonstrate lead placement for continuous cardiac monitoring • Select the best leads for the patient for monitor display • Observe the ECG findings of the patient and interpret in terms of rate, rhythm and specific findings for the patient.	10	6
12.	**Block 3 Practical 3**	Select two patient undergoing the following procedures o Transesophageal echocardiography o Holter monitoring o Treadmill test • Prepare patients and the unit • Provide nursing care to the patient during procedure and monitor the patient after procedure • Record the patient's condition and document the care	10	5
13.	**Block 3 Practical 3**	Select five patients with Central venous Pressure line and on hemodynamic monitoring • Observe the CVP catheter insertion site • Observe and monitor the central venous pressure of the patient using flush system • Provide care for CVP line in situ. • Observe the condition of the insertion site • Record the findings and procedure	10	5
14.	**Block 3 Practical 3**	Select two patients undergoing angiography and cardiac catheterization • Prepare the patients before the procedure. • Observe the patient during procedure and give care as required • Observe and care for injectionsite after the procedure • Prepare an instruction chart for patient undergoing cardiac catheterization/ angiography • Document / record the findings/activity	10	5

15.	**Block 3 Practical 4**	Select two patients undergoing Pacemaker implantation carry out following activities • Prepare articles • Assist in the procedure • Monitor the patient after procedure • Prepare the instruction material for patients with permanent pacing to be given at the time of discharge. • Write a report and record the activity	10	5
16.	**Block 3 Practical 7**	Select two patients and practice following procedures under supervision: • Introducing an oropharyngeal airway in a CPR simulator • Bag mask ventilation using CPR simulator. • Cardiac compression in a CPR simulator • Demonstrate CPR to your supervisor and peer group • Document / record the activity	10	5
17.	**Block 3 Practical 4**	Select a patient with intra aortic balloon pump (IABP) counter-pulsation device • Note for vascular changes (if any) in the distal limb (Observe and Record for the possible complications) • Carry out the nursing interventions related to the IABP counter-pulsation • Observe the inflation and deflation of balloon, its timing and dichotic notch on the arterial waveform. Note the beat ratio. • Assess the patient's status and cardiac performance. • Evaluate the patient for weaning from IABP. • Record the findings / activity	10	5
18.	**Block 4 Practical 2**	Select the patients posted for following investigations (select two patients for each investigation) • EEG, • video EEG, • MRI, • PET, • transcranial doppler • cerebral angiography • EMG and nerve conduction studies	15	6

		• Prepare the patient Observe them during the procedure and after procedure Provide care during and after the procedure Document /Record the observations in each case		
19.	**Block 5 Practical 2 and 3**	Select three patient undergoing following investigations (one patient for each procedure) o ultrasonography Kidney utters, bladder (KUB) o intravenous pyelography o 24 hour urine collection • Give necessary instructions to the patient for all the procedures • Observe the patients during the procedure • Give post procedure care • Prepare instruction chart for the patient undergoing the above procedures. • Document/record the findings and activity	15	8
20.	**Block 5 Practical 4**	Select two patient (one for each procedure) undergoing hemodialysis and peritoneal dialysis • Collect the equipments • Prepare the patient, unit and the machine • Note the type of shunt to be used / used for the patient • Provide the nursing care to the patient before, during and after the dialysis procedure • Observe for any complications that may occur/d • Record the observations and nursing care action	15	10
		Total	**180**	**100**

List of Supervised Activities

SNo	Practical	Title of the Activity	Hours	Marks
1.	**Block 1 Practical 1**	Select a patient with any gastrointestinal condition/ problem in CCU • Collect the detailed history of the patient using guidelines in practical manual. • Perform physical examination. • Collect the subjective and objective data of this patient. • Formulate nursing diagnosis • Record the findings	10	5
2.	**Block 1 Practical 4**	Select a patient receiving nasogastric feeding. • Give nasogastric feeding to patient • Document the nursing action, type of enteral feed given and its indication.	10	5
3.	**Block 2 Practical 2 and 5**	Select a patient requiring oxygen therapy • Give oxygen to patients by following methods o Venturimask o Nasal canuala • Monitor check the amount of oxygen flow, oxygen concentration and patient's condition • Observe Oxygen saturation by pulse oximetry • Observe capillary refill time of the patient • Record / document observation/findings	5	4
4.	**Block 2 Practical 1**	Select a patient with any respiratory condition/ problem in CCU • Collect the detailed history of the patient using guidelines in practical manual. • Perform physical examination with focus on respiratory system. • Collect the subjective and objective data of the patient. • Formulate nursing diagnosis • Record the findings	10	4
5.	**Block 2 Practical 2**	Select a conscious patient with chronic obstructive pulmonary disease COPD/post abdominal surgery • Teach the patient to perform incentive spirometry effectively. • Encourage the patient to take deep breaths. • Check / observe the inspiratory flow and respiratory pattern of the patient • Record / document the findings	10	4

6.	**Block 2 Practical 6**	Select a patient with mechanical ventilator • Note and record the following in relation to the patient o ABG values o Type of ventilator o Ventilatory mode o Ventilatory settings/parameters for your patients o Any complication developed due to mechanical ventilation • Observe the respiratory pattern of the patient. • Carryout the nursing intervention related to mechanical ventilation as given in your practical block 6, 4	5	5
7.	**Block 2 Practical 4**	Select an unconscious patient with airway problem. • Apply laryngeal mask airway or place combitube • Observe the patency of airway • Record the procedure and the observations made by you during the procedure	10	5
8.	**Block 2 Practical 4**	Select a patient with endotracheal intubation/ tracheostomy • Perform endotracheal suctioning/ tracheostomy suctioning • Observe the color, amount of secretions and conditions of the patient. • Record / document the findings • Practice the procedure of Endotracheal tube insertion using simulators /dummy	15	10
9.	**Block 2 Practical 7**	Select a patient requiring chest physiotherapy o Check for the presence of any contraindications for the procedure o Perform chest physiotherapy using the methods as given in the practical 7.1	10	4
10.	**Block 3 Practical 1**	Select any patient from a coronary care unit. • Collect the detailed history of the patient and record according to the proforma specified in 1.2.1. • Perform thorough physical examination by inspection, percussion, palpation and auscultation as per the format specified in 1.5 • Collect subjects and objective data • Formulate nursing diagnosis • Document the findings as per the format specified in 1.5	10	5
11.	**Block 3 Practical 7**	Select two patients and practice following procedures under supervision: • Introducing an oropharyngeal airway in a CPR simulator/ dummy	10	2

		• Practice Bag mask ventilation using CPR simulator/ dummy. • Practice Cardiac compression in a CPR simulator/dummy • Demonstrate CPR to your supervisor and peer group/ dummy		
12.	**Block 3 Practical 4**	Select a patient with intra aortic balloon pump (IABP) counter-pulsation device • Note for vascular changes (if any) in the distal limb (Observe and Record for the possible complications) • Carry out the nursing interventions related to the IABP counter-pulsation • Observe the inflation and deflation of balloon, its timing and dichotic notch on the arterial waveform. Note the beat ratio. • Assess the patient's status and cardiac performance. • Evaluate the patient for weaning from IABP.	10	5
13.	**Block 3 Practical 2**	Select a patient requiring electrocardiographic monitoring • Obtain a 12 lead ECG tracing of the patient • Observe the tracing and the patient's condition • Demonstrate lead placement for continuous cardiac monitoring • Select the best leads for the patient for monitor display • Observe the ECG findings of the patient and interpret in terms of rate, rhythm and specific findings for the patient.	5	5
14.	**Block 3 Practical 1**	Select a patient in CCU Collect the rhythm strip and report the ECG findings of patient with following conditions • Asystole • Ventricular fibrillation • Ventricular tachycardia • Complete heart block • Atrial fibrillation • Myocardial infraction • Document the activity	10	7
15.	**Block 3 Practical 1**	Select a patient with CVP line and on hemodynamic monitoring • Observe and record the central venous pressure of the patient • Perform nursing interventions appropriate for CVP line in situ • Check the condition of the insertion site. • Record the procedure and observation	5	4
16.	**Block 3 Practical 4**	• Practice the procedure for defibrillation on a simulator/dummy under supervision	5	4

		• Demonstrate the procedure for defibrillation/cardioversion in simulated situation to the peer group • Observe the defibrillation given to cardiac patient in CCU • Record the findings		
17.	**Block 3 Practical 5**	• Practice procedure of basic life support (BLS) and Advanced life support (ALS) techniques on a simulator/dummy • Demonstrate basic life support(BLS) technique ALS in the simulation setting to peer group • Record the procedure	10	5
18.	**Block 4 Practical 1**	Select a patient with altered level of consciousness in neurologic unit • Collect the articles for neurologic examination of the patient • Obtain a detailed history of the patient from the relatives/ documents • Perform neurologic examination of the patient • Assess the glasgow coma score of the patient • Formulate the nursing diagnosis • Record the findings as given in practical manual	10	5
19.	**Block 5 Practical 1**	Select a patient with any nephrologic condition from a critical care unit. • Collect the detailed history of the patient • Perform thorough physical examination by inspection, percussion, palpation and auscultation • Collect subjective and objective data • Formulate nursing diagnosis • Document the findings as per the format given in the practical munual	10	5
20.	**Block 5 Practical 1**	Select two patient (one each) undergoing hemodialysis and peritoneal dialysis • Collect the equipments • Prepare the patient, unit and the machine • Note the type of shunt to be used / used for the patient • Provide the nursing care to the patient before, during and after the dialysis procedure • Observe for any of the complications that may occur • Record the observations and nursing action	10	7
		Total	**180**	**100**

NOTES

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BNSL – 033 : Clinical Nursing Practice in Critical Care - 1

Block 1 **Role of Nurse in Diagnostic and therapeutic procedures in Critical Care Settings – Gastro intestinal System**

Practical -1 Assessment related to Gastrointestinal System
Practical - 2 Non Invasive And Invasive Diagnostic Procedures
Practical - 3 Invasive Procedures
Practical - 4 Therapeutic procedures

Block 2 **Role Of Nurse in Diagnostic and Therapeutic Procedures in Critical Care Settings – Respiratory System**

Practical-1 Assessment of Respiratory System
Practical-2 Non Invasive Procedures
Practical-3 Invasive Procedures
Practical-4 Airway Management
Practical-5 Oxygen Therapy
Practical-6 Mechanical Ventilation
Practical-7 Chest Physical Therapy and Chest Tube Drainage

Block 3 **Role of Nurse in Diagnostic and therapeutic procedures in Critical Care Settings – Cardiovascular system**

Practical-1 Cardiac Assessment
Practical-2 Non Invasive Diagnostic Procedures
Practical-3 Invasive Diagnostic Procedures
Practical-4 Therapeutic Procedures
Practical-5 Cardio Pulmonary Resuscitation

Block 4 **Role of Nurse In Diagnostic and Therapeutic Procedures in Critical Care Settings – Nervous System**

Practical -1 Neurological Assessment and Monitoring
Practical-2 Noninvasive Neurological Procedures
Practical-3 Invasive Neurological Procedures

Block 5 **Role of Nurse in diagnostic of therapeutic procedures in critical care setting - Renal System**

Practical -1 Assessment of Renal system
Practical -2 Non invasive Procedures
Practical -3 Invasive Procedures
Practical -4 Therapeutic Procedures

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