Part IV : Renal Disorders

- Acute and Chronic renal failure.
- Renal transplantation.
- Nursing intervention and management.

Learning Objectives

At the end of this chapter, the student should be able to:

1. Define concepts.
2. Describe the causes of acute and chronic renal failure and compare and contrast treatment options.
3. Discuss the stages of acute and chronic renal failure.
4. List the effect of chronic renal failure on the different body system.
5. Use the nursing process as a framework for the care of patients with acute and chronic renal failure.
6. List the indications, preparation, and steps of renal transplant procedure.
7. Describe the complications of renal transplantation.
8. Formulate preoperative and postoperative nursing diagnoses for the patient undergoing renal surgery.

Acute renal failure
Sudden and almost complete loss of kidney functions.

Causes

1. **Pre-renal causes**

   - Hypovolemia (hemorrhage, dehydration).
   - Ischemia
     a. Cross-clamping of the aorta.
     b. Surgery of the aorta or renal vessels.
     c. Extensive surgery in the elderly.
   - Septicemia (septic shock)

2. **Intra-renal causes**

   - Prolonged renal ischemia.
   - Hemoglobinuria (transfusion reaction, hemolytic anemia, crush injury, burns, massive tissue injury).
   - Exposure to nephrotoxic agents (Aminoglycoside antibiotics, heavy metals)
   - Acute glomerulonephritis.
   - Acute pyelonephritis.

3. **Post-renal causes**

   - Urinary tract obstruction, calculi, tumors, BPH and strictures.

Signs and Symptoms
1. Lethargy
2. Persistent nausea, vomiting, and diarrhea.
3. Dry skin and mucus membranes.
4. The breath may have the odor of urine.
5. Drowsiness, headache, muscle twitching, and convulsion.
6. Scanty urinary output, with low specific gravity.
7. Daily rise in the serum creatinine value.
8. Severe hyperkalemia which may lead to dysrhythmias and cardiac arrest.
10. Decrease in serum calcium level.
11. Anemia due to uremic, gastrointestinal lesions, reduced red cells life span and reduced erythropoietin production.

Management
The goals of management are:
- To restore normal chemical balance.
- To prevent complications.

The treatment modalities include the followings

1. Dialysis, hemodialysis, peritoneal dialysis.
2. Reduce potassium level by:
   a. Monitoring serum electrolytes level.
   b. ECG.
   c. Administering ion exchange resins (kayexalate) orals, or by retention enema and eliminate external sources of potassium.
3. Management of fluid balance by:


11. Intake and output recording.

12. Check blood pressure.

13. Check for any edema, or distension of jagular veins.

2. Dietary protein are limited to approximately 1 g/1 kgBW during oliguric phase and the high protein diet after the diuretic phase.

3. High carbohydrates, restricts foods and fluids containing potassium and phosphorus such as banana, juice, and coffee.

4. Bed rest to reduce patient's metabolic rate.

5. Skin care to avoid dryness, breakdown, and itching

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**Chronic renal failure**

It is a progressive irreversible deterioration in renal function. The body's ability to maintain metabolic and fluid and electrolyte balance fails. The end result is uremia, a syndrome resulting from an excess urea in the blood.
Stages of Chronic Kidney Disease

Stages are based on the glomerular filtration rate (GFR). The normal GFR is 125 mL/min.

<table>
<thead>
<tr>
<th>Stage</th>
<th>GFR</th>
<th>Clinical features</th>
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<tbody>
<tr>
<td>Stage 1</td>
<td>GFR ≥ 90 mL/min</td>
<td>Kidney damage with normal or increased GFR</td>
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<tr>
<td>Stage 2</td>
<td>GFR = 60–89 mL/min</td>
<td>Mild decrease in GFR</td>
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<tr>
<td>Stage 3</td>
<td>GFR = 30–59 mL/min</td>
<td>Moderate decrease in GFR</td>
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<tr>
<td>Stage 4</td>
<td>GFR = 15–29 mL/min</td>
<td>Severe decrease in GFR</td>
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<tr>
<td>Stage 5</td>
<td>GFR &lt;15 mL/min</td>
<td>Kidney failure</td>
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Pathophysiology

Renal function declines

The products of protein metabolism accumulate in the blood
Uremia develops

The rate of glumural filtration increase & protein exceed & decline

Develop of hypertension

So the patient goes through 3 well-recognized stages of CRF:

Reduced renal reserve, Renal insufficiency

ESRD.

**Causes**

- Chronic glomerulonephritis.
- Pyelonephritis.
- Uncontrolled hypertension.
- Hereditary lesion as polycystic kidney.
- Vascular disorders.
- Obstruction of the urinary tract
- Renal disease secondary to systemic disease.
- Infection.
- Drugs.
- Toxic agent.
- Exposure to environmental and occupational agents.

### Signs and Symptoms of CRF

<table>
<thead>
<tr>
<th>Body System</th>
<th>Signs &amp; Symptoms</th>
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</table>
| **1. Neurologic** | • Weakness and fatigue.  
|                | • Confusion, Inability to concentrate.                                           |
|                | • Disorientation.                                                               |
|                | • Tremors, Seizures.                                                           |
|                | • Asterixis.                                                                    |
|                | • Restlessness of legs, Burning of soles of feet.                               |
|                | • Behavior changes.                                                            |
|                | • Weakness and fatigue                                                          |
| **2. Integumentary** | • Gray-bronze skin color, Dry, flaky skin.                                      |
|                | • Pruritus.                                                                     |
|                | • Ecchymosis.                                                                   |
|                | • Purpura.                                                                      |
|                | • Thin, brittle nails.                                                          |
|                | • Coarse, thinning hair                                                         |
|                | • Hypertension.                                                                 |
|                | • Pitting edema (feet, hands, sacrum).                                          |
|                | • Periorbital edema.                                                           |
| 3. Cardiovascular | - Pericardial friction rub.  
|                  | - Engorged neck veins.  
|                  | - Pericarditis, Pericardial effusion, Pericardial tamponade.  
|                  | - Hyperkalemia.  
|                  | - Hyperlipidemia |
| 4. Pulmonary      | - Crackles.  
|                  | - Thick, tenacious sputum.  
|                  | - Depressed cough reflex.  
|                  | - Pleuritic pain.  
|                  | - Shortness of breath, Tachypnea.  
|                  | - Kussmaul-type respirations.  
|                  | - Uremic pneumonitis |
| 5. Gastrointestinal | - Ammonia odor to breath (“uremic fetor”).  
|                  | - Metallic taste.  
|                  | - Mouth ulcerations and bleeding.  
|                  | - Anorexia, nausea, and vomiting.  
|                  | - Hiccups.  
|                  | - Constipation or diarrhea.  
|                  | - Bleeding from gastrointestinal tract |
|                  | - Thrombocytopenia |
| 7. Reproductive  | - Amenorrhea.  
|                  | - Testicular atrophy.  
|                  | - Infertility.
8. **Musculoskeletal**

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<tr>
<td></td>
<td>Decreased libido</td>
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<tr>
<td></td>
<td>Muscle cramps, Loss of muscle strength.</td>
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<tr>
<td></td>
<td>Renal osteodystrophy.</td>
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<td>Bone pain.</td>
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<td>Bone fractures.</td>
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<td>Foot drop</td>
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**Medical Management**

The goal of management is to:

1. maintain kidney function and,
2. homeostasis for as long as possible.

**Pharmacologic Therapy**

- Phosphate-binding agents.
- Calcium supplements.
- Antihypertensive and cardiac medications.
- Anti-seizure medications, and,
- Erythropoietin (Epogen).

**Dialysis**

Parts of the Body Involved in hemodialysis-Vein in arm, leg, or neck

**Reasons for Procedure**

The purpose of dialysis is to help keep the body's chemicals in balance, which the kidneys do when they are healthy.

**The main functions of dialysis are:**

1. Removing waste and excess fluid from the blood to prevent build-up
2. Controlling blood pressure

3. Keeping a safe level of chemicals in the body, such as potassium, sodium, and chloride.

Dialysis may also be done to quickly remove toxins from the bloodstream, in cases of poisoning or drug overdose.
Nutritional Therapy

1. Adequate caloric intake and vitamin supplementation must be ensured.

2. Protein is restricted because urea, uric acid, and organic acids—the breakdown products of dietary and tissue proteins—accumulate rapidly in the blood when there is impaired renal clearance.

3. The allowed protein must be of high biologic value (dairy products, eggs, meats). High-biologic-value proteins are those that are complete proteins and supply the essential amino acids necessary for growth and cell repair.

4. The fluid allowance per day is 500 mL to 600 mL more than the
previous day's 24-hour urine output.

5. Calories are supplied by carbohydrates and fat to prevent wasting.

6. Vitamin supplementation is necessary because a protein-restricted diet does not provide the necessary complement of vitamins. Additionally, the patient on dialysis may lose water-soluble vitamins during the dialysis treatment.

7. Hyperkalemia is usually prevented by ensuring adequate dialysis treatments with potassium removal and careful monitoring of diet, medications, and fluids for their potassium content.

8. Sodium polystyrene sulfonate (Kayexalate), a cation-exchange resin, may be needed for acute hyperkalemia

Complications

1. Hyperkalemia due to decreased excretion, metabolic acidosis, catabolism, and excessive intake (diet, medications, fluids)

2. Pericarditis, pericardial effusion, and pericardial tamponade due to retention of uremic waste products and inadequate dialysis

3. Hypertension due to sodium and water retention and malfunction of the renin–angiotensin–aldosterone system

4. Anemia due to decreased erythropoietin production, decreased RBC life span, bleeding in the GI tract from irritating toxins and ulcer formation, and blood loss during hemodialysis

5. Bone disease and metastatic and vascular calcifications due to retention of phosphorus, low serum calcium levels, abnormal vitamin D metabolism, and elevated aluminum levels

Nursing Care Plan for patient with Chronic renal failure
Nursing diagnosis

Fluid volume excess & electrolyte imbalance related to decrease urine output & dietary & fluid restriction.

Goal: maintain of fluid & electrolyte balance.

Nursing intervention with Rational:

1. Assess serum electrolyte level, to provide base line data.
2. Daily weight the patient before & after doing dialysis, to determine if the weight achieve & decreased to normal, which was recorded by the doctor.
3. Assess skin turgor, to determine if there is presence of edema.
4. Assess V/S (BP, pulse, respiratory rat & rhythm ), to monitoring changes.
5. Provide foods & fluid with dietary restriction, to promote dietary changes.
7. Assist patient to cope with discomforts resulting from restrictions to increase patient comfort with dietary restriction.

Outcome criteria:

The patient is able to maintain dietary & fluid intake with restriction.
N.D

Altered nutrition less than body requirement RT dietary restriction

**N. Goal:** maintain adequate nutritional status.

**N.I. with Rational**

1. Assess nutritional status by daily weight the patient & laboratory values, to determine base line data for monitoring changes.

2. Provide patient’s food preference within dietary restriction , to increase dietary intake.

3. encourage high calorie, low protein, low potassium & low sodium snacks between meals ,to reduce sources of restricted food & provides calories for energy while low protein for growth & tissue healing

4. Explain rational for dietary restriction to the patient & his family ,to promote patient & family cooperation within dietary restriction.

**Outcome:**

The patient explained in his own word the rational for dietary restriction & his appetite is increased at meal time.

**N.D:**

Activity intolerance related to fatigue & dialysis procedure.

**Goal:** Participation in activity within tolerance.

**N.I with Rational :**

1. Assess factors contributing to fatigue (anemia, fluid &electrolyte imbalance, depression), to provide indication of severity of fatigue.

3. Encourage the patient to alternate activity within rest, to promote activity & exercise within limits & adequate rest.

4. Encourage the patient to rest after dialysis treatment, because the dialysis treatment will exhaust the pt.

5. Place the patient in high fowler position, to facilitate diaphragmatic expansion.

**Outcome:**

patient reports an increase in sense of well-being & he is more able to participate in activity & exercise.

**Discharge Plan:**

Teaching points to protect vascular access:

1. checks access before each treatment.

2. Keep access clean at all times.

3. Use access site only for dialysis.

4. Be careful not to bump or cut access.

5. Don’t use access site for blood pressure measurement or blood sampling procedure.

6. Don’t sleep with your access arm under your head or body.
Kidney transplantation

Kidney transplantation involves transplanting a kidney from a living donor or deceased donor to a recipient who has ESRD.

Indications

- Chronic renal failure (CRF) and,
- Renal tumors.

Contraindications for surgery

1. Metastatic cancer.
2. Ongoing or recurring infections that are not effectively treated.
3. Serious cardiac or peripheral vascular disease.
4. Hepatic insufficiency.
5. Serious conditions that are unlikely to improve after renal transplantation (i.e., the patient’s life expectancy can be finitely measured)
6. Demonstrated and repeated episodes of medical noncompliance.
7. Inability to perform rehabilitation adequately after transplantation.
8. Patients with AIDS.

Basic pre-transplant studies

1. Echocardiography and a stress study
2. Chest radiography
3. Pulmonary studies
4. Colonoscopy or barium enema (dependent on patient age)
5. Mammography, Papanicolaou (Pap) smear, and prostate-specific antigen (PSA) test, as indicated (depending on patient age)

6. Noninvasive vascular studies

7. Abdominal and renal ultrasonography

8. Serologic tests for HIV infection, hepatitis B and hepatitis C, cytomegalovirus (CMV) infection, and other viral infections

9. Studies of bladder capacity and function (potentially indicated)

10. Immunologic studies, should include human leukocyte antigen (HLA) typing and measurement of the panel-reactive antibody (PRA) titer.

Complications

1. Delayed graft function

The incidence of delayed graft function (as defined by the need for dialysis after transplantation) varies in accordance with donor, recipient, and transplant characteristics. Delayed graft function is rare with living donor grafts, probably because of the short cold ischemia time. For deceased donor kidneys, cold ischemia time remains the best predictor of delayed graft function.

2. Vascular thrombosis and stenosis

3. Ureteral obstruction.

   a. Early obstruction may result from clot, edema, or technical problems associated with the ureteroneocystostomy.
4. **Urinary leakage.**

5. **Lymphocele**
   Leakage from perivascular lymphatic vessels can lead to significant collections of lymph between the lower pole of the transplanted kidney and the bladder.

6. **Infection**
   The risk of opportunistic infections is increased after transplantation.[17] These infections are typically caused by commonly encountered pathogens such as *cytomegalovirus*, BK virus, fungi, *Pneumocystis (carinii) jiroveci*, and *Legionella* species.

7. **Rejection**

8. **Other complications**
   - Post-transplant diabetes.
   - Hypertension, and
   - Hyperlipidemia.