CHRONIC RENAL FAILURE
(END-STAGE RENAL DISEASE)

Chronic renal failure, or end-stage renal disease (ESRD), is a progressive, irreversible deterioration in renal function in which the body’s ability to maintain metabolic and fluid and electrolyte balance fails, resulting in uremia or azotemia (retention of urea and other nitrogenous wastes in the blood).

ESRD may be caused by systemic diseases, such as diabetes mellitus (leading cause); hypertension; chronic glomerulonephritis; pyelonephritis (inflammation of the renal pelvis); obstruction of the urinary tract; hereditary lesions, as in polycystic kidney disease; vascular disorders; infections; medications; or toxic agents. Comorbid conditions that develop during chronic renal insufficiency contribute to the high morbidity and mortality among patients with ESRD.

Environmental and occupational agents that have been implicated in chronic renal failure include lead, cadmium, mercury, and chromium. Dialysis or kidney transplantation eventually becomes necessary for patient survival. Dialysis is an effective means of correcting metabolic toxicities at any age.

Complications
Potential complications of chronic renal failure that concern the nurse and that necessitate a collaborative approach to care include the following:
• Hyperkalemia due to decreased excretion, metabolic acidosis, catabolism, and excessive intake (diet, medications, fluids)
• Pericarditis, pericardial effusion, and pericardial tamponade due to retention of uremic waste products and inadequate dialysis
• Hypertension due to sodium and water retention and malfunction of the renin–angiotensin–aldosterone system
• Anemia due to decreased erythropoietin production, decreased red blood cell life span, bleeding in the gastrointestinal tract from irritating toxins and ulcer formation, and blood loss during hemodialysis
• Bone disease and metastatic and vascular calcifications due to retention of phosphorus, low serum calcium levels, abnormal vitamin D metabolism, and elevated aluminum levels

Medical management
The goal of management is to maintain kidney function and homeostasis for as long as possible. All factors that contribute to ESRD and all factors that are reversible (such as obstruction) are identified and treated. Management is accomplished primarily with medications and diet therapy, although dialysis may also be needed to decrease the level of uremic waste products in the blood and to control electrolyte balance.
Pathophysiology
As renal function declines, the end products of protein metabolism (which are normally excreted in urine) accumulate in the blood. Uremia develops and adversely affects every system in the body. The greater the buildup of waste products, the more severe the signs and symptoms (see chart below).

The rate of decline in renal function and progression of chronic renal failure is related to the underlying disorder, the urinary excretion of protein, and the presence of hypertension. The disease tends to progress more rapidly in patients who excrete significant amounts of protein or have elevated blood pressure than in those without these conditions.

<table>
<thead>
<tr>
<th>Stages of chronic kidney disease</th>
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<tbody>
<tr>
<td>Stages are based on the glomerular filtration rate (GFR). The normal GFR is 125 mL/min/1.73 m².</td>
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<table>
<thead>
<tr>
<th>STAGE 1</th>
<th>Kidney damage with normal or increased GFR</th>
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<td>GFR ≥90 mL/min/1.73 m²</td>
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<tr>
<th>STAGE 2</th>
<th>Mild decrease in GFR</th>
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<td>GFR = 60-89 mL/min/1.73 m²</td>
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<tr>
<th>STAGE 3</th>
<th>Moderate decrease in GFR</th>
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<td>GFR = 30-59 mL/min/1.73 m²</td>
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<tr>
<th>STAGE 4</th>
<th>Severe decrease in GFR</th>
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<td>GFR = 15-29 mL/min/1.73 m²</td>
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<th>STAGE 5</th>
<th>Kidney failure</th>
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<td>GFR &lt;15 mL/min/1.73 m²</td>
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Assessing for signs and symptoms of chronic renal failure

Neurologic
- Weakness and fatigue
- Confusion
- Inability to concentrate
- Disorientation
- Tremors
- Seizures
- Asterixis
- Restlessness of legs
- Burning soles of feet
- Behavior changes

Integumentary
- Gray-bronze skin color
- Dry, flaky skin
- Pruritus
- Ecchymosis
- Purpura
- Thin, brittle nails
- Coarse, thinning hair

Cardiovascular
- Hypertension
- Pitting edema (feet, hands, sacrum)
- Periorbital edema
- Pericardial friction rub
- Engorged neck veins
- Pericarditis
- Pericardial effusion
- Pericardial tamponade
- Hyperkalemia
- Hyperlipidemia

Pulmonary
- Crackles
- Thick, tenacious sputum
- Depressed cough reflex
- Pleuritic pain
- Shortness of breath
- Tachypnea
- Kussmaul-type respirations
- Uremic pneumonitis

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

Hematologic
- Anemia
- Thrombocytopenia

Reproductive
- Amenorrhea
- Testicular atrophy
- Infertility
- Decreased libido

Musculoskeletal
- Muscle cramps
- Loss of muscle strength
- Renal osteodystrophy
- Bone pain
- Bone fractures
- Foot drop