

Renal Disease in Patients with HIV/AIDS

NYSNA Continuing Education

The New York State Nurses Association is accredited as a provider of continuing nursing education by the American Nurses Credentialing Center's Commission on Accreditation.

This course has been awarded 2 contact hours.

All American Nurses Credentialing Center (ANCC) accredited organizations' contact hours are recognized by all other ANCC accredited organizations. Most states with mandatory continuing education requirements recognize the ANCC accreditation/approval system. Questions about the acceptance of ANCC contact hours to meet mandatory regulations should be directed to the Professional licensing board within that state.

NYSNA has been granted provider status by the Florida State Board of Nursing as a provider of continuing education in nursing (Provider number 50-1437).

How to Take This Course

Please take a look at the steps below; these will help you to progress through the course material, complete the course examination and receive your certificate of completion.

1. REVIEW THE OBJECTIVES

The objectives provide an overview of the entire course and identify what information will be focused on. Objectives are stated in terms of what you, the learner, will know or be able to do upon successful completion of the course. They let you know what you should expect to learn by taking a particular course and can help focus your study.

2. STUDY EACH SECTION IN ORDER

Keep your learning "programmed" by reviewing the materials in order. This will help you understand the sections that follow.

3. COMPLETE THE COURSE EXAM

After studying the course, click on the "Course Exam" option located on the course navigation toolbar. Answer each question by clicking on the button corresponding to the correct answer. All questions must be answered before the test can be graded; there is only one correct answer per question. You may refer back to the course material by minimizing the course exam window.

4. GRADE THE TEST

Next, click on "Submit Test." You will know immediately whether you passed or failed. If you do not successfully complete the exam on the first attempt, you may take the exam again. If you do not pass the exam on your second attempt, you will need to purchase the course again.

5. FILL OUT THE EVALUATION FORM

Upon passing the course exam you will be prompted to complete a course evaluation. You will have access to the certificate of completion **after you complete the evaluation**. At this point, you should print the certificate and keep it for your records.

Introduction

A distinct renal syndrome was reported among patients infected with the Human Immunodeficiency Virus (HIV) early in the epidemic by Roa et al. (1984). In the initial study, the focus was on 750 HIV patients treated in two New York City hospitals between 1982 and 1986. Of these patients, it was noted that 78 (10.4%) had been evaluated for renal disease. Twenty-three of the renal patients were eventually diagnosed with a reversible acute renal failure (ARF), while the other 55 had symptoms that included proteinuria, azotemia, or both, and were diagnosed with HIV-Associated nephropathy (HIV-AN). Only two of the patients with HIV-AN survived more than 6 months from diagnosis. In each case the cause of death was listed as “failure to thrive” because patients did not respond positively to nutritional support and/or hemodialysis.

Today, renal insufficiency and chronic renal failure continue to be serious problems in patients with HIV/AIDS. While we have seen some improvement in the number and severity of cases in patients, probably due to successful treatment with antiretroviral medications (ART), there remain multiple causes for concern in this patient population.

Objectives

Upon completion of this course, the learner will be able to

- Review basic renal terminology and physiology.
- Discuss the pathogenesis of HIV associated renal disease.
- Describe symptoms of acute renal disease in HIV positive patients.
- Discuss nursing interventions in acute renal disease in HIV positive patients.
- Describe symptoms of chronic renal disease in HIV positive patients.
- Discuss nursing interventions in chronic renal disease in HIV positive patients.

About the Author

Judy K. Shaw, MS, ACRN, ANP-c

Judy K. Shaw, MS, ACRN, ANP-c, is a Nurse Practitioner in the Section of Infectious Disease at the Samuel S. Stratton VA Medical Center in Albany, NY. She is also a doctoral candidate at New York University.

Ms. Shaw has been working in the field of HIV/AIDS for more than ten years. She completed the Nicholas A. Rango HIV Clinical Scholar program, which was funded by the NYS AIDS Institute to develop practitioners with expertise in the field of HIV/AIDS, in 1999. Ms. Shaw has national HIV/AIDS certification through the American Academy of HIV Medicine and The HIV/AIDS National Certification Board. She has presented programs on HIV/AIDS topics locally and nationally and conducts research on medication adherence and nurses' knowledge of HIV/AIDS. She has had numerous publications and is co-author of the book *HIV/AIDS Nursing Secrets (2003)*. She is founding president of the NYS Chapter of the Association of Nurses in AIDS Care and current secretary.

Definitions

Acute glomerulonephritis: the sudden onset of hematuria, proteinuria, and RBC casts in the urine.

Acute renal failure: a rapid loss of renal function.

Acute tubular necrosis: a condition resulting from destruction of epithelial cells in the tubules and usually caused by poisons, ischemia, or hypovolemia.

Bowman's Capsule: a cup shaped structure consisting of a thin double membrane that surrounds the glomerulus.

Cortical nephrons: located close to the surface of the kidney.

Distal Convoluted tubule: The distal convoluted tubule is a portion of the nephron between the loop of Henle and the collecting duct.

Fenestrae: pores or cracks in the glomerular membrane that allows a portion of water and small solutes to be filtered out into Bowman's capsule while retaining the larger proteins and cells.

Glomerulus: a network of up to 50 parallel capillaries with branching and anastomoses that are covered with epithelial cells and encased in Bowman's capsule.

Glomerular filtrate: water and small solutes filtered through the glomerulus into Bowman's capsule.

Juxtamedullary nephrons: located deep in the kidney cortex near the medulla.

Loop of Henle: a section of the nephron that leads from the proximal convoluted tubule to the distal convoluted tubule in the kidney.

Nephrons: the functional units of the kidney.

Prerenal azotemia: Inadequate blood supply to the kidneys resulting in abnormal levels of urea, creatinine, various body waste compounds, and other nitrogen-rich compounds in the blood due to insufficient filtering.

Proximal convoluted tubule: the segment of the renal tubules that drain glomerular filtrate from Bowman's capsule.

Reabsorption: the passage of a substance from the lumen of the tubules through the tubule cells into the capillaries.

Secretion: involves the passage of a substance from the capillaries through the tubular cells into the capillary lumen.

How the Kidneys Work: A Review of Physiology

The kidneys are bean-shaped organs located retroperitoneal and bilaterally to the vertebral column between T-12 and L-3. The average kidney is about 5 inches in length and weighs between four and six ounces. Blood flow rate through the kidneys is estimated to be about 1200 ml/min. The kidneys' primary purpose is to regulate the volume and composition of extracellular fluid.

Nephrons are the functional units of the kidney, and each contains approximately one million. There are two types of nephrons: cortical, which are located close to the surface of the kidney and juxtamedullary, which are located deep in the kidney cortex near the medulla. Nephrons are made up of a **glomerulus**, **Bowman's capsule**, and **tubular system**. Each of these components is essential in urine formation.

Functions Within the Nephron

- **Glomerulus**

Blood flows from the aorta into the renal artery, which divides numerous times into smaller branches and eventually forms afferent arterioles. These arterioles form into a glomerulus, a network of up to 50 parallel capillaries with branching and anastomoses which are covered with epithelial cells and encased in Bowman's capsule. The pressure of the blood flowing through the glomerulus, which is porous because of the presence of many fenestrae (or cracks), causes a portion of water and small solutes to be filtered out into Bowman's capsule while retaining the larger proteins and cells. Glomerular membranes are 100 to 500 times more permeable than other capillaries. Unfiltered blood remains in the capillaries flowing through the glomerulus until they eventually unite again to form the efferent arterioles.

- **Bowman's Capsule**

A cup shaped structure consisting of a thin double membrane that surrounds the glomerulus. Hydrostatic pressure within the glomerular capillaries causes water and small solutes to be filtered out into the capsule. This material, glomerular filtrate then passes into the *proximal convoluted tubule*.

- **The Renal Tubular System**

- ***Proximal convoluted tubule***

This is the segment of the renal tubules that drains glomerular filtrate from Bowman's capsule. Cells in the proximal convoluted tubule have increased numbers of mitochondria to support rapid active transport. Two processes take place within the proximal tubule.

1. *Secretion*

In the proximal tubule, creatinine and hydrogen ions are secreted along with smaller amounts of other substances.

2. *Reabsorption*

About 80% of electrolytes and water are reabsorbed in the proximal tubule along with glucose, amino acids, and HCO_3^- .

- ***Loop of Henle***

The Loop of Henle plays an important role in concentrating the filtrate by conserving water (H_2O). The descending loop of Henle is permeable to water and moderately permeable to sodium (Na^+), urea, and other solutes. In the ascending limb, chloride (Cl^-)

Renal Disease in Patients with HIV/AIDS

ions are actively reabsorbed followed passively by Na^+ ions. About 25% of filtered Na^+ is reabsorbed here.

- ***Distal Convoluted tubule***

Two important functions take place in the distal tubule: regulation of water, and maintenance of the acid-base balance. The hormones Antidiuretic Hormone (ADH) and Aldosterone are essential for this process to occur. ADH is released by the posterior pituitary gland causing permeability of both the distal and collecting tubules. ADH is required for H_2O reabsorption. Stimuli for ADH release are increased serum osmolality and decreased blood volume. In the absence of ADH, tubules are almost impermeable and water in tubules leaves as urine. Aldosterone (released from the adrenal cortex) causes reabsorption of H_2O and Na^+ . Potassium (K^+) ions are excreted in exchange for Na^+ . Secretion of aldosterone is influenced by blood volume and concentrations of K^+ and Na^+ . Parathyroid hormone (from the parathyroid gland) is released in response to low serum Calcium (Ca^{2+}) and causes increased Ca^{2+} reabsorption and decreased PO_4 (bicarbonate).

The contents from as many as eight distal tubules can drain into one collecting duct. From the collecting duct, urine travels into the renal pelvis, the ureter, and the bladder for excretion. The nephrons clean blood of unwanted substances and waste products by retaining necessary substances in the blood and eliminating unwanted substances in the urine.

HIV and Renal Disease

Although the exact pathogenesis of HIV associated renal disease is not known, some evidence suggests that HIV-1 may directly infect renal cells. In fact, there are reports of viral replication occurring in renal glomerular and tubular epithelial cells in patients with HIV-1 viral loads that are at an undetectable level. In one case, the number of renal epithelial cells expressing mRNA was the same when measured before and during treatment with ART, suggesting that renal cells may act as a reservoir for HIV.

About one-half of patients with HIV/AIDS have elevated levels of proteinuria. This may result from abnormal glomerular permeability and/or renal tubular reabsorption abnormalities. Patients with renal insufficiency are unable to properly excrete the optimal amount of water because of a diminished glomerular filtration rate and/or deficiency of glucocorticoids.

A Case History

Mr. L. is a 61 year old African American male who has the following medical problems: HIV, chronic Hepatitis C, poorly controlled hypertension, chronic renal failure, cirrhosis, and depression. He has a past history of substance abuse including alcohol, injecting heroin, snorting cocaine, and smoking crack and marijuana. He has been clean and sober for about three years. His lifestyle is chaotic, and he often misses clinic appointments and doses of medication. He lacks insight into his medical problems and does not understand the need to follow a care plan.

Mr. L. has three significant risk factors to develop end stage renal disease: HIV, end organ disease resulting from poorly controlled hypertension, and history of IV heroin use. In 2002 his serum creatinine (SCr) was 2.1 mg/dl and serum blood urea/nitrogen (BUN) was 29 mg/dl, both slightly elevated and indicative of chronic renal disease. His average blood pressure was 196/101 mm/Hg, and his CD4 count was 230 cells/ml with a HIV-1 Viral Load of 89,000 copies/ml. He was scheduled to be seen monthly in the HIV clinic and was referred to the adherence clinic by his provider. Following a needs evaluation, the nurse started pouring all medications for him and calling to remind him of upcoming appointments in an attempt to increase adherence. Over the next two years his condition improved steadily with her encouragement.

In 2004, Mr. L. and his girlfriend had a disagreement and she moved home to Alabama. He was very upset and started drinking, missing appointments, and misusing his prescription medications. He missed several HIV clinic and adherence program visits, his telephone number was changed, and the nurse was unable to reach him. Finally, after several months he was brought to the emergency department with severe abdominal pain and diagnosed with pancreatitis and acute and chronic renal failure. On admission his SCr was 4.6 mg/dl and BUN was 59 mg/dl. The nephrologists were consulted, and after examining the results of a renal ultrasound, 24-hour urine for creatinine and protein, and urinalysis, concluded that the acute problem was most likely caused by drug toxicity. He was admitted for renal monitoring, antibiotics, intravenous fluids, and responded fair. After several days he was discharged home, but was admitted again about one month later with the same diagnosis. Since then he has been drinking less frequently and has been taking medications more regularly.

While Mr. L. recovered from acute renal failure he still has chronic renal failure. In fact, his SCr has continued to rise steadily and at his last visit was 4.8 mg/dl and BUN was 56 mg/dl. He was seen in renal clinic where he spoke with the nephrologists about dialysis. He was advised that he should consider having an AV graft placed so that it would be ready to use in the future. The nurse reviewed his diet, medications, and suggested some lifestyle modifications. She also invited him to a class to learn more about dialysis, which he attended. He has been coming to HIV clinic on a regular basis for the past two months with reminders from the adherence nurse, and taking most of his medications. He did not have the AV graft placed because the surgeons were unable to locate vessels in his arms that were not scarred from years of injecting heroin. He remains undecided if he will have dialysis or not if his kidneys fail.

Acute Renal Failure

Acute renal failure (ARF) is a rapid loss of renal function. Results include retention of nitrogenous (urea and creatinine) and non nitrogenous waste products, metabolic disturbances (metabolic acidosis and hyperkalemia), changes in body fluid balance, and effects on many other organ systems.

Ischemic causes of ARF that result from fluid, blood loss, or sepsis cause a decrease in blood flow and glomerular permeability. Nephrotoxins cause edema and cellular debris, leading to partial or complete tubular obstruction. The etiology of acute renal failure in patients with HIV is similar to the general population. The most common causes are:

1. Prerenal azotemia

- Inadequate blood supply to the kidneys resulting in abnormal levels of urea, creatinine, various body waste compounds, and other nitrogen-rich compounds in the blood due to insufficient filtering.
- Most common causes include: fluid depletion and hypovolemia due to diarrhea, vomiting, infection, surgery, gastrointestinal bleeding, nasogastric suctioning.

2. Acute tubular necrosis (ATN)

This is a condition caused by destruction of epithelial cells in the tubules resulting from:

- Shock - hypotension due to bleeding or fluid loss. Cells die from lack of nutrition and block tubules.
- Sepsis.
- Anoxia.
- Nephrotoxins - in HIV, especially pentamidine, amphotericin B, foscarnet, aminoglycoside antibiotics, contrast material, bactrim, pyrimethamine, cimetidine.
- Azotemia - accumulation of nitrogenous wastes in renal tubules.
- Hemolytic uremic syndrome - obstruction due to fragmented RBCs.
- Thrombotic thrombocytopenic purpura (TTP) - obstruction due to fragmented RBCs.
- Urinary tract outflow obstruction- crystalluria, tumor, blood clots, fungus balls, fibrosis.

3. Acute glomerulonephritis

- The sudden onset of hematuria, proteinuria, and RBC casts in the urine.
- Usually caused by an abnormal immune system reaction.
- Antibodies and antigens react to form an insoluble immune complex that becomes trapped in the capillaries of the glomerulus causing them to become blocked. The characteristic symptom of glomerulonephritis is proteinuria.

Signs and Symptoms of Acute Renal Failure

Acute renal failure is a medical emergency characterized by rapid loss of renal function. Depending on the cause and response to treatment, patients may fully recover from ARF or progress to CRF, End Stage Renal Disease (ESRD), or death. A thorough evaluation of changes in the patient's renal status is key to early intervention.

The following are indications of ARF:

- Increase in BUN and creatinine.
- Rapid development of anemia.
- Decreased urinary output.
- Proteinuria.
- Hypotension.

- Nausea/vomiting/diarrhea.
- Defect in platelet functioning.
- Memory impairment.

Nursing Interventions for Patients with Acute Renal Failure		
Identify patients at risk for ARF	<ul style="list-style-type: none"> • Hypovolemia. • Excessive fluid loss. • Hypotension. • Nasogastric suctioning. • Trauma. • Vomiting • Diarrhea. 	<ul style="list-style-type: none"> • Sepsis. • Bleeding. • Infection. • Thrombotic Thrombocytopenic Purpura (TTP).
Monitor vital signs	<ul style="list-style-type: none"> • Blood Pressure. • Respirations. • Pulse. 	<ul style="list-style-type: none"> • Temperature. • Input and output. • Weight.
Evaluate lab results	<ul style="list-style-type: none"> • BUN. • Serum creatinine. • Bicarbonate. 	<ul style="list-style-type: none"> • Calcium. • Potassium. • Phosphate.
Monitor for signs and symptoms of renal failure	<ul style="list-style-type: none"> • Confusion due to uremic toxins. • Fluid retention resulting from renal failure. • Infection at sites of intravenous lines or invasive catheters. • Anxiety related to changes in health and concern about prognosis. • Electrolyte imbalance resulting from decreased excretion and reabsorption. • Cardiac arrhythmias due to electrolyte imbalance. 	
Provide psychosocial support	<ul style="list-style-type: none"> • Discuss prognosis and disease process openly with patient and/or family if patient consents. • Refer for visiting nurse services if needed. • Provide education regarding diet, medications, and signs and symptoms of recurrent renal failure. • Provide emotional support and be available to listen to patient and/or family needs. • Identify financial needs related to acute illness and recovery period and refer to social work if needed. 	
Refer for spiritual support	<ul style="list-style-type: none"> • Assess patient's spiritual needs and preferences. 	

Nurses play an essential role in early identification and monitoring of signs and symptoms of ARF. Since the condition occurs rapidly, the patient and family may have many emotional and learning needs related to being faced with an unexpected and potentially life-threatening emergency. The nursing intervention of Presence, or "being there" for the patient, is important to provide comfort and a sense of security in an unfamiliar environment. Knowing that someone is responsible to monitor for changes, explain treatments and information, and provide emotional support is reassuring to both patients and family members.

Something as basic as a touch, or just checking to see if they are comfortable can be more meaningful to the patients and their families than the results of medical interventions. In fact, the results of several studies indicated that patients rated their overall perception of medical care by their interaction with nursing staff.

In Mr. L's case, the adherence nurse made a significant difference in his medical condition by performing a comprehensive evaluation of his specific needs and developing interventions aimed at promoting

behavioral changes. The success of his story was not due to a change in medical interventions, but rather to good nursing judgment and the ability of the nurse to engage him in treatment.

A Case History

Ms. R. is a 49 year old Caucasian female diagnosed with HIV (CD4= 356 cells/ml, VL= 12,088 copies/ml), adult onset diabetes, hypertension, peripheral neuropathy, and chronic hepatitis C. She has a history of substance abuse including heroin, cocaine, and marijuana. She has been clean for about 5 years. She was diagnosed with renal insufficiency about 10 years ago. Her risk factors for renal disease include: HIV, diabetes, poorly controlled hypertension, and history of heroin use.

Ms. R. is in denial about her medical condition. She has never taken ART and refuses each time it is offered. She has difficulty making appointments, often runs out of medications, and eats food high in fats, sugar, and salt. Her attitude is a paradox in many ways, because although she does not take care of herself medically, she works full time and is enrolled in a two-year degree program. She takes her job and schooling very seriously. Attempts by the clinic nurse to explain the relationship between HIV, other co-morbidities, and renal diseases were unsuccessful. Ms. R. also refused referrals to Mental Health for counseling.

In the past 5 years her renal function has continued to decline as evidenced by increased levels of SCr and BUN. A series of renal ultrasounds have shown a continual increase in kidney size and echogenicity. Ms. R. was informed that her CRF will progress to ESRD unless she is able to follow the medical care plan. Even then, the damage already sustained by her kidneys may not be reversible.

Ms. R. was contacted regularly by the HIV clinic nurse to remind her of appointments, to encourage medication and dietary adherence, and to provide support. The patient did not respond well to the additional encouragement in a way that improved adherence, but she did rely on the nurse for help and advice when she found herself in a crisis situation.

Chronic Renal Failure (CRF)

Chronic renal failure involves all compartments of the kidney. It is progressive with irreversible destruction of the kidneys. Tubular changes and interstitial edema can cause increases in kidney size and reduction in function. Glomeruli can become shrunken and collapse. Eventually nephrons are destroyed and replaced with scar tissue. CRF that continues to progress results in ESRD and death.

Among patients with HIV/AIDS, CRF is most commonly caused by HIV-Associated Nephropathy (HIV AN) and HIV-Associated Immune Complex Renal Disease (HIV ICD).

Patients with chronic renal disease require close monitoring of renal function, diet, weight, and medication use.

HIV-Associated Nephropathy (HIV AN)

HIV AN is the most common finding identified on biopsy of patients with HIV/AIDS and renal disease. While more commonly associated with later stages of infection, cases have been reported in all stages. Estimates of 90% or higher have been reported among African Americans with renal disease. Research in this field is limited.

HIV AN is usually characterized by:

- Proteinuria.
- Hypoalbuminemia.
- Enlarged echogenic kidneys on ultrasound.
- Focal and segmental glomerular sclerosis (FGS) on ultrasound.

HIV-Associated Immune Complex Renal Disease (HIV ICD)

HIV ICD occurs less frequently than HIV AN, and is more prevalent in Caucasians. On biopsy, deposits of immunoglobulins are seen. This condition is less likely to progress to ESRD.

HIV ICD is usually characterized by:

- Hematuria.
- Proteinuria.
- Renal capillary collapse.
- Presence of Immunoglobulin complexes on biopsy.

Uremia is the term used to describe the syndrome of systemic disturbances caused by retention of waste products usually eliminated by properly functioning kidneys.

Signs and Symptoms of uremia include:

- | | |
|---|----------------------------|
| - Nausea | - Pallor |
| - Uremic frost | - Edema |
| - Malnutrition | - Dry skin |
| - Infection | - Stomatitis |
| - Hypertension | - Congestive heart failure |
| - Motor weakness | - Vomiting |
| - Headache | - Lethargy |
| - Visual changes | - Seizures |
| - Confusion | - Dyspnea |
| - Fatigue | - Pruritis |
| - Impaired metabolism of
carbohydrates, fats, proteins | |

Differential Diagnosis of Renal Disease Based on Urinalysis Results in Patients with Uremia

Proteinuria, hematuria	ICD
Cellular casts, debris	ATN
Proteinuria	HIV AN
RBCs	Glomerulonephritis
WBCs	Acute interstitial nephritis or pyelonephritis

Patients with CRF may have multiple care needs. Because the cause of renal disease is often multifactorial, a complete assessment and evaluation is needed to develop interventions appropriate for each individual patient. This evaluation should include both physical and psychosocial components. Subtle differences can be indicative of a change in the patient's condition, in these cases early intervention is necessary.

Nursing Interventions for Patients with Chronic Renal Failure	
Provide dietary education	<ul style="list-style-type: none"> • Avoid foods high in salt and potassium
Monitor for signs of fluid retention	<ul style="list-style-type: none"> • Increased blood pressure • Dyspnea • Weight gain • Abnormal breath sounds • Edema
Monitor for anemia	<ul style="list-style-type: none"> • Check hemoglobin and hematocrit on a regular basis • Evaluate patient for fatigue, lethargy, confusion
Provide/refer for emotional support	<ul style="list-style-type: none"> • Denial • Anxiety • Depression

Although the patient in our case study did not respond ideally to the nursing interventions provided, she did come to trust and depend on the nurse, especially during times of crisis. The nurse was instrumental in educating family members, acting as an advocate for the patient and family, and providing support to the entire family throughout the patient's many illnesses.

Case Study

Mr. V. is a divorced 58 year old African American male diagnosed with AIDS (CD4 count 8 cells/ml, VL 180,000 copies/ml), chronic HCV, recurrent gout, poorly controlled hypertension, hyperlipidemia, and a history of heroin use (18 years) and pneumocystis carinii pneumonia (PCP). He has poor adherence and is seen erratically in the HIV clinic, usually for an acute illness. His renal function has continued to decline over the past five years with a steady increase in both SCr and BUN. He has had proteinuria for about five years as well. He claims that he last used heroin about five years ago, but occasionally still uses crack and marijuana.

He presented to the clinic about two weeks ago with complaints of fatigue, headache, anorexia, pruritis, and a general feeling of weakness. He admitted not taking his antiretroviral medications as prescribed, often missing doses.

Despite a loss of appetite, he had gained 12 pounds in the previous month. He had 2+ edema in the lower extremities bilaterally. Clinic staff noted that he seemed confused and was a poor historian. He was admitted for worsening renal failure and failure to thrive.

His provider ordered a complete blood count (CBC), complete metabolic profile (CMP), urinalysis, CD4 count, and HIV viral load. Results showed a marked elevated potassium level, BUN 58 mg/dl, SCr 4.2 mg/dl, estimated glomerular filtration rate 28 ml/min, and gross proteinuria with

some RBCs. A renal ultrasound was ordered and showed the following results:

- The right kidney measures approximately 10.6 x 5.4 cm.
- The left kidney measures approximately 11 x 6 cm.
- Both kidneys appear edematous with increased echogenicity.
- No masses, lesions or renal calculi are seen.
- There is minimal left hydronephrosis.

Over the course of two weeks his renal failure continued to decline and the decision was made to begin dialysis.

HIV and Dialysis

Until very recently, dialysis (the use of an artificial 'kidney' to filter waste products and toxins from the blood) was the only treatment option available for symptomatic HIV positive patients with end stage renal disease. Now, renal transplantation may be considered for HIV infected patients who are in reasonably good health. Both peritoneal and hemodialysis are options for those not considered good candidates for transplantation, with the decision usually being made depending on the patient's preference and ability/support to manage the procedure at home. Because of the high risk of infection related to immunosuppression, patients need to be monitored closely regardless of which type of dialysis they are using.

CDC revised their guidelines for dialysis of HIV patients in 1986:

Patients with ESRD who are undergoing maintenance dialysis and who have manifestations of AIDS or are positive for antibody to HIV can be dialyzed in hospital based or free standing dialysis units using universal infection-control precautions. Standard blood and body fluid precautions and disinfection and sterilization strategies routinely practiced in dialyses centers are adequate to prevent the transmission of HIV...Isolation of infected patients and non-reuse of a dialyzer by the same patient was initially recommended for patients receiving dialysis (CDC, 1986).

Complications of hemodialysis access is a concern when caring for patients with HIV/AIDS. In one study of 37 patients, the mean time to development of complications related to hemodialysis was 4.8 months, with a range from 1- 22 months. In this group study of patients (N = 37), the cause of end stage renal disease was almost exclusively due to HIV-AN (95%) with the remainder due to heroin related nephropathy (5%) (Gorski, Gorski, & Munez, 2002). Complications included: thrombosis (40%), infection (25%), and aneurysm (5%). At the 18 month follow-up, 59% had expired.

Prior to the advent of antiretroviral medications (ART) the value of initiating dialysis for HIV positive patients was debated in the medical community because of their overall poor prognosis. In one study that compared survival rates between HIV positive patients (N = 1000) and a comparable group of HIV negative patients (N = 1000) on dialysis selected from the U.S. Renal Data System database, the one year survival rate improved from 1990 (56%) to 1999 (74%), with a statistically significant decline in death rate ($p < 0.05$) (Ahuja, Grady, & Khan, 2002). In contrast, there was no significant improvement among the HIV negative group, although the rate remained higher overall in that group. The 12 and 24 month survival rates were 87%/79% in the HIV negative group and 58/41% in the HIV positive group. Age, race, and gender were not found to be statistical predictors of survival. However, several factors were identified that might explain the difference between the groups:

- Effects of hemodialysis on the pharmacokinetics of ART.
- Effect of increased uremia on the immunological response of patients possibly predisposing them to the development of opportunistic infections.
- Effect of the activation of white blood cells and the release of cytokines during dialysis which may actually enhance viral replication.

Based on the results of research to date and the consensus of medical experts, The HIV Medicine Association of the Infectious Diseases Society recently released the following summary and guidelines for the management of kidney disease in HIV-infected patients:

- Kidney disease is an important complication of HIV infection.
- Kidney function is estimated to be abnormal in about 30% of HIV positive patients.
- Kidney disease may be associated with progression to AIDS and death.
- Patients should be assessed for kidney disease at the time of HIV diagnosis with a urine analysis for proteinuria and either a creatinine clearance or glomerular filtration rate (GFR) to estimate renal function.

Renal Disease in Patients with HIV/AIDS

- ART should be prescribed based on renal function and adjusted as needed.
- Patients who show no evidence of renal disease but are at high risk should have annual screening. High risk patients include:
 - African Americans
 - CD4 < 200
 - HIV Viral Load > 4000
 - Diabetes Mellitus
 - Hypertension
 - Hepatitis C coinfection
- Patients with proteinuria of 1+ or greater or GFR < 60 ml/min should be referred to a nephrologist for additional evaluation.
- Blood pressure should be controlled, and the use of an angiotension enzyme inhibitor (ACE) or angiotension receptor blockers (ARB) should be used as first line therapy unless contraindicated.
- Dialysis should not be withheld from patients solely because of HIV infection.

Nursing Intervention for Dialysis Patients with HIV/AIDS	
Monitor for s/s of infection	<ul style="list-style-type: none"> • Document temperature each visit • Evaluate dialysis site for pain, erythema, drainage • Instruct in proper technique for dressing changes
Monitor blood pressure	<ul style="list-style-type: none"> • Encourage adherence with antihypertensive medications • Review low salt diet • Reinforce need for BP control to avoid end organ damage
Provide support	<ul style="list-style-type: none"> • Identify resources available in the facility and community • Be available to discuss concerns with patient and family/SO • Provide additional education as needed
Encourage adherence with antiretroviral therapy (ART) and HIV clinic visits	<ul style="list-style-type: none"> • Review importance of HIV control • Assess proper dosage of ART based on renal dosing
Assess for thrombosis	<ul style="list-style-type: none"> • Evaluate bruit (if applicable)

Conclusion

While the number of HIV infected patients with renal disease has declined after the advent of HIV therapy, the disease continues to be a threat to many patients. Nurses are in an ideal position to monitor for subtle changes because of their close working proximity with patients. Because of the complexity of renal disease, a holistic approach is needed to provide both physical and psychosocial care. Even when patients do not follow their care plan, the nurse can be effective by providing support and advocating for the patient and family.

The keys to good care of an HIV infected patient include:

- Early initiation of ART.
- Identification of patients at risk for renal disease.
- Complete evaluation for renal insufficiency including blood tests, renal ultrasound, and possibly renal biopsy.
- Regular monitoring for changes in renal function.
- Renal dosing of medications as appropriate.
- Blood pressure control.
- Dietary education.
- Abstinence from recreational drug use.

References

- Ahuja, T., Grady, J., & Khan, S. (2002). Changing trends in the survival of dialysis patients with Human Immunodeficiency Virus in the United States. *Journal of the American Society of Nephrologists*, 13, 1889-1893.
- Centers for Disease Control and Prevention. (1986). Recommendations for providing dialysis treatment to patients with Human T-Lymphotropic virus type III/lymphadenopathy-associated virus. *Annals of Internal Medicine*, 105, 558-559.
- Gorski, T., Gorski, Y., & Muney, J. (2002). Complications of hemodialysis access in HIV-positive patients. *The American Surgeon*, 68, 1104-1106.
- Gupta, S., Eustance, J., Winston, J., Boydston, I., Ahuja, T., Rodriguez, R., Tashima, K., Roland, M., Franceschini, N., Palella, F., Lennox, J., Klotman, P., Nachman, S., Hall, S., & Szczech, L. (2005). Guidelines for the management of chronic kidney disease in HIV-infected patients: Recommendations of the HIV Medicine Association of the Infectious Diseases Society of America. *Clinical Infectious Diseases*, 40, 1559-1585.
- Rao, T., Friedman, E., & Nicastrì, A. (1987). The types of renal disease in the Acquired Immunodeficiency Syndrome. *The New England Journal of Medicine*, 316(17), 1062-1067.
- Weiner, N., Goodman, J., & Kimmel, P. (2003). The HIV-associated renal diseases: Current insight into pathogenesis and treatment. *Kidney International*, 63(5), 1618-1631.

Renal Disease in Patients with HIV/AIDS Course Exam

After studying the downloaded course and completing the course exam, you need to enter your answers online. **Answers cannot be graded from this downloadable version of the course.** To enter your answers online, go to e-leaRN's Web site, www.elearnonline.net and click on the Login/My Account button. As a returning student, login using the username and password you created, click on the "Go to Course" link, and proceed to the course exam.

1. The components of the nephrons, that clean the blood of unwanted substances and waste products through urine formation are all the following EXCEPT:
 - A. Glomerulus.
 - B. Tubular system.
 - C. Anterior superior iliac spine.
 - D. Bowman's capsule.

2. The exact pathogenesis of HIV associated renal disease is known to be due to
 - A. HIV-1 directly infecting renal cells.
 - B. Renal cells acting as a reservoir for HIV.
 - C. Diminished glomerular filtration rates and deficiencies of glucosteroids.
 - D. The exact pathogenesis of HIV associated renal disease is NOT known.

3. Prerenal azotemia is a common cause of chronic renal disease in those who are HIV positive as well as those who are HIV negative.
 - A. True.
 - B. False.

4. Acute renal failure (ARF) is a medical emergency characterized by a rapid loss of renal function. Some indications of ARF are all the following EXCEPT:
 - A. Increased BUN and creatinine; anemia.
 - B. Nausea, vomiting, diarrhea.
 - C. Proteinuria, decreased urinary output.
 - D. Hypertension and seizure.

5. In addition to assessing patients for the possibility of acute renal failure, the nurse should also provide the following interventions:
 - A. Monitoring and evaluating vital signs and laboratory testing of blood and urine.
 - B. Assessing patients for evidence of chronic renal failure.
 - C. Providing psychosocial and spiritual support.
 - D. All of the above.

6. The most common causes of chronic renal failure among patients with HIV/AIDS is HIV-associated nephropathy (HIV AN) and HIV-Associated Immune Complex renal Disease (HIV ICD).
 - A. True.
 - B. False.

7. Some signs and symptoms of uremia, which is present during chronic renal failure, include all the following EXCEPT:
- A. Nausea, malnutrition, vomiting.
 - B. Uremic frost, pallor, edema, dry skin.
 - C. Hypotension, motor agitation, restlessness.
 - D. Dyspnea, seizures, congestive heart failure.
8. Among nursing interventions for patients with chronic renal failure are patient teaching regarding dietary information, assessment of the patient for evidence of fluid retention, monitoring for signs/symptoms of anemia, and the provision of emotional support.
- A. True.
 - B. False.
9. Renal transplantation may be considered for HIV infected patients who are in reasonably good health.
- A. True.
 - B. False.
10. Nursing interventions for patients with HIV disease who are undergoing dialysis for chronic renal failure include all the following EXCEPT:
- A. Monitoring for signs and symptoms of infection.
 - B. Monitoring blood pressure and assessing for thrombosis.
 - C. Providing emotional support or providing referrals for support.
 - D. Supporting adherence to antiretroviral therapies and clinic visits.
 - E. All of the above.