

Kidney Transplant

End-stage kidney disease, when the kidneys no longer function, can be treated with a kidney transplant a life-sustaining treatment option other than dialysis. Transplantation can greatly improve the quality of life for a person who is otherwise dependent on dialysis.

The recipient's tissue must be matched with a donor's. Donors for kidney transplantation can be living, non-heart-beating, or cadaver donors. In-depth tissue typing includes assessment of blood type (ABO) compatibility and histocompatibility, including human leukocytic antigen and other minor antigens. Clients receiving a donor kidney from a living, related donor with matching tissue type have the greatest chance of graft survival. Kidneys used from cadaver or non-heart-beating donors must be sufficiently perfused to maintain viability of the organ. The donated kidney is surgically implanted in the client.

INDICATIONS

POTENTIAL DIAGNOSES

INDICATIONS OF END-STAGE KIDNEY DISEASE

- Anuria
- Proteinuria
- Marked azotemia (elevated blood urea nitrogen [BUN] and serum creatinine)
- Severe electrolyte imbalance (hyperkalemia, hyponatremia)
- Fluid volume excess conditions (heart failure, pulmonary edema)
- Uremic lung

CLIENT PRESENTATION

EXPECTED FINDINGS OF END-STAGE KIDNEY DISEASE

- Anorexia
- Fatigue
- Numbness and tingling of extremities
- Shortness of breath
- Dry itchy skin
- Metallic taste in the mouth
- Muscle cramping
- Decreased attention span
- Seizures
- Tremor
- Heart failure
- Edema of hands and feet
- Dyspnea
- Distended jugular veins
- Anemia
- Vomiting
- Pulmonary edema
- Hypertension
- Cardiac dysrhythmias
- Pallor
- Bruising
- Halitosis
- Diminished or dark-colored urine

LABORATORY DATA

- Proteinuria
- Hematuria
- Elevated BUN levels
- Elevated serum creatinine
- Decreased glomerular filtration rate, either estimated from serum or urine creatinine 24 hr values
- Decreased hemoglobin and hematocrit
- Elevated potassium and phosphorus levels
- Sodium within expected reference range, increased, or decreased
- Metabolic acidosis

CONSIDERATIONS

RISK FACTORS

Conditions that increase the risks involved in kidney transplantation surgery, lifelong immunosuppression, and organ rejection

- Age younger than 2 years
- Age older than 70 years: Older adult clients are at risk for developing advanced heart disease and malignancies, which increases the risk for complications with kidney transplantation surgery. Ⓢ
- Advanced, untreatable cardiac disease
- Active cancer
- Chemical dependency
- Chronic infections or systemic diseases (HIV, hepatitis B or C)
- Coagulopathies and certain immune disorders
- Morbid obesity
- Diabetes mellitus
- Chronic pulmonary disease
- Untreated gastrointestinal diseases, such as peptic ulcer disease

PREPROCEDURE

NURSING ACTIONS

- Schedule preoperative laboratory assessments, including blood chemistry studies, CBC and differential, bleeding times, urine culture, blood type, and crossmatch.
- Administer preoperative medications as prescribed.
 - Prophylactic antibiotics
 - Immunosuppressant therapy
 - Methylprednisolone: an anti-inflammatory and immunosuppressant to decrease the immune system response of inflammation and rejection of the donor kidney. **QEBP**
 - Cyclosporine: an immunosuppressant medication to prevent rejection of the donor kidney.
 - Mammalian target of rapamycin (mTOR) inhibitors to interrupt the stimulation of T-cell signals
 - Everolimus: used to prevent activation of B cells and T cells to prevent rejection of the donor kidney
 - Monoclonal antibodies: Basiliximab or daclizumab are antibodies that bind with T cells to reduce T-cell growth and activation at the receptor site to prevent rejection of the donor kidney.
- The client usually receives dialysis within 24 hr of surgery.
- To increase the chance of graft survival, blood from the live kidney donor is often transfused into the client receiving the transplant.

CLIENT EDUCATION

- Prepare the client mentally and emotionally for the procedure.
- Inform the client of the interprofessional transplant team involved in the procedure. This includes nurses, provider, transplant surgeon, anesthesiologists and nephrologists, and clinical nurse specialist and other interprofessional health care workers. **Qpcc**
- Advise the client that compliance with the post-transplant interventions (lifelong immunosuppression) and risk factor reduction (smoking cessation, blood pressure and blood glucose control) are crucial to the success of the transplantation.

INTRAPROCEDURE

NURSING ACTIONS

- Provide padding to the bony prominences to provide comfort and prevent skin breakdown.
- Communicate surgical progress to the client's family members, if available.
- Assist in monitoring urine output and blood loss.
- Document surgical events.
- Assist in arranging postoperative unit placement and communicate postoperative needs of the client.

POSTPROCEDURE

NURSING ACTIONS

- Assess vital signs every 15 min initially and advance to every hour (follow institutional protocol). Maintain blood pressure within prescribed parameters.
- Assess intake and output at least hourly.
 - Urine output should be greater than 30 mL/hr. Notify the provider of oliguria evidenced by urine output less than 30 mL/hr. **Qpcc**
 - Monitor for abrupt decrease in urine output, indicating rejection, tissue injury, thrombosis of the renal artery, or obstruction in the renal system.
 - Assess urine appearance and odor hourly (initially pink and bloody, gradually returning to clear in a few days to several weeks).
 - Monitor daily urinalysis to check for protein, WBCs, RBCs, ketones, glucose, specific gravity, and pH.
- Daily weight assists in monitoring fluid status.
- Monitor for fluid and electrolyte imbalances, such as hypervolemia, hypovolemia, hypokalemia, and hyponatremia.
- Monitor for manifestations of infection, such as dyspnea, fever, incisional drainage, and redness.
- Monitor for early manifestations of organ rejection (fever, hypertension, pain at the transplant site).
- Assess surgical dressing for bloody drainage, which can indicate hemorrhage or hematoma formation.
- Administer intravenous fluids as prescribed, usually calculated to replace hourly urine output.
- Administer oral fluids and discontinue IV fluid once bowel function returns and fluids are tolerated.
- Encourage the client to turn, cough, and deep breathe to prevent atelectasis and pneumonia.
- Provide urinary catheter care.
 - Attach the large indwelling urinary catheter to dependent bedside drainage.
 - Maintain continuous bladder irrigation as prescribed to prevent obstruction from blood clot formation, which can cause damage to the transplanted kidney.
 - Remove the urinary catheter as soon as possible to decrease the risk of infection.
- Intervene for oliguria as prescribed. Diuretics and/or dialysis can be necessary until kidney function is satisfactory.
 - Mannitol, an osmotic diuretic, preserves urine flow and reduces the risk of acute kidney injury. Filtered mannitol draws water into the nephrons of the kidney and promotes diuresis.
 - Thiazides and loop diuretics are less effective when filtration rate is lower causing less diuresis.
- Monitor for excessive diuresis, which can result in hypovolemia and hypotension, and cause reduced blood flow to the graft. Notify the provider immediately.
- Administer immunosuppressive medications to prevent rejection (prednisone, cyclosporines, or other prescribed medication, and monoclonal antibodies [basiliximab or daclizumab]).
- Monitor for complications, such as infection, hypovolemia, and fluid retention.
- Immediately notify the surgeon if any manifestations of organ rejection appear.

- Administer stool softeners to prevent straining and constipation (risk associated with bowel manipulation during abdominal surgery and the effects of general anesthetics and analgesics).
- Arrange for counseling for the client and family if necessary.
- Arrange for post-transplant follow-up appointments and interventions.

CLIENT EDUCATION

- Instruct the client to monitor and report manifestations of infection, such as fever, incisional drainage, and redness.
- Instruct the client to adhere to the pharmacological regimen (corticosteroids, antilymphocyte preparations, cyclosporine, monoclonal antibodies).
- Instruct the client and family about prescribed diet and activity level.

DIET RECOMMENDATIONS

- Low-fat to decrease cholesterol
- High-fiber to avoid constipation
- Increased protein to promote healing, and rebuild and maintain muscle mass
- Adequate intake of potassium, calcium, and phosphorus.
- Restricted sodium intake to prevent fluid retention and hypertension especially when taking prednisone
- Avoidance of concentrated sugars or carbohydrates to control glycemic factors when on prednisone
- Magnesium supplements because cyclosporine can reduce magnesium levels

! Avoid grapefruit, which causes increased cyclosporine blood levels, when taking cyclosporine. **Qs**

ACTIVITY RECOMMENDATIONS

- Avoid contact sports that can cause an injury to the transplanted kidney.
- Increase activity as tolerated.

COMPLICATIONS

Organ rejection

NURSING ACTIONS: Monitor for and report manifestations of rejection immediately.

Hyperacute: Occurs within 48 hr after surgery

- **ETIOLOGY:** An antibody-mediated response causing small blood clots to form in the transplanted kidney that occlude vessels and result in massive cellular destruction. The process is not reversible.
- **FINDINGS:** Fever, hypertension, pain at the transplant site
- **TREATMENT:** Immediate removal of the donor kidney

Acute: Occurs 1 week to 2 years after surgery

- **ETIOLOGY:** An antibody mediated response causing vasculitis in the donor kidney, and cellular destruction starts with inflammation that causes lysis of the donor kidney
- **FINDINGS:** Oliguria, anuria, low-grade fever, hypertension, tenderness over the transplanted kidney, lethargy, azotemia, and fluid retention
- **TREATMENT:** Involves increased doses of immunosuppressive medications

Chronic: Occurs gradually over months to years

- **ETIOLOGY:** Blood vessel injury from overgrowth of the smooth muscles of the blood vessels causing fibrotic tissue to replace normal tissue resulting in a nonfunctioning donor kidney
- **FINDINGS:** Gradual return of azotemia, fluid retention, electrolyte imbalance, and fatigue
- **TREATMENT:** Conservative (monitor kidney status, continue immunosuppressive therapy) until dialysis is required

CLIENT EDUCATION

- Teach the client to monitor for manifestations of rejection and to contact the provider immediately.
- Instruct the client that rejection is diagnosed through a kidney scan and kidney biopsies.
- Instruct the client to adhere to the pharmacological regimen.

Ischemia

A delay in transplanting the donor kidney after harvesting can result in hypoxic injury of the donor kidney.

NURSING ACTIONS

- Monitor urine output, serum creatinine, and BUN levels to detect failure of the transplanted kidney. **Qpcc**
- Report hourly output volumes less than 30 mL/hr.
- Assist the client with dialysis as indicated.
- Prepare the client for a kidney biopsy to distinguish ischemia from organ rejection.

CLIENT EDUCATION: Advise the client that dialysis might be needed until the donor kidney heals.

Renal artery stenosis

Renal artery stenosis is due to scarring of surgical anastomosis.

NURSING ACTIONS

- Monitor for and report hypertension, bruit over artery anastomosis site, and decreased kidney function, such as oliguria and elevated BUN and creatinine. **Qpcc**
- Prepare the client for a kidney scan to verify the status of renal blood flow.
- Angioplasty and/or surgical intervention might be necessary.

CLIENT EDUCATION: Advise the client to monitor for peripheral edema and have blood pressure checked often.

Thrombosis

A blood clot can form in a major vessel of the transplanted kidney.

NURSING ACTIONS

- Monitor for and report a sudden decrease in urine output.
- Prepare the client for emergency surgery requiring an emergency transplant nephrectomy (removal of the transplant kidney).

CLIENT EDUCATION

- Keep the client informed about the risk of a blood clot.
- Advise the client to inform the provider of a sudden decrease in urine output.

Infection

- Infection is a common cause of first-transplant-year morbidity and mortality.
- Detection of early manifestations of infection are difficult when the client receives immunosuppressive therapy. Vague symptoms include low-grade fevers, mild reports of discomfort, and mental status changes.

NURSING ACTIONS

- Give high priority to infection control measures, such as frequent hand hygiene.
- Monitor for and report manifestations of a localized (wound) or systemic infection (pneumonia, sepsis).

CLIENT EDUCATION

- Instruct the client to monitor for and report manifestations of infection, such as fever, incisional drainage, and redness. Later indications of infection can include fatigue and discomfort. Report any manifestations of infection to the provider.
- Educate the client and family about the increased risk for infection during immunosuppressant therapy and infection control measures, such as frequent hand hygiene and avoiding crowds and people who have a communicable disease. The client might need to wear a face mask when out in public.
- Instruct the client to adhere to the pharmacological regimen.

Application Exercises

1. A nurse is assessing a client who has end-stage kidney disease. Which of the following findings should the nurse expect? (Select all that apply.)
 - A. Anuria
 - B. Marked azotemia
 - C. Crackles in the lungs
 - D. Increased calcium level
 - E. Proteinuria
2. A nurse is planning postoperative care for a client following a kidney transplant surgery. Which of the following actions should the nurse include in the plan of care? (Select all that apply.)
 - A. Obtain daily weights.
 - B. Assess dressings for bloody drainage.
 - C. Replace hourly urine output with IV fluids.
 - D. Expect oliguria in the first 4 hr.
 - E. Monitor serum electrolytes.
3. A nurse is teaching a client who is postoperative following a kidney transplant and is taking cyclosporine. Which of the following instructions should the nurse include?
 - A. "Decrease your intake of protein-rich foods."
 - B. "Take this medication with grapefruit juice."
 - C. "Monitor for and report a sore throat to your provider."
 - D. "Expect your skin to turn yellow."
4. A client who is scheduled for kidney transplantation surgery is assessed by the nurse for risk factors of surgery. Which of the following findings increase the client's risk of surgery? (Select all that apply.)
 - A. Age older than 70 years
 - B. BMI of 41
 - C. Administering NPH insulin each morning
 - D. Past history of lymphoma
 - E. Blood pressure averaging 120/70 mm Hg
5. A nurse is preoperative teaching with a client who is scheduled for a kidney transplant about rejection of a transplanted kidney. Which of the following statements should the nurse include in the teaching? (Select all that apply.)
 - A. "Expect an immediate removal of the donor kidney for a hyperacute rejection."
 - B. "You may need to begin dialysis to monitor your kidney function for a hyperacute rejection."
 - C. "A fever is a manifestation of an acute rejection."
 - D. "Fluid retention is a manifestation of an acute rejection."
 - E. "Your provider will increase your immunosuppressive medications for a chronic rejection."

PRACTICE Active Learning Scenario

A nurse is planning catheter care for a client who is postoperative following kidney transplantation surgery. To maintain indwelling urinary catheter patency and avoid complications, What actions should the nurse take?

Use the ATI Active Learning Template: Nursing Skill to complete this item.

INDICATIONS: List two reasons for an indwelling urinary catheter.

POTENTIAL COMPLICATIONS: Indicate three risk factors.

NURSING INTERVENTIONS: List three postoperative actions.

Application Exercises Key

1. A. **CORRECT:** Anuria is a manifestation of end-stage kidney disease.
B. **CORRECT:** Marked azotemia is elevated BUN and serum creatinine, is a manifestation of end-stage kidney disease.
C. **CORRECT:** Crackles in the lungs can indicate the client has pulmonary edema, caused from hypervolemia due to end-stage kidney disease.
D. Calcium levels are decreased due to increase in serum phosphate levels when the client has end-stage kidney disease.
E. **CORRECT:** Proteinuria is a manifestation of end-stage kidney disease.
 **NCLEX® Connection:** Physiological Adaptation, Pathophysiology
2. A. **CORRECT:** Daily weights are obtained to assess fluid status.
B. **CORRECT:** Drainage on the dressing is assessed to monitor for hemorrhage or hematoma.
C. **CORRECT:** Hourly urine output with IV fluid replacement is monitored to detect abrupt decrease in urine output, which can indicate rejection or other serious conditions of the transplant kidney.
D. Oliguria can indicate ischemia, acute kidney injury, rejection, or hypovolemia. Report oliguria immediately to the provider.
E. **CORRECT:** Serum electrolytes is monitored because electrolytes loss can occur with postoperative diuresis.
 **NCLEX® Connection:** Physiological Adaptation, Illness Management
3. A. The client should not decrease protein-rich foods in the diet, which promote healing and rebuilds muscle. There are no restrictions of protein intake for a client taking cyclosporine following a kidney transplant.
B. The client should not drink grapefruit juice, which can reduce cyclosporine metabolism and cause increased cyclosporine levels.
C. **CORRECT:** The client should report any manifestations of an infection because this medication causes immunosuppression.
D. The client should report manifestations of hepatotoxicity, such as jaundice, and abdominal pain.
 **NCLEX® Connection:** Pharmacological and Parenteral Therapies, Medication Administration
4. A. **CORRECT:** A client older than 70 years has an increased risk for complications from surgery, lifelong immunosuppression, and organ rejection.
B. **CORRECT:** A client who has a BMI of 41 is morbidly obese and is at an increased risk for complications of surgery, lifelong immunosuppression, and organ rejection.
C. **CORRECT:** A client who requires NPH insulin for type 1 diabetes mellitus is at an increased risk from complication of surgery, lifelong immunosuppression, and organ rejection.
D. **CORRECT:** A client who has a history of cancer, such as lymphoma, is at an increased risk for complications of surgery, lifelong immunosuppression, and organ rejection.
E. Blood pressure averaging 120/70 mm Hg is within the expected reference range does not place the client at a greater risk for complication of surgery, lifelong immunosuppression, and organ rejection.
 **NCLEX® Connection:** Health Promotion and Maintenance, Health Promotion/Disease Prevention
5. A. **CORRECT:** Immediate removal of the donor kidney is treatment for hyperacute rejection.
B. Dialysis can be required as a conservative treatment to monitor the client's kidney function for the progression of chronic kidney failure following kidney transplant.
C. **CORRECT:** Fever is a manifestation of an acute rejection.
D. **CORRECT:** Fluid retention is a manifestation of an acute rejection.
E. Immunosuppressants are increased to treat an acute rejection.
 **NCLEX® Connection:** Reduction of Risk Potential, System Specific Assessments

PRACTICE Answer

Using the ATI Active Learning Template: Nursing Skill

INDICATIONS

- Monitor hourly urinary output.
- Monitor color of urine and clots.

POTENTIAL COMPLICATIONS

- Oliguria
- Infection from an indwelling urinary catheter
- Blood clot formation

NURSING INTERVENTIONS

- Regulate IV fluids according to urinary output, as prescribed.
- Connect the indwelling urinary catheter to the bed lower than the client to promote gravity drainage.
- Remove the indwelling urinary catheter within a few days postprocedure.
- Implement continuous bladder irrigation as prescribed to remove blood clots that can obstruct the indwelling urinary catheter and cause damage to the donor kidney.

 **NCLEX® Connection:** Reduction of Risk Potential, Potential for Complications of Diagnostic Tests/Treatments/Procedures