it can be added to the dialysate to diffuse into the blood. Excess water is removed by creating a higher hydrostatic pressure of the blood moving through the dialyzer than of the dialysate, which flows in the opposite direction. This process is known as ultrafiltration.

Initially, clients with ARF typically undergo daily hemodialysis, then three to four sessions per week as indicated. Hemodialysis is not used if the client is hemodynamically unstable (e.g., with hypotension or low cardiac output). Following are complications associated with hemodialysis.

- Hypotension, the most frequent complication during hemodialysis, is related to changes in serum osmolality, rapid removal of fluid from the vascular compartment, vasodilation, and other factors.
- Bleeding is related to altered platelet function associated with uremia and the use of heparin during dialysis.
- Infection (local or systemic) is related to WBC damage and immune system suppression. *Staphylococcus aureus* septicemia is commonly associated with contamination of the vascular access site. Clients on chronic hemodialysis have higher rates of hepatitis B, hepatitis C, cytomegalovirus, and HIV infection than the general population.

See p. 000 for nursing care for the client undergoing hemodialysis.

**Continuous Renal Replacement Therapy**

Clients with acute renal failure may be unable to tolerate hemodialysis and rapid fluid removal if their cardiovascular status is unstable (e.g., due to trauma, major surgery, heart failure). Continuous renal replacement therapy (CRRT), which allows more gradual fluid and solute removal, is often used for these clients. In CRRT, blood is continuously circulated from an artery to a vein or a vein to a vein through a highly porous hemofilter for a period of 12 or more hours. Excess water and solutes such as electrolytes, urea, creatinine, uric acid, and glucose drain into a collection device. Fluid may be replaced with normal saline or a balanced electrolyte solution as needed during CRRT (Figure 27-7). This slower process allows more gradual fluid and solute removal, often is used for these clients. In CRRT, blood is continuously circulated from an artery to a vein or a vein to a vein through a highly porous hemofilter for a period of 12 or more hours. Excess water and solutes such as electrolytes, urea, creatinine, uric acid, and glucose drain into a collection device. Fluid may be replaced with normal saline or a balanced electrolyte solution as needed during CRRT (Figure 27-7).

**NURSING CARE OF THE CLIENT UNDERGOING HEMODIALYSIS**

**PREDIALYSIS CARE**

- Assess vital signs, including orthostatic blood pressures (lying, sitting, and standing), apical pulse, respirations, and lung sounds. These data provide baseline information to help evaluate the effects of hemodialysis. Hypertension may indicate excess fluid volume. The client who is hypotensive may not tolerate rapid fluid volume changes during dialysis. Abnormal heart sounds (e.g., a gallop or murmur) and changes in heart rate or rhythm may indicate excess fluid volume or electrolyte imbalance. Fluid overload may also cause dyspnea, tachypnea, and rales or crackles in the lungs.
- Record weight. Weight changes are an effective indicator of fluid volume.
- Assess vascular access site for a palpable pulsation or vibration and an audible bruit and for inflammation. Infection and thrombus formation are the most common problems affecting the access site in hemodialysis clients.
- Alert all personnel to avoid using the extremity with the vascular access site (or the nondominant arm, if long-term access has not been established) for blood pressures or venipuncture. These procedures may damage vessels and lead to failure of the AV fistula.

**POSTDIALYSIS CARE**

- Assess and document vital signs, weight, and vascular access site condition. Rapid fluid and solute removal during dialysis may lead to orthostatic hypotension, cardiopulmonary changes, and weight loss.
- Monitor BUN, serum creatinine, serum electrolyte, and hematocrit levels between dialysis treatments. These values help determine the effectiveness of the treatment, the need for fluid and diet restrictions, and the timing of future dialysis sessions. The anemia associated with renal failure does not improve with dialysis, and iron and folate supplements or periodic blood transfusions may be needed.
- Assess for dialysis disequilibrium syndrome, with headache, nausea and vomiting, altered level of consciousness; and hypertension. Rapid changes in BUN, pH, and electrolyte levels during dialysis may lead to cerebral edema and increased intracranial pressure.
- Assess for other adverse responses to dialysis, such as dehydration, nausea and vomiting, muscle cramps, or seizure activity. Treat as ordered. Excess fluid removal and rapid changes in electrolyte balance can cause fluid deficit, nausea, vomiting, and seizure activity.
- Assess for bleeding at the access site or elsewhere. Use standard precautions at all times. Renal failure and heparinization during dialysis increase the risk for bleeding. Frequent exposure to blood and blood products increase the risk for hepatitis B or C or other bloodborne diseases.
- If a transfusion is given during dialysis, monitor for possible transfusion reaction (e.g., chills and fever; dyspnea; chest, back, or arm pain; and urticaria or itching). Clients in renal failure may receive multiple transfusions, increasing the risk of transfusion reaction. Close monitoring during and after the transfusion is important to identify early signs of a reaction.
- Provide psychologic support and listen actively. Address concerns and accept responses such as anger, depression, and noncompliance. Reinforce client and family strengths in coping with renal failure and hemodialysis. Grieving is a normal response to loss of organ function. The client may feel hopeless or helpless and resent dependence on a machine. The nurse can help the client and family work through these responses and focus on positive aspects of living.
- Refer to social services and counseling as indicated. Clients with renal failure may need additional support services to help them adapt to and live with their disease.