

Dialysis & Kidney Transplant

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❖ Definition

- Helps sustain life
- Movement of fluid/molecules across a semipermeable membrane
- Acts as the kidney function
- Two types: hemodialysis and peritoneal

❖ Functions of Dialysis

- Rids body: excess fluid and electrolytes
- Acid-base balance
- Eliminates waste
- Homeostasis: osmosis, diffusion, and ultrafiltration
- **Diffusion:** \wedge to \vee
- **Osmosis:** \vee to \wedge
- **Ultrafiltration:** water and fluid removal; either pushing solutes through via **pressure or pulling** with a gradient across the membrane

❖ Hemodialysis

- Uses dialyzer and vascular access (AV fistula)
- Shunting blood from patient → dialyzer → circulation
- 3-5 times per week; 3-5 hr sessions
- One needle into an artery, one into a vein
- Potential Patients:
 - Renal insufficiency
 - AKI
 - CKD
 - Drug Toxicity
 - Persistent hyperkalemia
 - Hypervolemia not responsive to diuretics
 - Uremia
 - GFR <15 mL/hr (WNL:)
 - Clinical manifestations: volume changes, imbalances, fluid overload, neurological changes, bleeding, uremia
- Pre-Procedure: HD
 - Consent
 - Patency: Temporary vs. Permanent access (ash cath for emergent dialysis)
 - Bruit/thrill, pulses
 - VS, Lab values, weight (determines how much to remove)
 - Hold certain medications until after procedure

- During Procedure: HD
 - Monitor: complications
 - clot, air bubbles, temperature of dialysate, regulation of ultrafiltration
 - hypotension, cramping, vomiting, bleeding at access site, contamination
 - Monitor: VS
 - Monitor: Coagulation studies (bleeding, administer anticoag's)
 - Monitor: *Headache, nausea, or dizziness during*

- Post Hemodialysis
 - Monitor: VS
 - Monitor: Lab values
 - Monitor: Weight (1 L fluid = 1 kg)
 - Monitor: Complications (all listed above and below)
 - No invasive procedures 4 to 6 hrs post
 - Medications & Supplements – folate & protein (diet)
 - Activity restrictions: no heavy lifting, no constriction, no sleeping on top of extremity, hand exercises

- Complications:

advanced age, chronic illnesses, fragile veins – all risk for access site complications

- Clotting/Bleeding/Infection

Nursing Actions: aseptic technique, avoid compression, administer anticoag's, assess fistula, assess s/sx of infection

- Disequilibrium Syndrome: cerebral edema and increased ICP

Nursing Actions: slow dialysis exchange rate; administer anticonvulsants or barbiturates

- Hypotension: depletion and antiHTN's

Nursing Actions: replace fluids with IVF or colloid; slow rate; lower HOB

- Anemia: less folate & less erythropoietin

Nursing Actions: H/H, administer erythropoietin, transfuse products

- ID: HIV, Hep. B & C

Nursing Actions: sterile equipment, skin asepsis, standard precautions

- Steal Syndrome: decreased blood flow below fistula → ischemia, gangrene

Nursing Actions: assess circulation below fistula site; Tie off fistula & create new one

❖ **Peritoneal Dialysis**

- Instilling hypertonic dialysate solution into peritoneal cavity
 - Dwell Times
 - Peritoneum = filtration membrane
 - Requires intact membrane (no adhesions, no infection, no multiple surgeries)
- Candidates: (other than AKI, ESKD, & Uremia)
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- Pre-procedure: PD
- Assess weight, VS, electrolytes, BUN/Cr, glucose
 - Self-administration vs. assistance – MS, sterile, past experiences, understanding, ability
 - Types: CAPD, CCPD, APD
 - CAPD: continuous ambulatory peritoneal dialysis – 7 days/week for 4-8 hrs
 - CCPD: continuous-cycle peritoneal dialysis – 24 hr exchange, at night, final exchange left in to dwell during the day
 - APD: automated peritoneal dialysis – 30 min exchange repeated over 8-10 hrs while sleeping
 - Warm solution (prevents hypothermia and increases rate of diffusion)
 - Asepsis
 - Know and adhere to: Infusion, dwell, and outflow times: Exchange
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- During Procedure: PD
- Monitor VS
 - Monitor glucose level (dialysate = hypertonic solution = glucose)
 - Compare: Inflow and Outflow
 - Outflow- Equal or exceed amount of inflow
 - Assess Color
 - Clear, light yellow
 - S/sx of Infection
 - Fever, bloody cloudy frothy dialysate return, drainage at site
 - Assess Access Site – leaks, infection
 - Inflow, dwell, and outflow times
 - Inflow- about 10 minutes, close clamps, decrease flow if pain
 - Dwell- duration varies, depends on method
 - Drain- lasts 15-20 minutes, gently massage, 1st exchange may be pink or slightly bloody
 - Outflow bag- gravity
 - Milking catheter – fibrin

- Post-Procedure: PD
 - Monitor: weight, glucose, electrolytes, BUN/Cr
 - Client teaching:
 - vitamins & minerals
 - body image
 - Monitor: complications
 - Peritonitis – cloudy effluent; maintain asepsis; monitor s/sx
 - Site Infection – caused by fluid leaks, can lead to peritonitis; maintain asepsis, assess site, assess s/sx
 - Protein Loss – removed during exchange; monitor albumin; increase dietary intake
 - Hyperglycemia/Hyperlipidemia – from dialysate, blood absorbs too much; hyperlipidemia (occurs over time, causes HTN); monitor glucose, triglycerides, administer insulin, diet teaching, administer antihypertensive 's
 - Hypovolemia – monitor s/sx
 - Poor Inflow & Outflow – check tubing; causes: constipation, position, clot, displacement; prevent causes, lie supine with head slightly elevated
 - Hernias & Adhesions
 - Pulmonary – bronchitis, atelectasis, PNA, pulmonary distress
 - Bleeding

- Effectiveness & Adaptation
 - Short training program
 - Independence
 - Ease of traveling
 - Fewer dietary restrictions
 - Greater mobility than with HD

- Advantages:
 - Instituted immediately in almost any hospital
 - Technique less complex
 - Vascular access problems
 - Fluid/electrolyte changes gradually
 - Home dialysis is possible
 - Immediate life threatening events less likely to occur

- o Less expensive
- Disadvantages:
 - o Slower means of tx
 - o Peritonitis
 - o Protein loss into dialysate
 - o Abd surgery, ileus, bowel perf's are contraindications to use
 - o Crowding of organs

Kidney Transplant

- Indications:
 - o ESKD
 - Anuria
 - Proteinuria
 - Azotemia
 - Severe electrolyte imbalances
 - Excess fluid volume
 - Uremic lung
- Donors/Recipients
 - o Living: relatives, altruistic, paired donor
 - o Deceased: irreversible brain damage, brain dead
 - o Donor & Recipient: histocompatibility; using plasmapheresis and immunosuppression- reduced need for histocompatibility
 - o Candidacy determined by a variety of factors that vary among transplant centers
 - o Contraindications
 - Disseminated malignancies, untx cardiac disease, chronic respiratory failure, extensive vascular disease, chronic infection, unresolved psychosocial disorders
- Expected Findings of ESKD
 - o Anorexia, Fatigue
 - o N/T
 - o SOB
 - o Pruritus
 - o Metallic taste

- o Muscle cramping
 - o Seizures, Tremors
 - o HF
 - o Edema
 - o Dyspnea, Pulmonary edema
 - o Htn
 - o Dysrhythmias
 - o Pallor
 - o Bruising
 - o Halitosis
 - o Diminished or dark urine
- Laboratory Data
 - o Proteinuria
 - o Hematuria
 - o High BUN/Cr
 - o Low GFR/Urine creatinine clearance
 - o Low H/H
 - o High K+ & phos
 - o Na+ WNL, Low, or High
 - o Metabolic Acidosis
- Conditions that increase the risks involved:
 - o < 2 yrs of age
 - o > 70 yrs of age
 - o Advanced, untx cardiac disease
 - o Active cancer
 - o Chemical dependency
 - o Chronic infections or systemic diseases (HIV, hep B or C)
 - o Coagulopathies and certain immune disorders
 - o Morbid obesity
 - o DM
 - o Untx GI diseases
- Pre-procedure
 - o Blood transfusion from living donor
 - o Dialysis within 24 hrs of surgery
 - o Pre-operative medications
 - Antibiotics

- Corticosteroids
 - Cyclosporine, azathioprine & others (immunosuppressant)
 - Monoclonal antibodies: daclizumab (helps prevent rejection)
- Patient Teaching
 - Preparation
 - Adherence to post-transplant interventions
- Procedure
 - Live Donor
 - Donor prepared near recipient (if able)
 - Donor's surgery begins 1-2 hrs before recipient's surgery
 - May need to remove a rib from donor, takes about 3 hrs
 - Mostly done laparoscopic
 - Usually more pain than recipient
 - Recipient
 - Catheter placed, antibiotic solution instilled
 - Crescent-shaped incision
 - Right iliac fossa preferred
 - Will keep old kidney
 - Donor artery/vein anastomosed to recipient's iliac artery/vein
 - Donor ureter tunneled into bladder
- Post-Procedure
 - Assess: Vital signs
 - I&O: hourly, >30ml/hr; decrease may indicate:
 - Urine appearance and odor: hourly; initially pink/bloody eventually clear
 - Daily UA: ketones, protein, WBC RBC glucose specific gravity and pH
 - Daily weights
 - Fluid/Electrolytes: hypervolemia, hypovolemia, hypokalemia hyponatremia
 - Assess: Infection: dyspnea, fever, incision drainage, redness
 - S/sx of Rejection: HTN, pain
 - Assess: Incision

- o IVF/oral fluids: oral after NPO status changed
 - o Urinary catheter care: CBI
 - o Diuretics: only for oliguria; diuretics and/or dialysis may be needed; mannitol*, thiazide and loop diuretics less effective
 - o Excessive diuresis: hypovolemia, hypotension, and reduced blood flow to graft
 - o Immunosuppressive' s: prevent rejection
 - o Assess: complications (hypovolemia, infection, fluid retention)
 - o Stool softener: prevent constipation
- Teaching
- o Monitor/report s/sx infection
 - o Adhere to medication regimen
 - o Turn, CDB
 - o Diet:
 - Low-fat, high fiber, high protein, electrolyte replenishment, sodium restriction, avoid carbs, magnesium supplements, avoid grapefruit
 - o Activity restrictions:
 - No contact sports
 - Increase activity as tolerated
- Complications
- o **Organ rejection:** kidney scan and biopsy
 - **Hyperacute:** within 48 hrs; antibody mediated response, small clots form in the new kidney and occlude vessels
 - increase temp; increase bp; pain at transplant site
 - removal of transplanted kidney immediately
 - **Acute:** 1 week to 2 years; Most common in 1st 2 weeks post op; inflammation within the cells of the kidney that causes lysis of the new kidney
 - oliguria or anuria; temp >100 °; HTN; enlarged/tender kidney; lethargy; increase NUN/Cr; high K+; fluid retention
 - increase dose of immunosuppressive meds
 - **Chronic:** over months and years; is irreversible, fibrotic tissue replaces normal tissue and kidney does not function
 - gradual elevated BUN/Cr; fluid retention; lyte changes; fatigue

- conservative management (immunosuppressive ‘s and monitoring) until need dialysis
 - Patients with chronic rejection should be put on the transplant list in the hope that they can undergo repeat transplantation before dialysis is required.
- **Ischemia:** delay in transplanting; hypoxia
 - monitor I&O, BUN/Cr, hourly outputs; may need dialysis
- **Renal Artery Stenosis:** scarring of anastomosis
 - monitor: BP, for renal artery bruit, BUN/Cr, oliguria; may need angioplasty- assess for blood flow
- **Thrombosis:** report sudden decrease in UO; emergent nephrectomy of new kidney
- **Infection:** common cause of first-transplant-year morbidity and mortality; difficult to assess (immunosuppressive)- mild manifestations (low grade fever, fatigue, discomfort, mental status changes)
 - PNA, wound, IV line, drain site, UTI
 - Fungal – prophylactic antifungals (fluconazole/Diflucan)
 - Viral – CMV, Epstein-Barr; antiviral prophylaxis
 - infection control measures
- Following a transplant...
 - R/F CV disease (atherosclerotic vascular disease)
 - Leading cause of mortality following transplant
 - Control cholesterol, triglycerides, glucose, BP, and weight
 - R/F malignancies
 - Primary cause: immunosuppressant’s
 - Stress regular screening, preventive care
 - R/F original renal disease occurrence
 - Diabetes mellitus, glomerulonephritis
 - R/F corticosteroid-related complications
 - Avascular necrosis, PUD, Glucose intolerance, dyslipidemia, cataracts, infection/malignancy
 - Tacrolimus and cyclosporine : decrease steroid use