Renal

Function of the kidney

A: acid base balance
W: water removal
  : erythropoietin
T: toxin removal

B: blood pressure control
E: electrolyte balance
D: vitamin D activation

Diagnostic tests

Serum creatinine: measure the amount of creatinine in the serum (plasma) an end product of protein and muscle metabolism.
Normal range: 0.07-1.4
Measures: reflects glomerular filtration rate. Serum creatinine level increases when at least 50% of kidney function is lost. Kidney disease is the only thing that will cause increase of creatinine

B.U.N: measures the amount of nitrogenous waste. Increased BUN but normal creatinine signals dehydration (burnt buns). When bun and serum creatinine are both elevated this suggests renal dysfunction.

Urinalysis: a urine test for evaluation of the renal system and renal disease
Interventions: obtain a mid stream clean catch. 10-15 ml of first morning void. Do not refrigerate. Notes WBC count RBC protein, Tests to detect protein, glucose, and ketone bodies in the urine (proteinuria, renal glycosuria, and ketonuria, respectively) *Urine color
  • Urine clarity and odor • Urine pH and specific gravity

24 hour urine collection: measures over a 24 hour period. Discard first void and collect after that.

Specific gravity: a urine test that measures the kidneys ability to concentrate urine
Interventions: normal range is 1.010-1.020. And increase in specific gravity occurs with dehydration. A decrease in specific gravity is indicative of fluid volume excess or SIADH. Radio graphic dye, glucose, proteins can interfere with results

Urine culture and sensitivity: identifies the presences of micro organisms and what they are either sensitive/ resistant to
Interventions: clean catch mid stream in sterile

Creatinine clearance: measures how well creatinine removes waste from the blood. Blood sample and timed urine specimens. Provides the best estimate of GFR.
Interventions: encourage fluids before, during, and after the test. Avoid caffeine. Inquire about administering meds with PCP. Keep specimen on ice, get final sample from foley bag if applicable.
**Intravenous topography:**

X-ray procedure in which an intravenous injection of radiopaque dye is administered to visualize and abnormalities in the renal system.

**Pre procedure:** assess for iodine/shellfish allergy. NPO after midnight, administer laxatives if ordered. Inform the client about possible Throat irritation, flushing of the face, warmths, salty/metallic taste.

**Post procedure:** Vitals are vital, drink at least 1L of fluid unless contraindicated, assess veinapuncture site for bleeding, monitor output, monitor for allergic reactions, dye is damaging to kidneys risk is greater in older adults and those with dehydration. Dye can be (nephrotoxic)

**Assessment for fluid status of a patient:** strict I&O (is intake and output equal), daily weight(are they gaining or losing 500 ml =1 lb), blood pressure(are they hypertensive?)

**Education for an elderly patient:** elderly have decreased kidney fx, wipe front to back, comply with medication regimens, monitor diabetes and keep controlled, no smoking, no drinking.
**Chronic Kidney Disease**
- Slow progressive irreversible loss of kidney function.
- GFR less than 60 ml/min for 3 months
- It results in stage kidney disease along with azotemia / uremia
- Hypervolemia may occur due to kidneys inability to excrete sodium / hypovolemia due to inability to conserve sodium.

**Risk Factors**
- may follow acute kidney injury
  - diabetes and metabolic disorders #1 cause
  - Hypertension ( uncontrolled)
  - Chronic urinary obstruction
  - Recurrent infections ( glomerular nephritis from strep A) this why pts should finish antibiotics
  - Renal artery occlusion
  - Auto immune disorders

**Assessment**
- manifestations of CKD : s/sx of electrolytes imbalance
- kussmals breathing ,crackles, pericardial effusion, peripheral edema
  - tacypnea
  - Vital signs are vital! EKG could show peaked T waves which indicates hyperkalemia
  - Anemia can occur from decreased rbc production / EPO, monitor H&H /administer folic acid/
  - High carb, low potassium/low phosphorus
  - Provide oral care to prevent stomatitis
  - Educate about fluid and diet restriction
Acute kidney injury

-Precipitated by an event, rapid loss of kidney fx from renal cell damage. Abrupt, and can be reversible.

- leads to cell hypofusion, cell death, renal failure.
- Prognosis depends on the cause and condition of the client
- Normal/near normal kidney fx may resume gradually

Causes
Prerenal: outside kidney, intravascular volume depletion, dehydration, decreased cardiac output, decreased peripheral vascular disease, prerenal infection or obstruction

Intrarenal: inside the kidney (nephrons are dying), intrarenal infection, obstruction, nephrotoxicity (mycin drugs, NSAIDS)

Post renal: between the kidney and urethral meatus, bladder neck obstruction, BPH, bladder cancer, calculi, post renal infection.

Phases:
Oliguria: sudden decrease in urine, lasts 8-15 days. The longer this phase the least likely recovery becomes. Scanty urine less than 400ml/day.

- Fluid volume excesss: HTN, Edema, pleural and pericardial effusion, dysrythmia and HF, friction rub / chest pain / low grade fever
- Uremia, anorexia, N.V puritits.
- Metabolic acidosis: kussmals
- Neuro: tingling, drowsiness

Interventions: restrict fluids if HTN is present, administer meds as prescribed (lasix) to increase renal blood flow and diuresis

Diuresis: urine output rises slowly followed by diuresis 4-5L day

- Excessive urine output indicates the damaged nephrons are recovering b/c they are excreting waste.
- Watch for dehydration, tachycardia, hypotension, hypovolemia.
- LOC improves
- Administer IV fluids as prescribed which may help balance electrolytes

Recovery Phase: slow, may take up to 2 years

- Urine vol returns to normal, memory improves, strength ^, older adults have a harder time recovering, AKI can progress to chronic kidney disease.

Assessment: monitor vitals, monitor I&O, monitor changes in bun and creatinine. Restrict potassium, restrict diet LOW protein, auscultate lungs for FVE.
**Dialysis**

**Hemodialysis:**
"washing machines are broken, now your at the laundromat" Process of cleaning the blood and removing waste such as BUN, Creatine, Nitrogen. Removes excess body fluids (weigh pt before and after dialysis) and corrects electrolyte levels in the body.

**Interventions:** monitor vitals, temp may be elevated (contact HCP if temp is excessive sign is sepsis), monitor labs, assess access device (bruit or thrill), hold antihypertensives as they can cause the patient to bottom out because they may already be hypovolemic.

Do not ever flush dialysis shunt!!

**Av shunt:** teach the patient to flex hands to strengthen, it takes 6 weeks for the shunt to be useful, monitor for clotting (lack of bruit or thrill) swelling is a sign of ischemia, assess lung and heart sounds for HF,

**Complications of Dialysis:**
AIR EMBOLUS: dyspnea, tachypnea, chest pain, hypotension, reduced o2 saturation, cyanosis, anxiety, loc changes.

**Interventions:** stop the dialysis, turn the client to the left w/head down, notify HCP, assess vitals, document.

**Disequilibrium syndrome:** rapid change in composition of ECF Nausea, vomiting, headache, HTN, restlessness, muscle cramps, confusion, seizures.

**Interventions:** slow/stop dialysis, call HCP, prepare to administer hypertonic sailne, prepare to dialysis for s shorter period of time.

**Peritoneal dialysis**
A shunt is placed into the peritoneum with a hypertonic solution daily. The solution attracts the fluid and gets drained
- usually 1 liter in and 2 liters out
- Pts are at increased risk for inception due to having it done often 1x daily up to 5x
- Look for cloudy or smelly fluid, abdominal tenderness, malaise, N,V, sign of infection (peritonitis) if present get a sample for culture and sensitivity.
- Weigh before and after
- Continuous cycling usually consists of 3 cycles at night, and an 8hr dwell in the AM
- Give fiber/stool softener with fluids
- Troubleshoot if blocked (look for kinks)
**KIDNEY TRANSPLANT**

- performed for irreversible kidney failure
- recipient must take immunosuppressants to prevent rejection
- assess renal fx studies
- hemodialysis 24h before transplant
  - administer osmotic diuretics
  - Monitor vitals and daily weights
  - Report urine output less than 100 ml/h
  - Urine is pink and bloody at first then turns normal in a few days

**Transplant rejection**

**Hyperacute**: occurs at time of anastomoses of organ./ remove immediately

**Acute**: most common, usually within 6 weeks, can occur anytime  
**Interventions**: potentially reversible w/ increased immunosuppressants early, high doses of cortico steroids, or monoclonal antibodies,

**Chronic rejection**: slowly, months to years, mimicks Chhronic kidney disease,  
**Interventions**: Immunosuppressive medications
**Glomerulonephritis**

Inflammatory injury to the glomerulus
Usually systemic caused by Strep or pharyngitis
**Acute**: Occurs 2-3 weeks after strep infection
**Chronic**: slowly over time or post acute phase

**Complications**: kidney failure, Hypertensive encephalopathy, pulmonary edema, Heart failure

**Assessment**: peri orbital and facial edema, edema, fever, hematuria, ^BUN^ CREATINE, azotemia, proteinuria, foamy urine,

**Nursing management**: give antibiotics educate the pt to finish them, protect the kidney with ACE/ARB/DIURETICS limit intake, monitor I&O, restrict sodium, ^vitamis/iron

**Polycystic kidney disease**

Cyst formation and hypertrophy of the kidney/ prepare for drainage
No treatment
Genetic
The result is chronic kidney disease
Often no symptoms until 30-40 yrs, lumbar/flank/abdominal pain that worsens with activity, fever, chills, recurrent UTI, hematuria, pyuria, calculi, HTN, palpable abdominal masses.

**Renal and urinary cancer**

Risk factors:
Bladder
Cigarette smoking—risk proportional to pack-years of smoking
• Exposure to environmental carcinogens—dyes, rubber, leather, ink, or paint
• Recurrent or chronic bacterial infection of the urinary tract
• Bladder stones
• High urinary pH
• High cholesterol intake
• Pelvic radiation therapy
• Cancers arising from the prostate, colon, and rectum in male

Renal
Gender—affects men more than women
• Tobacco use
• Occupational exposure to industrial chemicals, such as petroleum products, heavy metals, and asbestos
• Obesity
• Unopposed estrogen therapy
• Polycystic kidney disease

**Complications of kidney trauma**

Acute Kidney Injury

Bleeding

Early postoperative complications (within 6 months) include rebleeding, perinephritic abscess formation, sepsis, urine extravasation, and fistula formation. Other complications include stone formation, infection, cysts, vascular aneurysms, and loss of renal function. Hypertension can be a complication of any surgery but usually is a late complication of kidney injury.

**Nursing management of patients with Nephrectomy**

- performed for partial or total kidney damage
- monitor the incision for infection and placement of tubes
- protect the skin from urinary drainage
- place an ostomy pouch over the pen rose drain
  - do not irrigate
  - Encourage fluid intake

**Urinary tract infection (cystitis)**

Inflammation of the bladder from an infection

Most common causative organism is E.coli being introduced into the urethra

Women are more at risk/ especially pregnant women

Older adults are more at risk due to decreased kidney fx and dehydration they may show confusion as the first sign of a UTI.

**Assessment**

Frequency, urgency, pain, burning, abdominal discomfort, hematuria, dysuria, WBC greater than 100000, elevated specific gravity and PH.

**Intervention:** obtain a urine specimen for C&S before giving antibiotics, have the pt finish the antibiotics, increase fluids 3000ml/day, acid ash diet, sitz bath, provide meticulous peri care, discourage caffeine.

**Education:** Avoid alcohol, finish meds, repeats urine culture,
Kidney/bladder stones

Urolithiasis: urinary calculi, formed in the ureters

Nephrolithiasis: kidney calculi, formed in the parenchyma of the kidney

Manifestations: calculi occluded the ureter and causes hydroureter. Urinary stasis, impairment of renal fx, hydronephrosis, and kidney damage may occur if not treated.

Causes: family HX, high calcium diet, ^protien, ^oxilate and purines., obstruction/urinary stasis, dehydration, diuretics, UTI, prolonged urinary catheterization, hypecalcemia, hyperparathyroidism, elevated Uris acid levels "gout"

Assessment: renal colic, sharp sever sudden onset of pain, dull aching kidney pain, Nausea, vomiting, pallor, diaphoresis, urinary frequency, low grade fever, high RBC count in urine, bacteria noted.

Education: encourage ambulation, increase fluids, no coffee, decrease calcium intake, decrease purine intake, decrease oxalate.

Lithotripsy

Monitor vitals, monitor I&O, monitor for bleeding, monitor for pain and urinary obstruction.

50-100 NCLEX questions
Play list

Renal play list
https://youtu.be/sMVmJEShdUY
https://youtu.be/kbQZfiwaUK0
https://youtu.be/eQbPhknGdDE
https://youtu.be/3xqF6qfwwCA
https://youtu.be/XXxPPID5ge4
https://youtu.be/Ni_LO8xaVTE
https://youtu.be/Ydzo0ypudQM
https://youtu.be/ngV2uYQq7Ss
https://youtu.be/xhZAL90UfgM
https://youtu.be/YsuqVaNU580
https://youtu.be/-qrW6EZWKZM
https://youtu.be/5cfph1VVL5Y
https://youtu.be/iYy7heyog0Q
https://youtu.be/iXas7uColjg
https://youtu.be/cTzYLAsiFBI
https://youtu.be/3y2xhX_IdGs
https://youtu.be/Lzq4XxAf79I