Nephrology

- Acute Renal Failure
- Chronic Renal Failure
- Indications for Dialysis

Acute Renal Failure

What is AKI?

According to The Kidney Disease: Improving Global Outcomes (KDIGO), which it the most current and preferred definition, it is:

an increase in serum creatinine of ≥0.3 mg/dL within 48 hours OR an increase in serum creatinine of ≥50% within 7 days OR Urine output of <0.5 mL/kg/hour for >6 hours

Etiology:

1)Prerenal: Decreased renal perfusion (70% of causes)

a. Intravascular volume depletion: Dehydration, third-spacing

b. Decreased arterial pressure: CHF, sepsis,

c. Extracellular fluid loss : Burns, diarrhea, vomiting, diuretics or hemorrhage

d. Decreased CO: CHF, shock

e. Medication changes to renal vasculature: ACE-i, ARBs, NSAIDs, Tacrolimus, Cyclosporine

2)Intrinsic: classified according to the site of injury

a. Vascular Injury: afferent arteriolar vasoconstriction --> decreased GFR (Ex. TTP, Vasculitis, RAS, malignant HTN)

b. Glomerulonephritis: Includes renal (PSGN, IgA, membranoproliferative GN), hematologic dz (HUS, TTP), systemic inflammation (SLE, HSP), and pulm-renal syndromes (Goodpasture, granulomatosis with polyangitis). +hematuria(RBC casts) and proteinuria.

c. Interstitial Nephritis: analogous to an allergic rxn in the kidney, may be associated with fever, arthralgia, and rash. Allergic rxns can be due to drugs (penicillin, cephalosporin, NSAIDs, Sulfas, PPIs), autoimmune disorders (ex. SLE), infections (diphtheria, GAS), or other dzs such as sarcoidosis.

d. Acute Tubular Necrosis (ATN): cell death and necrosis from renal ischemia (prolonged hypoperfusion aka prolonged prerenal state), toxins(rhabdo, uric acid crystals, radiocontrast dye, hemolysis, amioglycosides)

3)Postrenal: Renal outflow obstruction

a. Intrarenal/tubular: crystals, nephrolithiasis

b. Ureteral: bilateral nephrolithiasis, thrombosis, edema from retrograde pyelography

c. Extra-ureteral: Bladder or cervical CA

d. Bladder neck: neurogenic bladder, autonomic neuropathy

e. Urethra: BPH, prostate CA, urethral stricture

-Evaluate for volume status, skin tenting LE edema, ascites, skin rash, purpura, bladder distension, prostate enlargement etc.

-Monitor urine output, sediment, UA, electrolytes

-Calculate FENa (collect urine sample prior to IV fluid or diuretic tx). If patient is on diuretics utilize FEUrea.

-FENa: (Una/Pna)/(Ucr/Pcr), FEUrea: (Uurea/Purea)/(Ucr/Pcr)

- Renal US to r/o obstruction or assess for hydronephrosis

-Serology for complement levels and renal biopsy if etiology is unclear.

Prerenal	Intrinsic	Postrenal
FENa <1%, BUN/Cr >20, FEUrea </= 35%	FENa >2%, BUN/Cr <20, FEUrea > 50%	
Urine specific gravity >1.020	Urine specific gravity <1.010	
Few hyaline casts	ATN: muddy brown cast AIN: WBC casts, urine eos GN: dysmorphic RBCs, RBC casts	+/- non-dysmorphic RBCs, WBC or crystals.
Replete fluids: Isotonic IVF D/C nephrotoxic agents Renal dosing of meds Optimize CO, hydrate, support pressure, correct electrolytes Treat infections(sepsis)	Steroids may be indicated D/C nephrotoxic agents Renal dosing of meds	Foley cath to relieve obstruction

Chronic Renal Failure

Definition

GFR <60 for 3 months or more

AND/OR

presence of kidney damage (albuminuria, sediment or anatomic abnormalities or a hx of kidney transplantation).

Stages of CKD:

> G1 (normal) – GFR >90 mL/min
> G2 (mild) – GFR 60 to 89 mL/min
> G3a mild-mod – GFR 45 to 59 mL/min
> G3b (mod-severe) – GFR 30 to 44 mL/min
> G4 (severe) – GFR 15 to 29 mL/min
> G5 (kidney failure) – GFR <15 mL/min or dialysis

Etiology:

Most common is DM. Others are HTN/RAS, glomerular, interstitial , drugs, congenital, myeloma and PKD.

Evaluation:

-Evaluate for uremic symptoms and signs

General	Nausea, weight loss, hypothermia
Skin	Pruritus, calciphylaxis(skin ulcers)
Metabolic	increased K and phosphorus, decreased Ca, 2 PTH, acidosis
Cardio	HTN, CHF, LVH, pericarditis
Neuro	seizures, neuropathy. decreased memory/attention/MS (encephalopathy)

Heme	Anemia, bleeding(plt dysfunction)

Management:

-Consult Nephrology if proteinuria or GRF <30. BP measurements, IVs for dialysis access planning.

-Restrict sodium, potassium, phosphorus and protein intake especially if HTN or hyperkalemic.

-Treat/ risk reduction of co-morbidities (DM, HTN, CAD) with glucose control/ SGLTi, statin, ACEi/ARB (reassess Cr and d/c if there is a 30% increase post ACEi/ARB).

-Sevelamer to control phosphorus levels, HCO3 replete if acidotic, Fe supplementation for anemia (goal Hb 10-11.5).

-Evaluate for transplant (GFR <20)

Indications for Dialysis

Acute Indications:

Volume overload refractory to diuresis

Severe hyperkalemia (K >6.5 mEq/L) or rapidly rising K+ levels

Severe metabolic acidosis (and pH <7.1)

Uremia (pericarditis, uremia, unexplained mental status decline)

Toxic overdose of a dialyzable drug (Barbiturates, Isoniazid, Salicylates, Methanol etc)

Chronic Indications:

CKD stage 5, GFR<15

Modalities:

Intermittent Hemodialysis (IHD): access-> AV fistula/graft

Peritoneal Dialysis (PD): access ->peritoneal catheter.

Timing:

3 times weekly, on alternate days, (MWF or TThSa) is the recommendation for intermittent hemodialysis (IHD).