

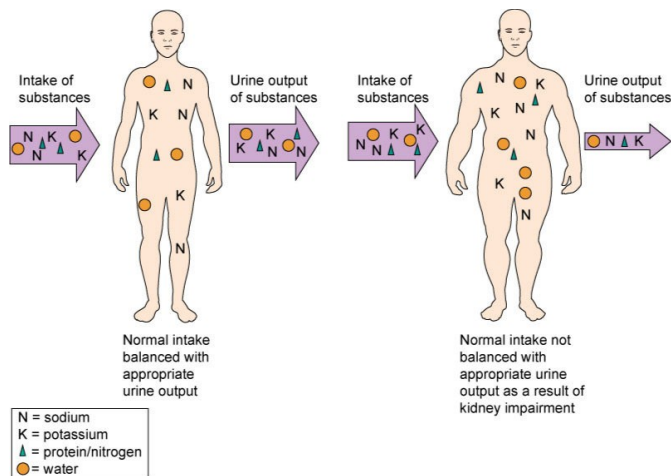
Urinary System

Acute Kidney Injury

<https://www.youtube.com/watch?v=TI58w1xeCH4&list=PLx0JMY5NjCIM4BOAcufr2tNluBafYWXbA&index=13&t=0s>

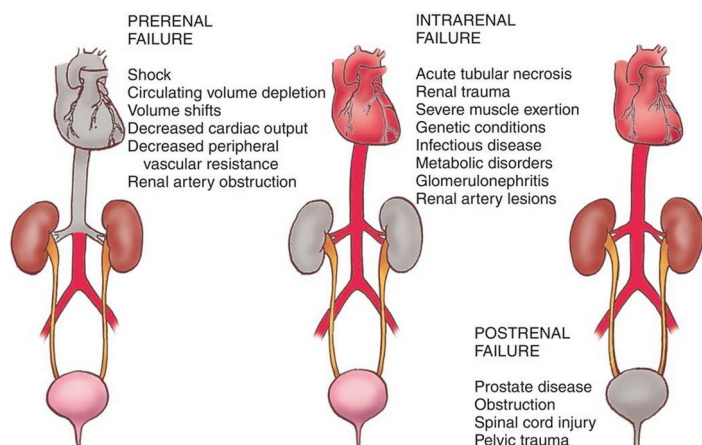
Acute Kidney Injury

- ◆ Severe impairment or lack of function
- ◆ Inability to excrete waste products
- ◆ Functional disturbances of all body systems
- ◆ Abrupt onset – hrs to a few days, ↓ GFR, ↑ BUN/Cr, ↑ K, UO ↓ 400ml/24 hr
- ◆ Usually follows trauma or contact with nephrotoxic agent
- ◆ Previously healthy individuals



Causes of Acute Kidney Injury

- ◆ Prerenal Causes
- ◆ Intrarenal / Renal Causes
- ◆ Postrenal Causes



Prerenal Causes of AKI

Inadequate renal perfusion (any factors outside of kidneys that affect blood flow)

- Decrease in vascular volume
- ◆ Dehydration, hemorrhage, burns, vomiting/diarrhea, excessive diuresis
- Decrease in cardiac output
- ◆ MI, arrhythmia, CHF
- Decreased peripheral vascular resistance
- ◆ Septic shock, anaphylaxis
- Renal vascular obstruction
- ◆ Renal artery or vein thrombosis

Intrarenal Causes of AKI

Damage to the renal tissue leading to malfunctioning nephrons

- Hemolytic blood transfusion reaction – hemoglobin in tubules
- Severe crushing injuries – myoglobin
- Chemical exposure
- Drugs – gentamicin, contrast, NSAIDs, ACE inhibitors
- Acute glomerulonephritis or pyelonephritis

- Malignant hypertension / Pregnancy induced hypertension
- SLE – attacks kidney
- Acute tubular necrosis – number one cause; ischemia, nephrotoxins, or sepsis

Postrenal Causes of AKI

Conditions that involve mechanical obstruction of urinary outflow; often difficult to diagnose- asymptomatic unless obstruction is bilateral

- ◆ Obstructive disorders
- ◆ Calculi
- ◆ BPH
- ◆ Neoplasms
- ◆ Trauma
- ◆ Strictures

Correcting prerenal and postrenal causes can allow for normal renal function to return

Phases of AKI

- ◆ Initiation phase
- ◆ Oliguric phase
- ◆ Diuretic phase
- ◆ Recovery phase

<u>Initiation (1)</u> • Begins at time of insult • Continues until s/sx apparent • Hours to days	<u>Oliguric (2)</u> • Within 48hr of agent, can be up to 7 days • < 400 ml/24 hr • Urine: bloody, protein casts, WBC's, RBC's; specific gravity 1.01 (wnl = 1.003-1.03) • Azotemia • <u>Excess Fluid</u> • <u>Metabolic acidosis</u>: kussmaul breathing • <u>Electrolyte imbalances</u>: - o Hyperkalemia: ≥ 5.5 mEq/L - o Hyponatremia: < 130 mEq/L; s/sx- warm moist flushed skin, muscle weakness, twitching, confusion, delirium, convulsions - o Hypocalcemia & hyperphosphatemia: s/sx- irritability, muscle cramps, hyperflexia, N/T • Restrict fluids
<u>Diuretic (3)</u> • Duration: 48-72 hrs to 2-3 weeks • Excrete urine • $\wedge$ UO $\rightarrow$ 4-5 L/day (dilute) • <u>Deficient fluid volume</u> • <u>Electrolyte imbalances</u>: - o Hypokalemia - o Hyponatremia • BUN/Cr high then stabilize at end of phase • Excrete waste products • Increase fluids	<u>Recovery (4)</u> • GFR – sustain life (concentrate & dilute urine, maintain lytes) • May take 3-12 months • Some left with permanent damage to GFR (ESKD)

Acute Kidney Injury (UO & Cr indicators)

- ◆ Diagnosis
 - ◆ Urinalysis – sediment, casts, protein (osmolality, Na content, and specific gravity help dx cause)
 - ◆ BUN & Creatinine
 - ◆ Serum Electrolytes
 - ◆ Renal Ultrasound – done first; Renal Scan, CT, MRI – no contrast!
- ◆ Classification for Staging AKI (RIFLE)
 - ◆ R - risk
 - ◆ I - injury
 - ◆ F - failure
 - ◆ L - loss

◆ E – ESKD

■ Treatment

- ◆ Goal of therapy – maintain fluid & electrolyte balance; Treat the identified cause
- ◆ Assessments: hydration
 - ◆ Excess:
 - ◆ Deficit:
- Daily weights
 - Strict I &O
- ◆ Fluid Replacement : according to losses for 24 hours (calculate all losses- diarrhea, urine... plus 600 mL for insensible losses)
Ex: Monday: urine 400 mL; Tuesday fluid allocation would be 1,000 mL
- ◆ Lyte imbalances: **hyperkalemia** (insulin/glucose, bicarb, calcium gluconate, HD, kayexalate) **calcium antacids** (supplements; bind phosphate, never magnesium antacid)
- ◆ Dietary restrictions: low Na, K, and protein; high carb; fat sources
* adequate calories needed
- ◆ Safety: adjust medications; prevent infection!
- ◆ Rest/Support

■ Prevention

- ◆ Prerenal
 - Adequate hydration
 - Prevent shock
 - Monitor UO and report changes of decreased output
- ◆ Intrarenal
 - Monitor renal function
 - Treat HTN
 - Correct blood type with transfusions
 - Tx UTI, prevent pyelonephritis
- ◆ Postrenal

- Prevent obstructions
- Prevent septicemia
- Meticulous catheter care

■ Nsg Dx: infective tissue perfusion; deficient fluid volume, excess fluid volume, r/f infection, r/f injury, r/f self-care deficit, deficient knowledge