

ICU patients 4-5% will need RRT for AKI, & have high mortality & morbidity.

Definition \Rightarrow elevation ≥ 0.3 mg/dl in serum \uparrow Cr from baseline within hrs to days
 \pm Oliguria (< 400 ml/day).
 Chronic: weeks to months

Classifications \Rightarrow

1 RIFLE: Risk, Injury, Failure, Loss, End stage renal disease \Rightarrow 5 stages

Parameters \rightarrow Cr & urine output

- Deficiencies \rightarrow
- 1- Baseline Cr needed
 - 2- No criteria of progression or timing
 - 3- Compare pts. at diff. time
 - 4- No criteria for RRT

2 AKIN: Acute Kidney Injury Network [reflect varying degrees of renal dysfunction] \Rightarrow 3 stages

Parameters \rightarrow Cr & urine output

Stage	① Serum Cr	② Urine Output
1	$> 1.5-2 \times$ ^③ baseline	< 0.5 mL/kg/h $\times > 6$ h
2	$> 2-3 \times$ baseline	< 0.5 mL/kg/h $\times > 12$ h
3	$> 3 \times$ baseline or any <u>RRT</u> given	< 0.3 mL/kg/h $\times > 24$ h or anuria $\times > 12$ h

3 KDIGO

4 Cr

Causes of AKI \rightarrow Pre-renal "most common" \Rightarrow Shock, hypovolemia, hypotension

Renal

Post-renal "least common" \Rightarrow Bladder outlet, obstruction, stones, Tumors
 elderly \uparrow
 young \uparrow
 congenital (urethral strictures)

Pre-renal Failure \Rightarrow

- \downarrow GFR, BUT increase rapidly if renal blood flow normalizes.

- No structural basis

- Mechanism of GFR autoregulation \leftarrow Dilatation afferent \uparrow PGI₂ / \uparrow A-II constrict efferent

Factors impaired autoregulation

- Chronic renal failure → already maximum dilatation
- NSAIDs & COX 2 inhibitor → ⊗ PG
- ACEI & ARBs → ⊗ A-II
- Chronic vascular disease (age / hypertension / dyslipidemia)

- Causes of pre-renal failure: ① ↓BP ⇒ ECF volum depletion / cardiogenic / vasodilatation

[gastroenteritis < vomiting / diarrhea, inadequate water intake, hemorrhage]

② Renal vasoconstrictors ⇒ cyclosporine, tacrolimus,

catecholamines, cocaine, amphotericine, hyperCa²⁺

- Diagnosis :: History / PE / Urinalysis = bland / urine electrolytes (Na⁺ or Cl⁻ < 20 mmol/L)

Furosemide ↑Na excretion ⇒ can't decide if AKI depending on it

Renal failure ⇒ - Causes ⇒

1 Ischemic ATN

Ischemic ATN

- Toxic ATN
- RPGN Rapidly progressive glomerulonephritis
- AIN Acute interstitial nephritis
- TMA thrombotic micro-angiopathy
- Crystals Tubular obstruction by crystals.

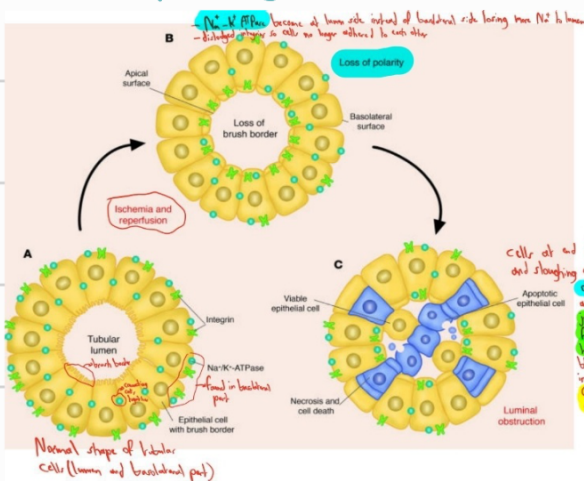
Common

- Same causes as prerenal failure

- Parts of nephron sensitive to hypoxia ⇒ ¹Thick ascending limb ²straight portion of proximal tubule (S3)

- Aggravated by ⇒ sepsis / obstructive jaundice / hemolytic anemia / Rhabdomyolysis

- Loss of polarity → loss brush border → loss ICAMs → necrosis & apoptosis



Backflow ← Tubular obstruction

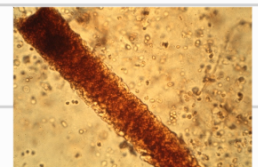
⇒ ↑Na & Tubuloglomerular feedback ⇒ constriction

(activation of RAS) → ↓glomerular cap. p.

No respond to normalization of BP.

↑Cr ⊕ oliguria - anuria.

- Diagnosis ⇒ urinalysis : blood + debris + heme granular casts (protein + blood + intact) cell



2] Toxic ATN

- Non oliguria + ↑Cr

- Causes →
- Aminoglycosides
 - gentamycine
 - Neomycine
 - streptomycine
 - Radioccontrast within 48hrs
 - Hb, myoglobin
 - Ethylene glycol
 - Amphotericin, cisplatin

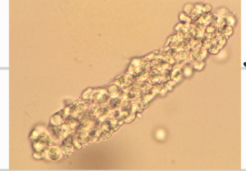
3] Allergic Interstitial Nephritis

≠ Prolong exposure to drug.

penicillins Allopurinol Cipro/NSAIDs

- Rash / fever / eos. in blood

- Pyuria, WBC casts



multi-nucleated

4] RPGN

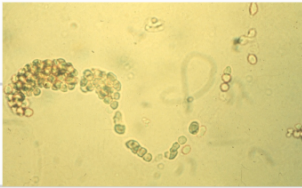
- Anti-GBM ab. (goodpastures)

- Immune complex mediated

- SLE
- post. infection
- IgA nephritis

- Pauci-immune (ANCA ⊕)

- wegner's
- Micro polyangitis



no nuclei

5] Thrombotic Microangiopathy

- Scleroderma renal crisis

- cyclosporine

- Anemia / Thrombocytopenia

▶ Indications for dialysis >>

✓ persistent hyperkalemia

✓ persistent acidosis

✓ Anuria

✓ pleural effusion

✓ uremic encephalopathy

≠ Elevation of Cr by itself not indicator for dialysis, there must be associated complication that listed above.