IN THE NAME
of
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AKI

- A sudden reduction in GFR

- Pre renal
- Intrinsic
- Post renal

- Common problem in ICU

- What is the GFR and how we can asses it in the conditions of AKI?

- In 2004, the Acute Dialysis Quality Initiative (ADQI) group published the RIFLE classification of ARF, based on changes from the patient's baseline either in serum creatinine level or glomerular filtration rate (GFR), urine output (UO), or both.

RIFLE Classification

	eCCl	Urine output
Risk	Decrease by 25%	<0.5 mL/kg/hour for 8 hours
Injury	Decrease by 50%	<0.5 mL/kg/hour for 16 hour
Failure	Decrease by 75% or <35 mL/min/1.73m^2	<0.3 mL/kg/hour for 24 hour or anuric for 12 hour
Loss	Persistent renal failure > 4weeks	not applicable
End stage	Persistent renal failure >3 months	not applicable

AKI stage	Serum creatinine (SCr)	Urine output
1	1.5-1.9 times baseline OR ≥ 0.3 mg/dL increase	< 0.5 mL/kg/h for 6-12 hours
2	2.0–2.9 times baseline	< 0.5 mL/kg/h for ≥ 12 hours
3	3.0 Times baseline OR Increase in SCr to ≥ 4.0 mg/dL OR Initiation of RRT OR Decrease in eGFR to < 35 mL/min/1.73 m^2 in patients < 18 years	< 0.3 mL/kg/h for ≥24 hours OR Anuria for ≥ 12 hours

Renal Aging System

INJURY

↓ eCCI	% FO	Score
No change	<5%	1
↓ 0-25%	≥5%	2
↓ 25-50%	≥10%	4
↓ ≥50%	≥15%	8

CKD

KDIGO: Prognosis of CKD by GFR and albuminuria categories

GFR categories (ml/min/1.73 m²) Description and range				Persistent albuminuria categories Description and range		
				A1	**A2**	**A3**
				Normal to mildly increased	Moderately increased	Severely increased
				<30 mg/g <3 mg/mmol	30–300 mg/g 3–30 mg/mmol	>300 mg/g >30 mg/mmol
	G1	Normal or high	≥90			
	G2	Mildly decreased	60–89			
	G3a	Mildly to moderately decreased	45–59			
	G3b	Moderately to severely decreased	30–44			
	G4	Severely decreased	15–29			
	G5	Kidney failure	<15			

Urea and BUN

- During antidiuresis with urine flow rates less than 30 mL/h, urea clearance is as low as an estimated 30% of GFR.
- Under conditions of diuresis, with urine outputs greater than 100 mL/h, urea clearance can increase to 70-100% of GFR.
- BUN concentration is dependent on nitrogen balance and renal function.
- BUN concentration can rise significantly with no decrement in GFR by increases in urea production with steroids, trauma, or GI bleeding.

Urea and BUN

- Tetracycline increases BUN by decreasing tissue anabolic rates.

- Basal BUN concentration can be depressed severely by malnutrition or advanced liver disease.
- Always estimate basal BUN concentration first when attempting to correlate changes in BUN with GFR.
- For example, in a patient with cirrhosis and a BUN of 12 mg/dL, a GFR in the normal range may be assumed. Only with the knowledge of a baseline BUN of 4 mg/dL does the real decrease in GFR become apparent.

GFR

- Cockcroft-Gault equation: GFR mL/min = (140 - age y)(weight kg)(0.85 if female)/(72 X serum creatinine mg/dl)
- Creatinine production is determined by muscle mass.
- It produced by a constant manner.
- Serum creatinine must always be interpreted with respect to patient's weight, age, and sex.
- Difference between Filtration Fraction and GFR.
- Effects of nephron loss on Filtration fraction, and GFR

Creatinine

- Certain diseases and medications can interfere with the correlation of serum creatinine with GFR.
- Acute glomerulonephritis causes increased tubular secretion of creatinine, falsely depressing the rise in serum creatinine when ARF occurs in acute glomerulonephritis.
- Trimethoprim and cimetidine cause decreased creatinine secretion and a falsely elevated creatinine with no change in GFR.
- Difference between Creatinine clearance and the clearance of other substances in normal condition versus AKI .

Creatinine

- Creatinine poorly differentiates between pre-renal and intrinsic renal failures and approximately 50% of renal mass has to be lost for the serum creatinine to rise.
- Pickering and colleagues set out to determine the clinical utility of a 4-hour creatinine clearance (CrCl), compared with plasma creatinine, for diagnosing AKI

$$GFR = \frac{U_{Cr} \times V}{P_{Cr}}$$

Measuring glomerular filtration rate in acute kidney injury: Yes, but not yet

Thank You For Your Attention