Acute Kidney Injury in the ED

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Outline

- 1. Diagnostic challenges
- 2. ED treatment
- 3. Contrast induced nephropathy

Acute Kidney Injury

- Complicates ? 5% of hospital admissions
- 20% rise in Serum Creatinine = double short term mortality! (Coca; Am J Kidney Disease, 2007)

Making the Diagnosis

- GFR
- Serum Creatinine
  - Doesn't rise until 50% decrease in GFR
  - Multiple cofounders: age, sex, mass, composition, diet…
- Creatinine Clearance
  - Require 24hr collection of urine
  - MDRD or Cockcroft-Gault are estimates that assume steady state
    - Can use these to estimate baseline Cr when you don't have prior Cr levels

Ideal Biomarkers

- Sensitive
- Specific to type of AKI
- Prognostic
- Mutltiple Novel Markers: cystatin C, NGAL, IL-18, KIM-1 among many others
  - (Hudson; Emergency Medicine Clinics 2011)

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Not Yet!

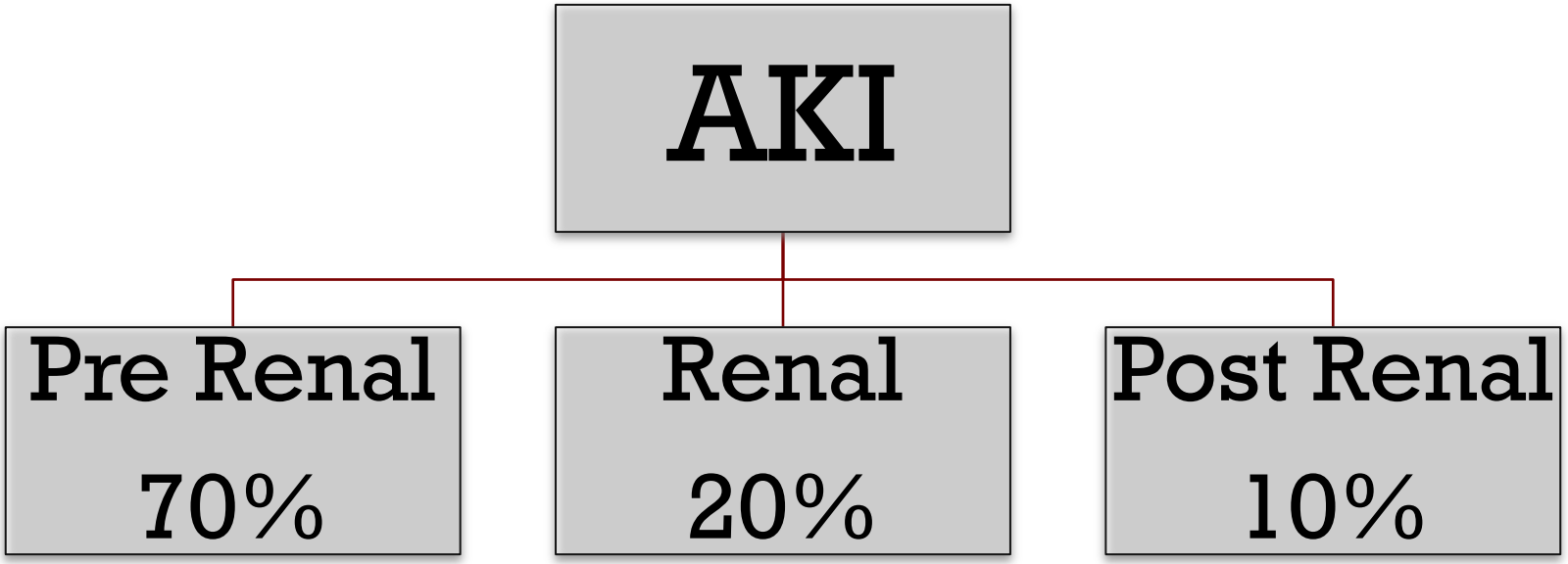
RIFLE Classification

	CREATININE	GFR	URINE OUTPUT
RISK	150% rise	>25%	<0.5mL/kg/ h X 6 hours
INJURY	200%	>50%	X 12 hours
FAILURE	Tripled	>75%	X 24 hours
LOSS	Complete loss > 4 weeks		
END STAGE	> 3 months		

AKIN Staging System

STAGE	Creatinine	Urine Output
1	150% rise or 26.5umol/L	<0.5mg/kg/h for 6 hours
2	>200% rise	<0.5mg/kg/h for 12 hours
3	>300% rise or 350umol/L or need for RRT	<0.3mg/kg/h for 24 hours

COMMUNITY ACQUIRED AKI



Pre Renal AKI

- Clinical Picture: volume depletion
- High BUN/CR
- Urine: hyaline casts, FENa <1%, Na <10mmol/L

FENa

- 1% cut off indicate pre renal AKI
- False negatives: CRF, diuretics, vomiting
- False positive: early on in course of many causes of renal failure; fluid overload states – CHF, cirrhosis
- Useful in patients with normal GFR normal

Treatment: Pre Renal AKI

- Ensure adequate renal perfusion – dehydration, sepsis, CHF…
- Crystalloids
- Stop: NSAIDs, ACEI, hypercalcemia, contrast, toxins
- Ensure no renal artery disease

Usually reversible!

Post Renal AKI

- Clinical Picture: prostatism, pelvic tumors, stones, enlarged bladder…
- Normal Urine
- US or CT maybe required

Treatment: Post Renal AKI

- Relieve obstruction ASAP – Foley, nephrostomy…
- CT or US if more proximal obstruction suspected
- Hyperkalemia
- Infection

Post Obstructive Diuresis

- Rare
- Natriuresis and diuresis = hyponatremia and hypotension
- NO NEED TO CLAMP THE FOLEY
- 0.45% NaCl at 75% rate of urine loss (assuming BP normal)
- Correct electrolytes

Intrinsic Renal Causes of AKI

- Clinical picture varies
- Urine: Na, FENa, casts, protein
- Further work up depends on clinical scenario

Treatment: Intrinsic Causes of AKI

- Varies with presentation
- IV fluid hydration – within limits
- Stop offending agents
- No Radiocontrast
- Correct electrolytes

Hyperkalemia

- Insulin and dextrose
- Calcium gluconate
- Inhaled beta agonists
- $NaHCO_3$ – only if acidotic
- Potassium binding resins: ineffective and possibly dangerous

Treatment: Intrinsic Causes of AKI

- Loop diuretics
- Mannitol
- Dopamine
- Fenoldopam

Treatment: Intrinsic Causes of AKI

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Not Effective!

- Mehta JAMA 2002, Kellum CCM 2001; Kellum 2011

Contrast Induced Nephropathy

- Serum Creatinine rise of 25% within 48 hours of contrast and no other cause identified
- Pathogenesis not understood
- ? 3rd most common cause of in patient elevation in creatinine

CIN: Risk Factors

- Pre existing renal dysfunction
- Diabetes – unclear if really an independent risk factor
- Age > 75 yo

CIN: How to Avoid it

- Avoid contrast if at risk – other imaging, non contrast scans
- Use low osmolality contrast
- Use lowest dose possible
- No repeat scans!
- Stop other nephrotoxins
- **Ensure adequate hydration**

CIN Prevention

- N-acetyl csyteine
- Na HCO3
- Diuretics
- Vasodilators
- Theophylline
- RRT

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No Help

Contrast Induced Nephropathy

- Occurs in only 5% of patients with renal impairment
- Extremely unlikely to result in need for dialysis or death
- If the clinical picture indicates you absolutely need the scan then go ahead

Acute Kidney Injury

- Our diagnostic tools are not very good; Yet!
- Don't rely on FENa to diagnose volume depletion
- The risks of Contrast Induced Nephropathy are much less than initially thought