

RENAL FAILURE

Oliguria

Definition: urine output $<0.5\text{ml/kg/hr}$ for 2 hours

Causes of oliguria

Prerenal – hypoperfusion

Renal - intrinsic renal disease:

glomerular diseases

renal tubular diseases

vascular diseases

interstitial diseases

- nephrotoxins – e.g. contrast, aminoglycosides, amphotericin B
rhabdomyolysis, liver failure

Postrenal – ureteric obstruction

bladder outlet obstruction

Foley catheter obstruction

Management of Acute Renal Failure

- rule out obstruction
- avoid nephrotoxins
- treat infections
- maintain hydration and perfusion
the lower limit of renal autoregulation is 80mmHg, can be higher for hypertensive patients
- watch out for abdominal compartment syndrome as a cause for ARF

Tests for distinguishing prerenal and renal causes of renal failure are described in many textbooks but not always useful. In general, fluid resuscitation is useful in prerenal failure

Tests	Prerenal failure	Acute Tubular Necrosis
Urine osmolality (mOsm/L)	>500	<400
Urine sodium (mmol/L)	<20	>40
Fractional excretion of Na (%)	<1	>2
BUN/Cr ratio	>20	<20
Urinalysis	normal	casts

Points to note:

- Although oliguric renal failure generally carries a less favourable prognosis than non-oliguric failure, conversion of oliguric failure to non-oliguric failure with frusemide, dopamine etc does not improve outcome of acute renal failure
- Other aspects to note in taking care of ARF patients
 1. fluid balance
 2. electrolytes
 3. drugs (a number of drugs will require dose adjustments)
- Consider renal replacement therapy

Contrast Agents and Acute Renal Failure

Many studies looking at strategies to minimize and prevent contrast-induced nephropathy – optimal strategy have not been defined. Basic and common sense approach should include a) identifying at risk patients (ie those with who have pre-existing chronic renal disease or acute renal failure/impairment b) performing contrast studies only if indicated c) ensure adequate fluid hydration d) avoiding other concurrent nephrotoxic agents eg aminoglycosides if possible. 2 additional strategies used in this ICU include:-

N-acetylcysteine

- Recent studies shows prehydration and N-acetylcysteine may lower the incidence contrast induced nephropathy. Dose is oral 600 mg BD, 2 doses pre- and 2 doses post-contrast. We have also been giving IV instead of oral N-acetylcysteine for patients who are under total bowel rest, or if we run out of time. Dose IV is still arbitrary – refer to on-call consultant
- At risk ICU patients are those who have pre-existing renal impairment or who are acutely deteriorating in renal function

Or

Sodium Bicarbonate (PWH protocol)

- Add 80mls of 8.4% sodium bicarbonate into one 500 mls bottle/bag of Dextrose 5% (to achieve a sodium concentration of approximately 138 mmol/L, total volume of 580mls)
- Infuse at a rate of 3ml/kg/hr one hour before contrast study, followed by 1 ml/kg/hr for the next 6 hours during and after the procedure

Rhabdomyolysis and Acute Renal Failure

- should be suspected in patients with high CPK and risk factors:
 - o unconscious patients lying in a same position for some time eg. overdose
 - o ischaemic limbs

- compartment syndrome
- crush injury
- burns, electrocution
- hyperthermia etc.
- check urine for myoglobin
- monitor serial CPK
- treat underlying cause e.g. compartment syndrome (consult orthopaedics, burns team)
- maintain hydration
- maintain urine output of 100ml/hr
- consider NaHCO_3 IV to maintain urine to maintain urinary pH >6 and serum pH < 7.5, consider mannitol/frusemide
- do not replace calcium unless patient develop signs of hypocalcaemia
- monitor K^+ closely
- renal replacement therapy may be indicated

Reference:

Tepel M et al. Prevention of radiographic-contrast-agent-induced reductions in renal failure by acetylcysteine. *N Eng J Med* 2000; 343:80-4

Merten GJ et al. Prevention of contrast-induced nephropathy with sodium bicarbonate: a randomized controlled trial. *JAMA* 2004; 291(19):2328-34