

Characterised by a rapid fall in GFR (over hours or days) causing an accumulation of fluid and nitrogenous waste products demonstrated by a rise in blood urea and creatinine.

May be anuric (<50ml/day), oligouric (<400 ml/day) or non-oligouric.

GFR Estimation

Cockcroft-Gault Formula: for creatinine clearance - relies on gender, ideal wt [kg] and serum Cr:

$\text{Male CrCl (\sim\text{GFR}) ml/min} = \frac{(140 - \text{age}) \times \text{ideal wt}}{0.814 \times [\text{serum Cr}]}$	(For Female multiply this by 0.85)
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Causes

- Pre-renal:
 - Volume depletion (e.g. haemorrhage, severe vomiting or diarrhoea, burns, etc.)
 - Hypoperfusion (e.g. CCF, sepsis, RAS)
- Intrinsic ARF ('Renal'):
 - Prolonged pre-renal causes
 - Glomerular disease: GN
 - Tubular injury: ATN following prolonged ischaemia; nephrotoxins (e.g. myoglobin, aminoglycosides, radiocontrast media, heavy metals, light chains in myeloma kidney)
 - Acute interstitial nephritis: drugs (e.g. NSAIDs), infection or autoimmune diseases
 - Vascular disease: vasculitis (usually with ANCA), cryoglobulinaemia, PAN, HUS, thrombotic microangiopathy, cholesterol emboli, RAS, renal vein thrombosis,
 - Eclampsia/malignant hypertension
- Post-renal:
 - Calculus
 - Blood clot
 - Papillary necrosis
 - Urethral stricture
 - Prostatic hypertrophy or malignancy
 - Pelvic tumour (e.g. bladder, ureter, prostate)
 - Radiation fibrosis
 - Retroperitoneal fibrosis/haematoma

Epidemiology

- Annual incidence: 50/100,000 ~40% need dialysis
- Prerenal ARF and ischaemic ATN together account for 75% ARF

Risk factors

Elderly, vascular disease including HT, pre-existing renal impairment, CCF, DM, chronic infection, myeloma & myeloproliferative disorders

Presentation

Depends on the underlying cause and ARF severity.

Symptoms

- Urine output: typically oliguria or anuria phase followed 1-14d later by a polyuric phase.
- Nausea, vomiting
- Dehydration
- Confusion

Signs

- Signs of underlying cause may be present.
- Fluid overload

Differential diagnosis

- Chronic renal failure
- Acute on chronic renal failure

Investigations

Urinalysis: Micro for cells, casts (RBC or tubular), crystals. Na (<20mmol/L), osmolality (>plasma in pre-renal, ≤plasma in renal), urine/plasma Cr ratio (>40). Bence-Jones protein & myoglobin.

Bloods: UEC (↑K, ↑Cr, ↑Ur - Rule of thumb for $Cr_{\mu\text{mol/L}}:Ur_{\text{mmol/L}}$ ratio when $Ur>10\text{mmol/L}$: ratio <10 suggests pre-renal, 10-25 suggests normal or post-renal, and >25 suggests renal renal failure),

ABG (met.acidosis), FBC, CMP (↓Ca, ↑Mg, ↑PO₄), CK (if rhabdo), immunological screens as indicated (ANA, ANCA, antiDNase B, C', specific antibodies)

Imaging: CXR (for APO), renal artery Doppler, USS, DTPA scan, MRI/MRA, CT (obstructive)

ECG: recent MI, hyperkalaemia

Other: Renal biopsy

Complications

- Volume overload (severe pulmonary oedema)
- Hyperkalaemia
- Metabolic acidosis
- Stress ulceration

Management

Treat complications - may require dialysis for:

- Refractory hyperK⁺
- Intractable fluid overload
- Oliguria <5ml/kg/day
- Overt uraemia (encephalopathy, pericarditis)
- Ur>30mmol/L & Cr>700-1000μmol/L
- Uncontrollable acidosis or HT
- Dialysable drug OD
- Hyperthermia

Fluid balance & daily weights - maintain renal perfusion (may need diuretics e.g. frusemide, no evidence for dopamine infusion) and urine output, replace deficits without causing fluid overload

Relieve any obstruction (IDC, stent)

Prevent secondary insult - avoid NSAIDs, aminoglycosides, ACEI etc.

GIT haemorrhage prophylaxis - PPI, avoid aspirin

Optimise nutritional support - ?restricted K⁺, Na⁺ & protein diet

Identify and aggressively treat infection

Treat underlying cause

Prognosis

- Mortality ~50% if in-hospital dialysis required. Closely related to the underlying cause.
- If not significant recovery of renal function within 6 to 8 weeks → ESRF
- Poor prognosis RF: increasing age, multiple organ failure, oliguria, hypotension, number of transfusions and acute on chronic renal failure.

Prevention

- Identification of patients at risk.
- Maintain adequate blood pressure and volume status.
- Avoid potentially nephrotoxic agents, especially NSAIDs, ACEI.
- Acetylcysteine plus volume expansion may be used to prevent contrast nephropathy.