

Acute Kidney Injury and Continuous Renal Replacement Therapy



Initial Management

- AKI defined by
 - Increase in serum creatinine by $>26 \mu\text{mol/L}$ in $<48\text{hrs}$
 - Increase in serum creatinine to $1.5\times$ baseline in $<7\text{days}$
 - $\text{UO} < 0.5\text{ml/kg/hr}$ for 6 hours
- STOP AKI Care Bundle
 - **S**epsis – if suspected complete sepsis screen and consider antibiotics
 - **T**oxins – avoid e.g. Gentamicin, NSAIDs, IV Iodinated Contrast
 - **O**ptimise Blood Pressure
 - assess & normalise volume status
 - Consider withholding anti-hypertensives and diuretics
 - Consider vasopressors to target patient appropriate MAP
 - **P**atient Safety
 - Identify cause –
 - urinalysis
 - US renal tract if obstruction suspected (within 6 hrs if pyelonephrosis suspected)
 - If rarer cause suspected refer to Renal Registrar and consider more specialised investigations
 - Treat complications e.g. hyperkalaemia/ acidaemia
 - Review all medication doses – may change again commenced on RRT
 - Review Fluid Prescription and Fluid balance

CRRT

- Indications:
 - Acidaemia – $\text{pH} < 7.1$
 - Hyperkalaemia- intractable
 - Fluid overload
 - Pulmonary
 - Peripheral
 - Uraemic complications
 - Pericarditis
 - Encephalopathy
- Consultant only initiation
- Default anticoagulation is **citrate**
- **Always** follow the protocol
- Prescribed before initiation and then daily by ICU team
- **Default dose** is 25 ml/kg/hr
- Consider 35 ml/kg/hr if septic
- Separate regimen for liver patients
- Many patients likely to need Ca^{2+} replacement prior to commencement
- Monitor the T:I ratio for evidence of citrate accumulation (>2.5)
- Monitor acid-base balance and adjust prescription according to protocol if metabolic alkalosis develops (may occur $> 48\text{-}72\text{hrs}$)
 - If metabolic alkalosis continues and filter length time is $> 72\text{hrs}$ change filter
 - If metabolic alkalosis continues despite changing filter convert to MultiBic CVVHD
- Monitor fluid balance and adjust fluid removal accordingly
- All patients to be referred to renal team for initial review of cause of AKI

Recovery and Follow Up

- Consider discontinuing CRRT if:
 - Primary pathology correcting
 - U&E, pH and volume status acceptable
 - $\text{UO} > 400\text{mls}/24\text{hrs}$
- If kidney function not recovering request renal US
- Renal referral for follow up unless full recovery in renal function

AKI Staging & Investigation



Stage	Serum Creatinine	Urine Output
1	1.5-1.9 x baseline or ≥ 26 µmol/L increase < 48hrs	<0.5 ml/kg/hr for 6-12 hours
2	2.0-2.9 x baseline	<0.5 ml/kg/hr for ≥ 12 hours
3	> 3.0 x baseline or increase in creatinine to ≥ 354 µmol/L or initiation of RRT	<0.3 ml/kg/hr for ≥ 24 hours or anuria for ≥ 12 hours

AKI INVESTIGATIONS

Standard Investigations

- Usual ICU blood tests
- Urinalysis
- Renal US

More Specialised Investigations

- Serum electrophoresis & Urinary Bence-Jones Protein (high Ca²⁺ – myeloma?)
- ANCA/Anti GBM (rash/joint involvement/haemoptysis - autoimmune?)
- Immunoglobulins (autoimmune?)
- ANA & Complement (autoimmune?)
- ASOT (post strep GN?)
- CK (rhabdomyolysis?)
- Blood/urine/sputum cultures (sepsis?)
- Blood film/LDH/Reticulocytes (TTP/HUS?)
- Hepatitis & HIV screen
- Urine PCR (if proteinuria)

DISCHARGE

Document

- Maximal AKI Stage
- Cause of AKI
- Medications stopped
 - Advice on whether to consider restarting
- Review all specialised investigations

Discuss with Renal Registrar if:

- Patient has not fully recovered independent kidney function and may require further RRT
 - Discuss early as may need intermittent HD organising after leaving ICU
- Cause of AKI remains unclear

Further information

- LTHT AKI Guidelines
- KDIGO AKI Guidelines
- LTHT RRT Protocol
- Renal drug handbook