Frimley Park Hospital NHS
NHS Foundation Trust

In partnership with the Ministry of Defence

MANAGEMENT OF ACUTE KIDNEY INJURY GUIDELINES

Originators	Lead MAU Consultant Deputy Chief Pharmacist Lead Clinician for Patient Safety
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This guidance has been produced in line with the recommendations from the London Acute Kidney Injury Network. The Network guidelines are consistent with available national guidelines (UK Renal Association, Intensive Care Society, NCEPOD, National Imaging Board and NICE Clinical Guideline 50 on acute admissions)

This information is also available on the Network website at
www.londonaki.net

Risk, Prevention & Recognition

Some AKI is Predictable, Preventable and/or Recognised Late

Risk Assess for AKI

The risk of AKI is contributed to by the acute insult and background morbidity

Background

Elderly
CKD
Cardiac failure
Liver disease
Diabetes
Vascular disease
Background nephrotoxic medications

ACUTE 'STOP'

Sepsis and hypoperfusion
Toxicity
Obstruction
Parenchymal kidney disease

Prevent AKI – the 4 'M's

Monitor Patient

(observations and MET, regular blood tests, pathology alerts, fluid charts, urine volumes)

Maintain Circulation

(hydration, resuscitation, oxygenation)

Minimise Kidney Insults

(e.g. nephrotoxic medications, surgery or high risk interventions, iodinated contrast and prophylaxis, hospital acquired infection)

Manage The Acute Illness

(e.g. sepsis, heart failure, liver failure)

Recognise AKI

1.5x increase from most recent baseline creatinine or 6 hours of oliguria

AKI Develops

INSTITUTE CARE BUNDLE

Prevent AKI progression by rapid diagnosis, supportive care, specific therapy and appropriate referral

AKI Care Bundle

Institute in all patients with a 1.5 x rise in creatinine or oliguria (<0.5mls/kg/hr) for >6 hours

This is a Medical Emergency

Full set of physiological observations
Assess for signs of shock/hypoperfusion
If MET triggering give oxygen, begin resuscitation and contact critical care outreach team

Fluid therapy in AKI

Assess heart rate, blood pressure, jugular venous pressure, capillary refill (should be <3 secs), conscious level.
If hypovolaemic give bolus fluids (e.g. 250-500mls) until volume replete with regular review of response.
Middle grade review if >2 litres filling in oliguria.
If the patient is euvolaemic give maintenance fluids (estimated output plus 500mls) and set daily fluid target.

Monitoring in AKI

Do arterial blood gas and lactate if venous bicarbonate is low or evidence of severe sepsis or hypoperfusion.
Consider insertion of urinary catheter and measurement of hourly urine volumes.
Measure urea, creatinine, bone, other electrolytes and venous bicarbonate at least daily while creatinine rising.
Measure daily weights, keep a fluid chart and perform a minimum of 4 hourly observations.
Perform regular fluid assessments and check for signs of uraemia.

Investigation of AKI

Investigate the cause of all AKI unless multi-organ failure or obvious precipitant
Urine dipstick. If proteinuria is present perform urgent spot urine protein creatinine ratio (PCR).
USS should be performed within 24 hours unless AKI cause is obvious or AKI is recovering or within 6 hours if obstruction with infection (pyelonephritis) is suspected. Check liver function (hepatorenal), CRP and CK (rhabdomyolosis). If platelets low do blood film/LDH/Bili/retics (HUS/TTP). If PCR high, consider urgent Bence Jones protein & serum free lights chains.

Supportive AKI Care

Treat sepsis – in severe sepsis intravenous antibiotics should be administered within 1 hour of recognition.
Stop NSAIDS/ACE/ARB/metformin/K-sparing diuretics and review all drug dosages.
Give proton pump inhibitor and perform dietetic assessment.
Stop anti-hypertensives if relative hypotension. If hypovolaemic consider stopping diuretics.
Avoid radiological contrast if possible. If given follow prophylaxis protocol.

Causes Think 'STOP AKI'

Sepsis and hypoperfusion, **T**oxicity (drugs/contrast), **O**bstruction, **P**arenchymal kidney disease (acute GN)

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AKI Care Bundle Checklist

URGENT ASSESSMENT	YES	NO	N/A
ABC and full set of observations			
Oxygen therapy			
Early warning system triggering			
Critical care outreach called (if triggering)			

FLUID THERAPY IN AKI	YES	NO	N/A
Clinical assessment of volume status and perfusion			
Bolus fluids with reassessment to achieve euvolaemia			
Maintenance fluid requirements estimated and prescribed			

MONITORING IN AKI	YES	NO	N/A
Physiological monitoring plan decided (minimum 4 hourly)			
Arterial blood gas and lactate if indicated			
Urinary catheter and hourly volumes (if indicated)			
Daily blood tests while creatinine rising			
Daily weights instituted			
Fluid chart instituted			

INVESTIGATION OF AKI	YES	NO	N/A
Urine dipstick and documentation of result			
If proteinuria, protein creatinine ration checked			
USS <24hrs requested (AKI not recovering or cause not clear)			
Bone, liver function, CK,CRP			
Myeloma screen (if appropriate)			
Autoimmune screen (if appropriate)			
If platelets low, microangiopathy screen (blood film, retics, LDH)			

SUPPORTIVE AKI CARE	YES	NO	N/A
Sepsis treated (IV antibiotics <1 hour if severe)			
Drug chart and dosages reviewed			
NSAIDS/ACE/ARB/K-sparing diuretics/metformin stopped			
Consider gastric protection			
Antihypertensives stopped if relative hypotension			
Dietetic assessment			

AKI REFERRAL	YES	NO	N/A
Senior review			
Referral nephrology			
Referral critical care			

Signed: ..... **Job Title:** .....

Date: ..... **Bleep No:** .....

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'STOP' AKI and Checklist

The London AKI Network has developed the 'STOP' Acronym to improve awareness of AKI causes

STOPaki

Sepsis & hypoperfusion Toxicity Obstruction Parenchymal kidney disease

SEPSIS & HYPOPERFUSION	YES	NO	N/A
Severe Sepsis			
Haemorrhage			
Dehydration			
Cardiac Failure			
Liver Failure			
Renovascular Insult (E.g. Aortic Surgery)			

TOXICITY	YES	NO	N/A
Nephrotoxic Drugs			
Iodinated radiological Contrast			

OBSTRUCTION	YES	NO	N/A
Bladder Outflow			
Stones			
Tumour			
Surgical Ligation of Ureters			
Extrinsic Compression (E.g. Lymph Nodes)			
Retroperitoneal Fibrosis			

PARENCHYMAL KIDNEY DISEASE	YES	NO	N/A
Glomerulonephritis			
Tubulointersitial Nephritis			
Rhabdomyolysis			
Haemolytic Uraemic Syndrome			
Myeloma Kidney			
Malignant Hypertension			

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Date: ..... Bleep No: .....

AKI Complications

Hyperkalaemia, Acidosis, Pulmonary Oedema, reduced Conscious Level

Begin Medical Therapy and Get Help

Local Critical Care Team
and
Local Nephrology Team (if onsite)

Hyperkalaemia

Medical therapy of hyperkalaemia is a transient measure pending imminent recovery in renal function or transfer to kidney unit or critical care for renal replacement therapy.
If ECG changes give calcium gluconate 10mls 10% over 10 minutes.
If bicarbonate <22mmol/L and no fluid overload give 500mls 1.4% sodium bicarbonate over 3-4 hours.
K>6.5mmol/L or ECG changes give Actrapid 10 units in 50mls of 50% dextrose over 15 minutes & salbutamol 5 mg nebulised (caution with salbutamol in tachycardia or ischaemic heart disease).
Actrapid and salbutamol reduce ECF potassium for <4 hours only. See Management of Hyperkalaemia guidelines for ongoing hyperkalaemia or if ECG not normalised

Acidosis

Medical therapy of acidosis with bicarbonate should be reserved for emergency management of hyperkalaemia (as above) pending specialist help.
pH<7.15 requires immediate critical care referral.

Pulmonary Oedema

Sit the patient up and give oxygen (60-100% unless contraindicated).
If haemodynamically stable give furosemide 80mg IV. Consider repeat bolus and infusion at 10mg/hour and/or commence Glyceryl Trinitrate 1-10mg/hour titrating dose.

Reduced Conscious Level

Manage uraemic coma as per all reduced consciousness (airway management) pending critical care transfer and emergency renal replacement therapy.

These are Holding Measures Prior to Specialist Help from Critical Care or Nephrology Services

Fluids

Adult Maintenance Fluids

Baseline Requirements
50-100mmol sodium, 40-80mol potassium and 1.5-2.5L water per 24 hours Oral, enteral or parenteral route

Adjust estimated requirements according to changes in sensible or insensible losses

Sensible Losses
(measurable)
Surgical drains
Vomiting
Diarrhoea
Urine
(variable amounts of electrolytes)

Insensible Losses
Respiration
Perspiration
Metabolism
Increase in pyrexia or tachypnoea
(Mainly water)

Regular assessment of volume and hydration status
Daily weights
Fluid charts
Measured electrolytes

Available parenteral solutions (if required)
Hartmann's solution
Sodium chloride 0.9%
5% dextrose
Consider Potassium containing bags if correction of electrolyte required

Adult Resuscitation or Replacement Fluids

Give According to Clinical Scenario

General Volume Replacement or Expansion
Give balanced crystalloid solutions (Hartmann's solution)
These contain small amounts of potassium. Avoid in hyperkalaemia. If AKI only use these if close (HDU) monitoring of potassium
Or
Colloids
Avoid high molecular weight (>200kDa) starches in severe sepsis due to risk of AKI
Assess vital signs, postural blood pressure, capillary refill, JVP and consider invasive or non-invasive measurement using flow-based technology

Haemorrhage
Give blood and blood products
Balanced crystalloid or colloid may be given while blood awaited
Clinical assessment as above

Severe Free Water Losses (hypernatraemia)
5% dextrose
or Hartmann's solution

Hypochloraemia
(vomiting, NG drainage)
Give sodium chloride 0.9%
(Potassium repletion usually also required)