**Causes of AKI**

**Pre-Renal AKI** - decreased perfusion of thekidneys:-

* **Volume depletion** (excessive diuresis,haemorrhage, shock, burns, severe trauma)
* **Cardiovascular disorders** (congestivecardiac failure & acute MI)
* **Obstruction of renal arteries** (renalthrombosis, renal artery stenosis)

**Post-Renal AKI** - obstruction to urine outflow,from the collecting ducts in the kidney down to the urethra.

* **Deposition of crystals** in the tubules, eg.uric acid, sulphonamides, aciclovir, cisplatin.
* **Renal stones** in the ureter or bladder
* **Tumour**, either within the tract or pressingon it from another pelvic organ, eg. prostate hypertrophy, bladder cancer, bowel cancer.

**Intra-Renal AKI** – damage to the kidney itself

* **Sustained hypoperfusion**, or exposure to **nephrotoxic agents**

Antibiotics - aminoglycosides, amphotericin. Analgesics - paracetamol, salicylates Ethylene glycol (antifreeze)

* **Autoimmune renal disease** - vasculitis, SLE,interstitial nephritis, glomerulonephritis, etc

**Contact the RPG Secretariat at:-**

UK Renal Pharmacy Group

Renal Association,

Brandon House, Building 2001

Southmead, Bristol

BS34 7RR, UK.

Tel: 01117 4148152.

e-mail: RPG@renal.org



 **www.renalpharmacy.org.uk**

**High Risk Medicines and Actions**

When a patient is admitted with AKI, a thorough review of medication is required:

* To eliminate potential causes / risk / contributory factors for AKI
* To avoid inappropriate combinations of medicines in the context of AKI
* To ensure all prescribed medicines are clinically appropriate

**Review all Medications**

* Remember to check medication history thoroughly and ask about “Over the Counter” preparations, herbal remedies or teas and alternative therapies.
* Check use of recreational drugs (cocaine, ketamine, etc).
* Consider withholding nephrotoxic medications on admission in patients at high risk of AKI
* Ensure that all doses are amended concomitant with the patient’s degree of renal impairment. Re-assess daily until AKI resolves
* Educate the patient before discharge re which medications to restart and when.
* Discuss medicines to avoid in future and “sick day” guidance.
* Ensure information on which medications to restart and when are communicated to the GP or next care setting.



**Acute Kidney Injury (AKI) Medicines Optimisation**

***UK Re*** AKI is a rapid deterioration in a patient’s renal function over hours or days secondary to an acute event.

* 65% of AKI starts in community
* In the hospital setting 20% of acute admissions will develop AKI.
* Up to 30% of all cases of AKI are thought to be due to drugs.
* 5% of inpatients develop drug-induced renal impairment.

Comprehensive guidelines on medicines management and care bundles in patients with AKI can be found at:

**www.thinkkidneys.nhs.uk/aki**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Effects on renal/fluid/electrolyte** | C**hange in the side effect profile when renal** | **Action in presence of AKI** |
|  | **physiology** | **function is reduced** |  |
| **NSAIDs / COX II inhibitors** | Altered haemodynamics within the kidney leading |  | Avoid these agents in people at high risk of AKI |
|  | to underperfusion and reduced glomerular |  |  |
|  | filtration |  |  |
|  |  |  |  |
| **Opioid analgesics** |  | Accumulation of active metabolites in AKI (especially | Avoid long acting preparations. |
|  |  | morphine, pethidine and codeine) – increased | Reduce dose and frequency |
|  |  | incidence of CNS side effects & respiratory depression | Use opiates with minimal renal excretion e.g. fentanyl, |
|  |  |  | oxycodone, hydromorphone, tramadol |
| **Pregabalin & Gabapentin** |  | Accumulation leading to an increase in CNS side | Reduce dose |
|  |  | effects |  |
| **Antihypertensives (Ca-channel blockers,** | Hypotension may exacerbate renal hypo-perfusion | Risk of bradycardia with Beta Blockers | Consider withholding / reduce dose depending on blood |
| a**-blockers,** b**-blockers, etc)** |  |  | pressure |
| **ACEI / ARBs / Aliskiren** | Hypotension |  | In some situations, e.g. heart failure continuing them |
|  | Hyperkalaemia |  | might actually be helpful |
|  |  |  | In AKI consider with holding |
| **Diuretics (Thiazide & Loop)** | Volume depletion | Loop diuretics preferred as thiazides less effective if | If volume depleted, consider with holding |
|  | Acute interstitial nephritis (rare) | GFR < 25ml/min. However thiazides can potentiate |  |
|  |  | the effects of loop diuretics |  |
| **Potassium sparing diuretics amiloride,** | Volume depletion |  | Stop if AKI |
| **eplerenone spironolactone** | Hyperkalaemia |  |  |
| **Statins** | May cause AKI if rhabdomyolysis is present | Increased risk of rhabdomyolysis | Stop if AKI due to rhabdomyolysis, OR if patient develops |
|  |  |  | unexplained / persistent muscle pain |
| **Digoxin** | Hyperkalaemia | May accumulate in AKI leading to bradycardia, visual | Reduce dose |
|  |  | disturbances, mental confusion | Monitor potassium and drug levels |
|  |  |  |  |
| **Direct Oral Anticoagulants** |  | May accumulate leading to increased risk of bleeding | Consider withholding, particularly agents with high renal |
|  |  |  | clearance. |
| **Aciclovir / Valaciclovir** | Crystal nephropathy | Drug accumulates in reduced renal function leading to | Reduce dose |
|  | Acute interstitial nephritis (rare) | mental confusion, seizures | Encourage patient to drink plenty |
| **Aminoglycosides** | Tubular cell toxicity | Ototoxicity | Avoid if possible. If use is unavoidable, reduce dose &/or |
|  |  |  | increase dosing interval. Monitor drug levels and renal |
|  |  |  | function 2 – 3 times per week |
| **Carbapenems** |  | Drug accumulates in reduced renal function leading to | Reduce dosing frequency |
|  |  | mental confusion, seizures |  |
| **Fluconazole** |  | Accumulation leading to acute mental confusion, | Reduce dose |
|  |  | coma, seizures |  |
| **Ganciclovir / Valganciclovir** | Crystal nephropathy | Accumulation leading to neutropenia, anaemia and | Reduce dose |
|  |  | thrombocytopenia | Monitor renal function and full blood count |
| **Vancomycin** | Acute interstitial nephritis (rare) | Accumulation leading to renal toxicity, ototoxicity | Reduce dose / increase dose interval |
|  |  |  | Monitor levels |
| **Trimethoprim** | Increased risk of hyperkalaemia (especially in | Accumulation increases risk of hyperkalaemia | Avoid or reduce dose (particularly if patient is already |
| **Co-trimoxazole** | combination with spironolactone or ACEI/ARB) | (particularly with high doses), nausea and vomiting | taking an ACEI, ARB or spironolactone) |
| **Phenytoin** | Acute interstitial nephritis (rare) | Risk of phenytoin toxicity if patient has low serum | Monitor levels. Correct phenytoin levels for uraemia and |
|  |  | albumin levels | low serum albumin |
| **Hypoglycaemic Drugs** |  | Accumulation in AKI may increase risk of | Avoid long acting preparations |
|  |  | hypoglycaemia | Monitor blood glucose levels & reduce dose if necessary |
| **Metformin** |  | Risk of lactic acidosis increased | Avoid if GFR < 30 ml/min |
|  |  | Accumulation leading to hypoglycaemia |  |