

Prescribing in CKD

Friday 2nd October 2015
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Measuring/Estimating Renal Function

Table 3 – Formulas for estimating glomerular filtration rate*

Cockcroft-Gault ⁵	$\frac{(140 - \text{age}) \times (\text{IBW})}{\text{SCr} \times 72}$
Modified MDRD ^{6†}	$186.3 \times \text{SCr}^{-1.154} \times \text{age}^{-0.203} \times 0.742$ (if female) $\times 1.210$ (if African American)

IBW, ideal body weight; SCr, serum creatinine; MDRD, Modification of Diet in Renal Disease.
 *Age, years; IBW, kg; SCr, mg/dL.
 †An online calculator based on the modified MDRD equation can be found at:

Current CKD Classification Based on Severity and Therapy

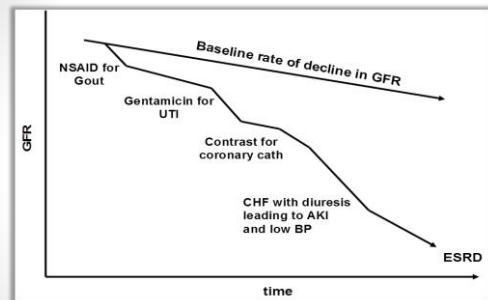
Stage	Description	GFR (ml/min/1.73 m ²)
1	Kidney damage with normal or ↑ GFR <i>clinically significant</i>	≥ 90
2	Kidney damage with mild ↓ GFR	60-89
3	Moderate ↓ GFR <i>for transplant</i>	30-59
4	Severe ↓ GFR	15-29
5	Kidney failure <i>D for dialysis</i>	< 15 (or dialysis)

Factors Affecting Prescribing

- Medications or their metabolites may cause nephrotoxicity
- Increased sensitivity
- Efficacy reduced
- Decreased excretion of parent drug and possible metabolites which have the potential to accumulate, causing toxicity.

Nephrotoxicity and AKI

- Avoided where possible
- Different mechanisms: compromise circulation, cause volume depletion or alter renal haemodynamics, direct glomerular insult
- ACEi ARB Renin Inhibitor Aciclovir Allopurinol Aminoglycosides Ciclosporin Cotrimoxazole Diuretics Lithium NSAIDs Penicillins PPIs Rifampicin Tacrolimus Vancomycin



Fink, et al, AJKD, 2009

Case 1 89yo male

- **Background:**
- Hypertension
- Hypercholesterolaemia
- Atrial fibrillation
- TIA x 2
- Exsmoker
- CKD III, baseline creat 135
- **Medications:**
- Atorvastatin 20mg
- Lercanidipine 10mg
- Warfarin as per INR
- PRN Paracetamol

Case 1 89yo male

- Functional decline in recent months with poor mobility.
- Changed from warfarin to abigatran 110mg bd at patient request
- Presents to ED following a 5 day diarrhoeal illness, with GCS 12/15
- NCCT: massive intracranial haemorrhage with midline shift
- Labs: AoCKI, sCreat 270
- Supportive care

NOACs

Rivaroxiban (xarelto)	Dabigatran (pradaxa)
Factor Xa inhibitor	Direct thrombin inhibitor
Use with caution in elderly	Use with caution in elderly
Use with caution CrCl 15-49 Dose reduce	Use with caution CrCl 30-50 Dose reduce
Ensure renal function stable	Ensure renal function stable
Contraindicated with CrCl <15	Contraindicated with CrCl <30

Case 2: 78 yo male

- **Background:**
- CCF
- Osteoarthritis
- Hypercholesterolaemia
- T2DM
- CKD III, baseline sCreat 150
- **Medications:**
- Metformin 1g bd
- Gliclazide 90mg od
- Aspirin 75mg od
- Valsartan 160mg
- PRN Ibuprofen 400mg bd

Case 2: 78 yo male

- Presents to ED weak and lethargic following 4 day history of diarrhoea and vomiting
- On arrival, BP 80/55mmHg, GCS 13/15
- Labs: Urea 48, Creat 505, K 6.2, PH 7.17, Lac 7

Case 2: 78 yo male

- AKI
- Hypoperfusion
- Volume depletion
- Loss of autoregulation (ACEi/NSAIDs)
- Lactic acidosis secondary to metformin accumulation

NSAIDs

- Decrease renal prostaglandin production
- AKI
- CKD
- Hypertension
- Oedema
- Hyperkalaemia/Type IV RTA
- Acute interstitial nephritis
- Analgesic nephropathy

Metformin

- Renally excreted
- Lactic acidosis rare complication
- Risk factors
 - Renal impairment
 - Tissue hypoperfusion
- Dosing recommendations based on CrCl

60-90	Max 2g daily
30-60	Max 1g daily
<30	Avoid

ACEi/ARB

- Induce efferent arteriolar vasodilatation through blockade of angiotensin II
- When renal perfusion is impaired -> decline in GFR
- Situations:
 - Hypotension
 - Decrease true or effective circulating blood volume
 - Critical RAS
- Measure eGFR prior to initiating ACEi and within 2 weeks after any dose increment
- Do not stop unless eGFR declines >25%
- Do not stop unless K >5.5 mmol/L –
 - consider low-dose K-wasting diuretic
 - dietician

Analgesics

- WHO Analgesic Ladder

1.	Non-opioid +/- adjuvant *Paracetamol *NSAIDs *Adjuvant agents- gabapentin/pregabalin *Lidocaine Patch 5%
2.	Weak opioid +/- non-opioid +/- adjuvant *Tramadol *Codeine
3.	Strong opioid +/- non-opioid +/- adjuvant

Case 3 63yo female

- | | |
|----------------------|--------------------|
| • Background: | • Medications: |
| • ESKD 2 IgAN | • Prograf 2mg bd |
| • CRT 2012 | • MMF 500mg bd |
| • Baseline sCreat 90 | • Prednisolone 5mg |
| • Asthma | • PRN ventolin |

Case 3 63yo female

- Unwell x 2 weeks. Recently prescribed augmentin for LRTI by GP. Nil improvement in symptoms.
- Attends ED - Pyrexial 38.9degrees. BP 105/60mmHg. HR 110bpm. Reduced air entry on auscultation. CXR right midzone consolidation.
- Commenced on clarithromycin and discharged home 3 days later after significant clinical improvement.
- Presents again 2 days later- tremors and nausea.
- Labs: Creat 225, K 6.3, HCO3 19, Tac 13

Immunosuppressants

- Triple therapy
 - Calcineurin Inhibitors
 - Antimetabolites
 - Steroids
- Brand specific and NOT interchangeable

Immunosuppressants

- CNI – prevent activation/proliferation of T cells
- Narrow therapeutic window
- Interactions
- Toxicity
- CYP 450 3A4 Inducers
 - DECREASE Tac/CyA levels -> increasing risk of rejection
 - Phenytoin/rifampicin/isoniazid
- CYP 450 3A4 Inhibitors
 - INCREASE Tac/CyA levels -> toxicity
 - Fluconazole/amiodarone/clarithromycin

Bowel Cleansing

- Safe:
 - lactulose
 - senna
 - movicol
 - microlax enemas.
- PO4 enemas should be avoided -> APN
 - Tubular and interstitial CaPO4 deposits
 - Induce AKI or CKD
 - Timing of insult varies
 - Risk factors

Vaccination

- All CKD patients should be offered annual vaccination with influenza vaccine
- All patients with:
 - eGFR <30ml/min/m2
 - and those at high risk of pneumococcal infection should receive pneumococcal vaccine unless CI.
- Revaccination -5 years.
- Live vaccines - appreciation of patients immune status important

Thank you

