PHA-6020Y

Patient centred medicine from bench to bedside

Workshop ANSWERS

Renal disease

Learning Outcomes

By the end of this workshop you will be able to:

- Use appropriate reference resources to make recommendations for dosage adjustments in renal impairment
- Describe the therapeutic options for the treatment of chronic renal failure
- Identify pharmaceutical problems associated with the treatment of individual patients with renal disease
- Identify the therapeutic and toxic monitoring parameters for the drug used in the treatment of renal disease

Pre-workshop tasks:

- In advance of the workshop please complete **QUESTIONS 1 & 2 FROM CASE 1** (use resources listed below)

Resources

- On Bb:
  - Screencast series on renal disease
  - Note: You are able to access The Renal Drug Handbook online via your UEA library account – please ensure you are able to access this works **prior to the workshop**
    - Extracts from BNF/SPCs/The Renal Drug Handbook will be uploaded after the workshops for reference

CASE STUDY 1 - AKI

Q1 & Q2 TO BE COMPLETED IN ADVANCE OF WORKSHOP

Mr Anthony Brown is a 54 year old male is admitted to hospital at 09:00 this morning with community acquired pneumonia. You are a prescribing pharmacist in the acute medical unit, working alongside a doctor to review Mr Brown.

		Patient:	Mr AB
		Hospital number:	987465
		DoB:	12.1.1970
		Address:	2 Orchard Rise, Flatplace
PMH:	Type 2 DM (10 years) Hypertension (5 years) AF (2 years ago)		
Drug Allergies:	Metronidazole (rash)		
DH:	Perindopril 4mg OD Bisoprolol 2.5mg OD Apixaban 5mg BD Simvastatin 40mg ON Metformin 500mg TDS Gliclazide 40mg OD		
	Buys OTC Ibuprofen 400mg TDS PRN		
PC:	Shortness of breath (SOB), cough and sputum production		
HPC:	1/52 Gradual increase in symptoms above		
OE:	Patient short of breath and coughing up thick green sputum		
	BP:	97/64 mmHg	
	Temperature:	38.2 degrees Celsius	
	Pulse:	67 BPM	
	Weight	70kg	
	Height	170cm	
SH			
Occupation:	Retired teacher		
Alcohol:	6-8 units/week		
Smoking status:	Non-smoker		

BIOCHEMISTRY

Collection LAB No

Today 2696

Potassium **5.1*** 3.6-5.00 mmol/L	Urea **9.7*** 1.7-7.1 mmol/L	Creatinine **270*** 55-125 µmol/L	eGFR **29*** ml/min/1.73m^2		

1. What is Mr AB's CrCl in ml/min and what stage of AKI is he currently in? (Baseline creatinine = 120 µmol/L **/** Baseline eGFR = 20ml/min/1.73m^2)

$$\frac{(140-54) \times 70 \times 1.23}{270}$$

= 27ml/min

AKI Stage 2 as 2-2.9x baseline creatinine

Note: **For UEA workshops/exams always use actual body weight**. In practice IBW may be used in some cases e.g. extremes of muscle mass, but use of ABW/IBW is still debated in practice and varies – see prescribing in renal impairment in the BNF for more information.

2. The doctor wants to prescribe co-amoxiclav IV for Mr AB's CAP. Using the BNF and the renal drug handbook extracts, what are the recommendations for dosing?

BNF	RHB
1.2 g initially, then 600 mg every 12 hours (eGFR 10-30ml/min/1.73m^2)	1.2g every 12 hours (CrCl 10-30ml/min)

Note: In practice we would use RHB dosing.

There is an argument for using a higher dose as their CrCl isn't far from 30ml/min & we are expecting this to improve – drug dependent as to what you would do in practice, for an anti-biotic you may choose to go higher to treat the infection. For UEA workshops/exams stick to resource recommendations but be aware of the practicalities of prescribing in practice.

3. Using the drug chart written in A&E earlier today, prescribe the co-amoxiclav as per your recommendation in Q2. The prescription should start at 18:00 this evening.
   [ANSWER ON DRUG CHART]
   Note: Duration could be between 5-7 days. BNF duration for CAP for PO dosing is 5 days, however as the patient has been hospitalized and needing IVs, 7 days would be acceptable.

4. Using the drug chart, identify any actual and potential pharmaceutical care issues for your patient.
   Using the tables below to help you document the issue(s) and the action(s).
   Where you recommend the patient to start on any **NEW** medication, please also complete details of the monitoring parameters for the new drug, otherwise leave it blank. (the number of boxes below does NOT give any indication to the number of issues to be identified)

Issue	**Action required**
No allergy status	Add allergy status from history onto the chart (also ensure verbal check with patient)
Monitoring parameters	
Therapeutic	**Toxic**
N/A	N/A

Issue	**Action required**
Perindopril prescribed in AKI and hypotensive state	Hold perindopril Monitor renal function & blood pressure. Re-start once AKI and bp resolve due to long term reno protective benefit for T2DM patients.
Monitoring parameters	
Therapeutic	**Toxic**
	BP target <140/90

Issue	**Action required**
Simvastatin not EBM according to guidelines (and over 10mg ON) Note: Would hold in AKI if risk of rhabdomyolysis, in this patient no need to hold necessarily, but may be held while in AKI & unwell as no harm in doing so	Change to atorvastatin 20mg ON as per EBM. No dose reduction required (consider aspirin review as lack of evidence for primary prevention)
Monitoring parameters	
Therapeutic	**Toxic**
Lipid profile – Total cholesterol + LDL + HDL (target >40% reduction in non-HDL cholesterol) Lack of CV event	LFTs, myopathy/muscle pain, creatinine kinase (CK)

Issue	**Action required**
Metformin C/I in CrCl <30ml/min (Note in RHB = 25% of dose if CrCl 10-	Hold metformin and monitor CrCl and blood glucose. Re-start once CrCl >30ml/min.

45ml/min, however in 'other information' states manufacture C/I – appears some debated research however current practice is manufacturer recommendation) No SGTL2I	Once recovered consider initiation of Dapagliflozin 10mg OD as per T2DM guidelines, and when starting dapagliflozin, consider stopping gliclazide, dependent on glucose control, as this may take over glycaemic control with the metformin. No need to hold gliclazide due to AKI as mostly cleared by the liver – in practice high doses may be reduced for safety as a small % is excreted by the kidney/if blood glucose if low or borderline.
Monitoring parameters	
Therapeutic	**Toxic**
Blood glucose (4-7mmol/L) HbA1c (target 48mmol/mol)	Blood glucose <4mmol/L Counsel patient regarding: MHRA warning for Fournier's Gangrene (keep genital area dry/clean and be aware of symptoms such as itching and irritation that indicate infection) Sick day rules – hold while acutely unwell particularly in D&V (provide with patient information leaflet linked on Bb for information)

Issue	**Action required**
Apixaban should be reduced to 2.5mg BD as CrCl 15-29ml/min.	Reduce dose to 2.5mg BD. Monitor CrCl and increase back to 5mg BD dosing once AKI resolved. If worsens below 15ml/min then switch to LMWH.
Monitoring parameters	
Therapeutic	**Toxic**
Lack of CVA	Hb, bleeding signs, ORBIT score

Issue	**Action required**
Ibuprofen OTC – can cause AKI, MHRA advise avoid in renal impairment where possible	Stop taking ibuprofen PRN, can cause AKIs by pre-renal route (reduced perfusion) or intrinsic AKI if severe acute reduced perfusion (acute interstitial nephritis). Prescribe paracetamol PRN as a replacement for pain management. (500mg-1g QDS PRN, or 1g QDS PRN would be acceptable dosing for this patient)
Monitoring parameters	
Therapeutic	**Toxic**
Pain score	Weight (<50kg reduce dose) Liver impairment (reduce dose)

5. **Once you have confirmed the care issues with a facilitator,** amend the drug chart accordingly to carry out your actions.
   [ANSWERS ON DRUG CHART]
   Note: You do not have to demonstrate changes exactly as shown, as long as you have made your changes clear e.g. 'Hold, signed & dated' from the next dose, so there is no chance a nurse would give the next dose + your details are on the front page as a prescriber so that who your signature belongs to is clear.

CASE STUDY 2 – CKD

Ms Ali Rai is a 64 year old female with CKD stage 5 who is starting on dialysis. She will be having haemodialysis three times a week and her history is below. You are a non-prescribing pharmacist at the clinic reviewing Ms Rai.

	Patient:	Ms Ali Rai
	Hospital number:	746209
	DoB:	20.01.1960
	Address:	17 Oak way, Flatplace
PMH:	NSTEMI (10 years ago) Hypertension (20 years ago) CKD stage 5 (2 years ago) ACR = 73mg/mmol	
Drug Allergies:	NKDA	
DH:	Aspirin 75mg OD Atorvastatin 80mg OD Bendroflumethiazide 2.5mg OD Bisoprolol 5mg OD Ramipril 5mg OD	
	BP:	165/95 mmHg
	Pulse:	65 BPM
	Weight	67kg
	Height	165cm

1. For each of the following drugs, check both the SPC and Renal Drug Handbook and document in the tables below the dosing advice given in each resource.

Drug: Aspirin	
SPC	**RHB**
C/I in severe renal impairment	Dose as in normal renal function

Drug: Ramipril	
SPC	**RHB**
Slightly dialysable. Initial dose 1.25 mg/day and the maximal daily dose is 5 mg; should	Initial dose 1.25 mg daily and increase according to response.

be administered few hours after haemodialysis is performed.	

Note: 'dialysable' = capable of diffusing through dialysis membrane

Drug: Bendroflumethiazide	
SPC	**RHB**
Use with caution in renal impairment (severe renal insufficiency is a contraindication to use)	Unlikely to work.

Note: From teaching - ineffective CrCl<30ml/min (BNF 01.24)

Drug: Atorvastatin	
SPC	**RHB**
No adjustment of dose is required	Not dialysed. Dose as in normal renal function

Drug: Bisoprolol	
SPC	**RHB**
In patients with severe renal impairment (CrCl <20ml/minute), the dose should not exceed 10mg once daily.	Dose as in normal renal function

Provided below are Ms Rai's pre-dialysis blood test results.

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Collection LAB No

Today 2696

Urea	Creatinine	Hb	Ferritin	eGFR	
39*	**568***	**8.4***	**54***	**10***	
1.7-7.1	55-125	13.0-18.0			
mmol/L	µmol/L	g/dL	µg/L	ml/min/1.73m^2	

2. Using the results above, what treatment would you recommend giving to Ms Rai prior to dialysis treatment and why? Please include in your answer any toxic or therapeutic monitoring parameters for new medication recommended.

- Reduced Hb due to low erythropoietin levels in the blood, causing less RBC proliferation in the bone marrow.
  Treat with IV recombinant human erythropoietin e.g. Eprex 50units/kg 3x weekly (maintenance 75-300units/kg weekly).
  Target: Hb 100-120g/L.
  Toxic: Hb >120g/L (can lead to CV events & clots), joint pain, high bp (dose-dependent)

- Reduced ferritin – low iron stores due to mainly reduced absorption, **need to replace this first** for epo injection to be effective.
  IV iron therapy e.g. Ferinject (indicated when <200mcg/L)
  Target: Ferritin 200-500mcg/L
  Toxic: high bp, skin, anaphylaxis, hypophosphataemia

3. Post- dialysis, Ms Rai's bp is 150/92. Using the information provided, including your answers to Q1, critique the management of Ms Rai's hypertension. Any new medication proposed should have toxic and therapeutic monitoring parameters written.

Target <130/80 mmHg as CKD, HTN and ACR >70mg/mmol

Bendroflumethiazide contra-indicated – stop.

Ramipril – 5mg max dose in SPC, no max dose in RDHB. Check how pt is tolerating, check toxic parameters e.g. potassium, before up-titrating if able to tolerate. Note: not concerned over effects on CrCl as already ESRF.

Add in CCB e.g. amlodipine 5mg OD (BP target <130/80mmHg, toxic parameters: ankle oedema, dizziness, headaches)

Note: SGTL2 inhibitor – not in this patient as CKD5 would be under the guidance of eGFR 25-75 at start of treatment

4. Using your answers to questions 2 and 3, fill in the below SBAR form.

SITUATION	e.g. I am (x) from (x). I am reviewing (x) and need to discuss issues (x) … I am (student name) a pharmacist in clinic today. I am reviewing one of our patients named Ali Rai and would like to a discuss a few issues I have found with you.
BACKGROUND	e.g. (x) is an (x) patient. Their last set of observations/blood tests were (x). Ms Rai is a CKD stage 5 patient starting their first haemodialysis session today. In their pre-dialysis bloods, they have a low haemoglobin and low ferritin, and their blood pressure remained high after dialysis at 150/92.
ASSESSMENT	e.g. I think the problem is (X) These results suggest Ms Rai is experiencing renal anaemia and needs replacement erythropoietin and iron therapies. Also, as her blood pressure target would be <130/80 I suggest we optimise her anti-hypertensive therapies to help bring this under control.
RECOMMENDATION	e.g. I recommend that we (x) with a target of (x) and follow up (x) I would recommend that we give 1g of Ferinject IV then start Eprex at 50units/kg three times a week and titrate to a maintenance weekly dose. To control her blood pressure, I recommend that we stop her bendroflumethiazide as this will be ineffective at this stage of CKD. Also, I recommend we up titrate her ramipril to 7.5mg OD or add in a calcium channel blocker, such as amlodipine 5mg OD, with follow up in a weeks' time to assess her blood pressure control.

CASE STUDY 3 - CKD

Mx Kai Harrison, aged 66 (DOB: 22.01.1958, address: 12 Flatplace Gardens, Flatplace, FP6 7NQ) has CKD stage 5 and receives haemodialysis 3 times a week. They are visiting the clinic for their dialysis and are complaining of severe itching. You are a prescribing pharmacist reviewing their recent blood test results and clinical observations.

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Collection LAB No

Today 2696

eGFR **10*** ml/min/1.73m^2	Corrected calcium **1.98*** 2.1-2.6 mmol/L	Phosphate **2.45*** 0.8-1.45 mmol/L			

1. Using the test results above, explain why their calcium and phosphate are out of range, and how this should be managed. For any new medications recommended, include any therapeutic and toxic monitoring parameters.

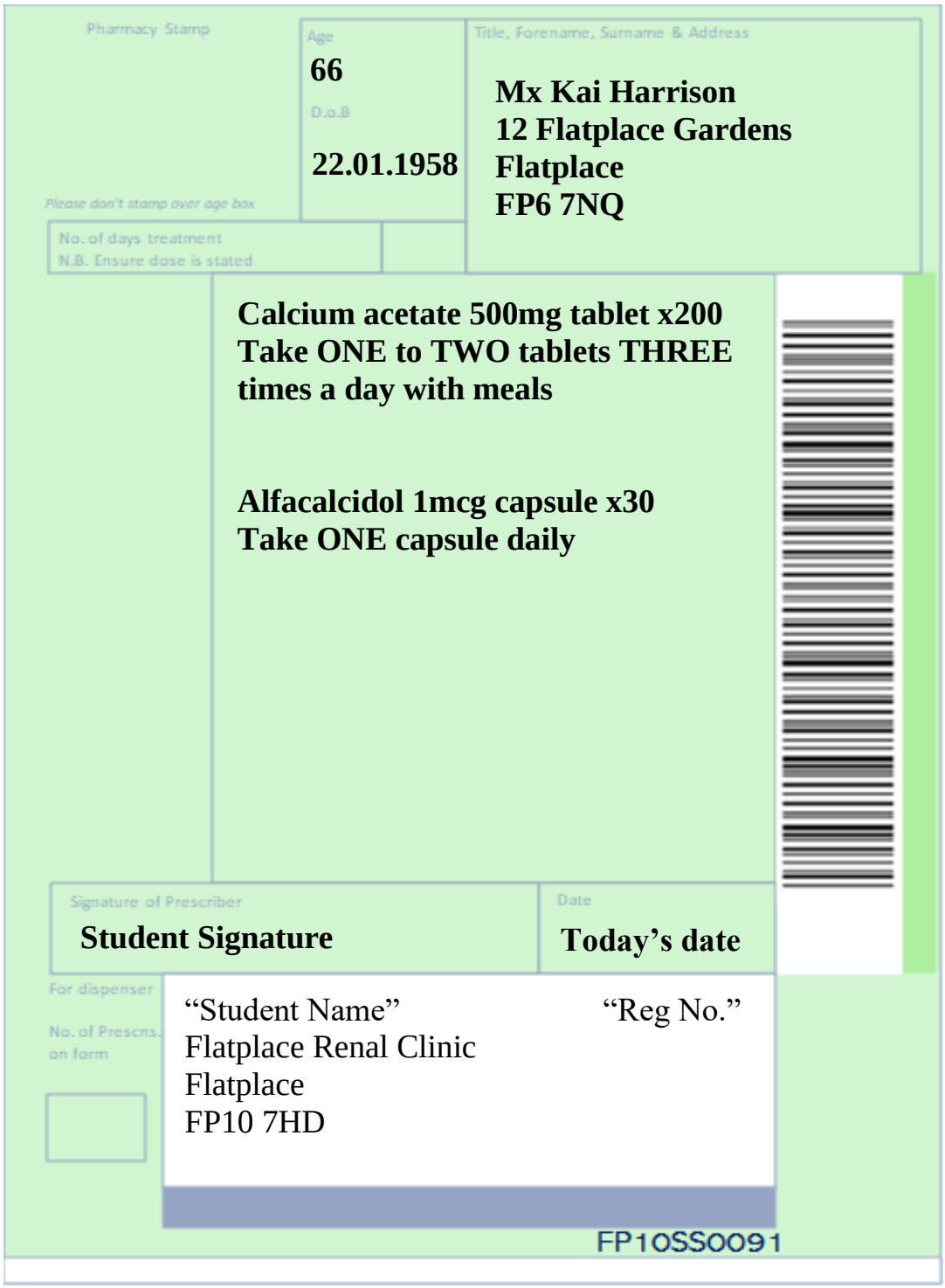
- Raised phosphate levels (hyperphosphataemia) due to kidneys inability to excrete phosphate
  Prescribe a phosphate binder e.g. calcium acetate 1-2 tablets three times a day with meals, dose depending on meal size
  Therapeutic: Phosphate target 1.1-1.7mmol/L in dialysis patients, pruritis control
  Toxic: GI side effects (constipation/nausea/diarrhoea), Hypercalcaemia (>2.6mmol/L)

NOTE: If pruritis management mentioned, creams/gabapentinoids/antihistamines can be used off-label but no NICE guideline. Jan 2024: Approval of Difelikefalin for pruritis in CKD patients on haemodialysis – activating opioid K receptors. STUDENTS DO NOT NEED TO KNOW PRURITIS TREATMENTS & WILL NOT BE EXAMINED ON, THIS IS FOR INFORMATION ONLY (this is stated in screencasts also)

- Reduced calcium level (hypocalcaemia) due to low activated vitamin D levels, and a high level of sequestering by phosphate.
  Prescribe activated vitamin D or partially activated vitamin D (e.g. alfacalcidol 1mcg OD)
  Target corrected calcium 2.2-2.6mmol/L
  Toxic: Calcium >2.6mmol/L, abdominal pain, nausea

- Counselling for all new drugs – indication, dose, frequency, side effects
  Details for individual medication
  AVOID OTC: NSAIDs

2. Using your answer to Q1, write the appropriate prescription(s) for Mx Harrison. You are prescribing at Flatplace Renal Clinic, Flatplace, FP10 7HD.



Pharmacy Stamp

Age
66

D.o.B
22.01.1958

Please don't stamp over age box

Title, Forename, Surname & Address

Mx Kai Harrison
12 Flatplace Gardens
Flatplace
FP6 7NQ

No. of days treatment
N.B. Ensure dose is stated

Calcium acetate 500mg tablet x200
Take ONE to TWO tablets THREE times a day with meals

Alfacalcidol 1mcg capsule x30
Take ONE capsule daily

Signature of Prescriber
Student Signature

Date
Today's date

For dispenser

No. of Prescns. on form

"Student Name" "Reg No."
Flatplace Renal Clinic
Flatplace
FP10 7HD

FP10SS0091

The next week, you are reviewing Mx Harrison's pre-dialysis blood tests at the clinic.

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Collection LAB No

Today 2696

Corrected calcium 2.4 2.1-2.6 mmol/L	Phosphate **2.15*** 0.8-1.45 mmol/L				

3. Using the blood test results above, what pharmaceutical issue(s) can you identify and what action(s) would you take? For any new medications, state any therapeutic and toxic monitoring parameters.

Phosphate remains high despite treatment

- Check adherence, phosphate binders notorious for low adherence due to tablet burden & GI side effects
- If poor adherence – counsel & encourage adherence if they are able to tolerate
- If they cannot tolerate/have good adherence but ineffective – use alternative e.g. Sevelamer 800mg, 3-6 tablets TDS (2.4-4.8g daily in 3 divided doses)
  Therapeutic: Phosphate target 1.1-1.7mmol/L in dialysis patients, pruritis control
  Toxic: GI side effects (constipation/nausea/diarrhoea)

Don't forget diet – referral to renal dieticians for dietary advice & lowering intake of high phosphate (Note: students are not expected to know any more detail than this regarding dietary advice)