

# Drugs used in kidney disease

Dr.Nathasha Luke

- Drug treatment of urinary tract infection
- Drugs used in acute renal failure
- Drugs used in chronic renal failure
- Drugs used in renal transplant recipients
- Drugs in the treatment of glomerulonephritis

# Drug treatment of UTI

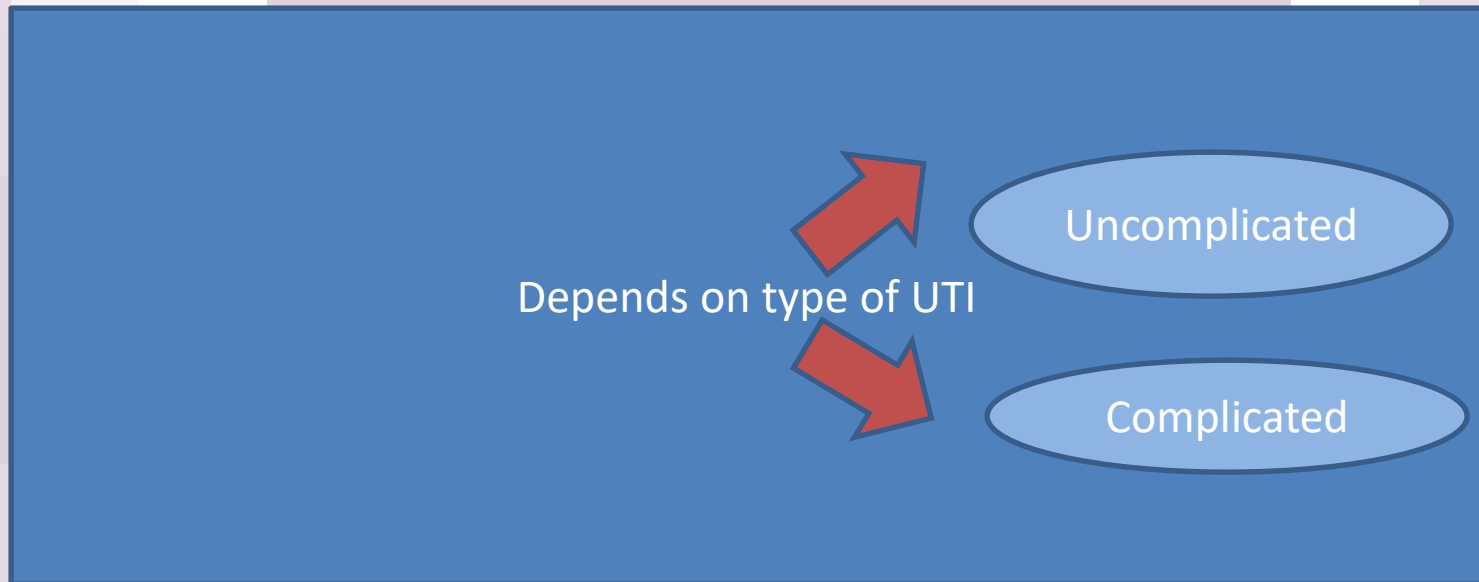
- Principles of management of UTI
  - hydration
  - relieve obstruction
  - remove foreign body
  - antibiotics

# Antibiotics in UTI

- Empirical treatment –change according to culture and ABST results
- Drugs should not cause further deterioration of renal function

# Antibiotics in UTI

- What antibiotic?
- Duration of treatment?



# Antibiotics in UTI

Uncomplicated UTI(cystitis)	Complicated UTI
Antibiotics/urinary antiseptics	Antibiotics used/urinary antiseptics not effective
Oral	Systemic
Short courses	Might need prolonged courses
Relatively small doses	

# Antibiotics in UTI

What are urinary antiseptics?

- Most antibiotics are highly concentrated in the urine and therefore are very effective at clearing bacteria from the urinary tract.
- However, in cases of pyelonephritis, prostatitis or epididymitis, proper tissue antibiotic concentrations are important.



# Uncomplicated UTI-treatment

- First line-
  - coamoxyclav(amoxycillin+ clavulinic acid)
  - nitrofurantoin
  - Trimethoprim/co-trimoxazole
  - 1<sup>st</sup> generation cephalosporin
- 3-5 day courses
- Amoxycillin-high resistance rates-so not for empirical treatment
- Quinolones –not for lower tract infections

# Complicated UTI-treatment

- **Acute pyelonephritis**

- Empiric parenteral treatment

- Drugs

Ampicillin plus gentamycin

third-generation cephalosporin-cefotaxime

Quinolones -ciprofloxacin

- Switch from parenteral to oral therapy at 48 hours  
after clinically well

- Treat for 14 days.

# ***Asymptomatic bacteriuria***

- Generally, does not need treatment, except in pregnancy.
- Treatment is not indicated in the elderly (20 - 40% incidence) and patients on catheterization (90% incidence)

- ***Acute pyelonephritis with intrarenal, perirenal or pararenal abscess***

-Treatment as for complicated UTI and appropriate drainage.

- ***Epididymitis/Acute bacterial prostatitis***

-Co-trimoxazole or fluoroquinolones for at least 3 -4 weeks to obtain adequate tissue levels.

# UTI in pregnancy

- Cephalosporins
- nitrofurantoin-avoid near term

AVOID- trimethoprim, sulphonamides,  
quinolones, aminoglycosides

# Drugs used in Chronic renal failure

# Principals

- Delay/halt further progression
- Treating symptoms and pathological manifestations
- Timely planning of renal replacement therapy

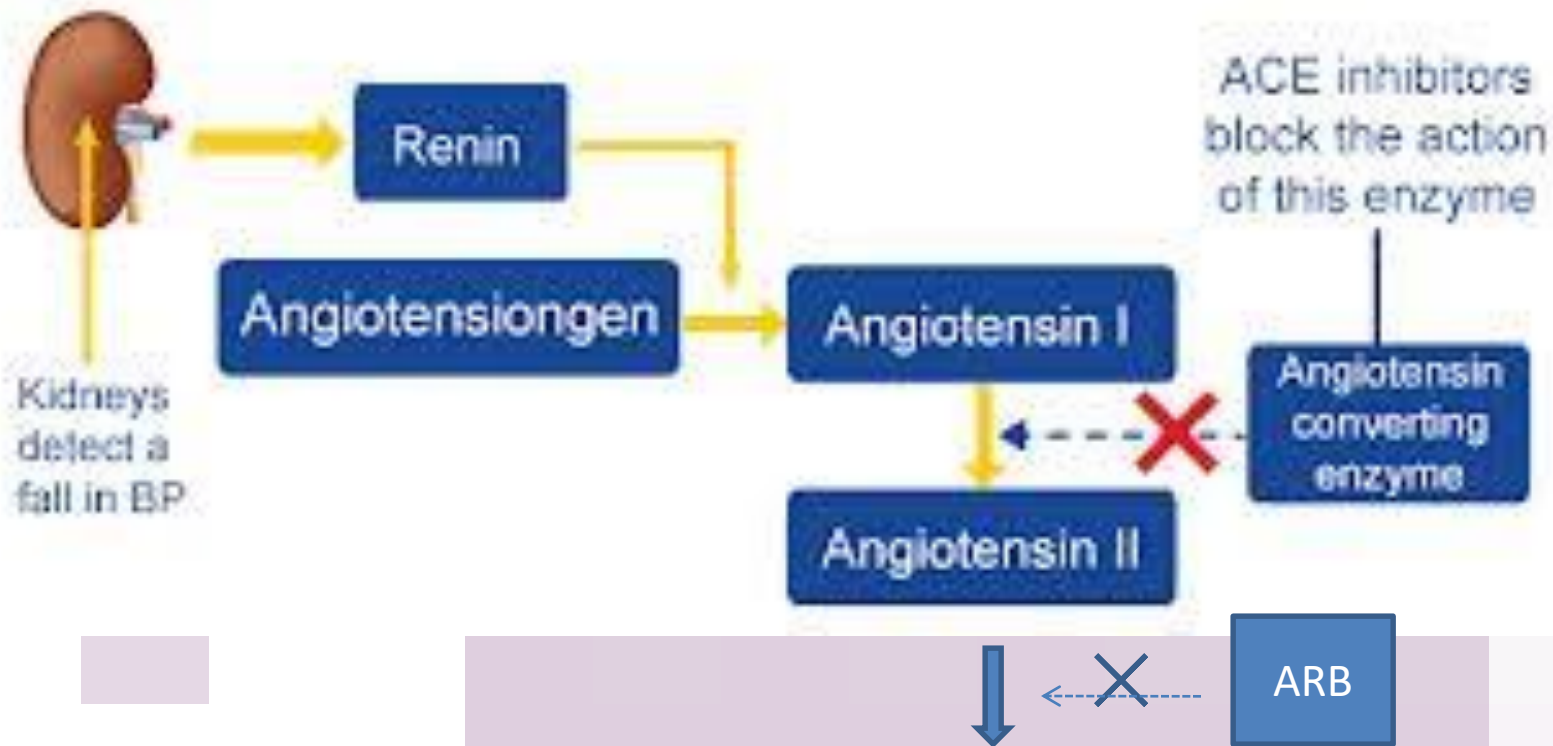
# Delay/halt further progression

- Treatment of the underlying condition if possible
- Aggressive blood pressure control
- Treatment of hyperlipidemia
- Glycemic control
- Avoidance of nephrotoxins-IV contrast media, NSAIDs, aminoglycosides
- **Use of angiotensin-converting enzyme inhibitors (ACEIs) or angiotensin-receptor blockers (ARBs) in patients with proteinuria and/or diabetic nephropathy**



# ACEI/ARB mechanism of action

## Renin Angiotensin Aldosterone System



# ACEI/ARB in CKD

- Reduces proteinuria
- Reduces blood pressure
- Reduces progression of CRF
- Reduces mortality
- Reduces likelihood of long term dialysis

Reduced GFR



Activation of Renin-angiotensin axis



Constriction of afferent and efferent arteriole (efferent > afferent) to maintain glomerular perfusion pressure



Increased intraglomerular pressure

Decreased renal perfusion

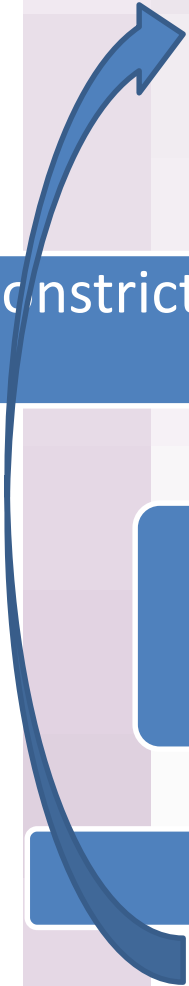
Peritubular and interstitial hypoxia



Loss of peritubular capillaries and scarring



Worsening of renal failure



Reduced GFR



Activation of Renin-angiotensin axis



ACEI/ARB

Constriction of afferent and efferent arteriole



Increased intraglomerular pressure

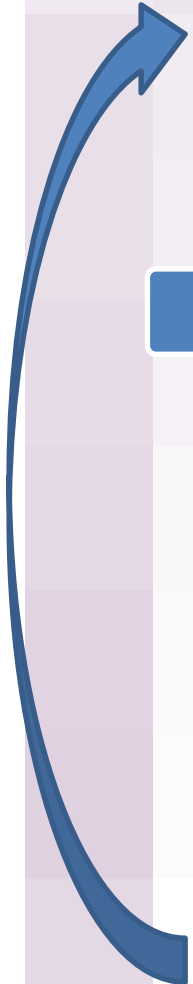
Decreased renal perfusion  
Peritubular and interstitial hypoxia



Loss of peritubular  
capillaries and scarring



Worsening of renal failure



# ACE inhibitors and ARB

- Should use cautiously
- It may result in declining of renal function at the initiation of therapy
- Should monitor for hyperkalemia

# Treating symptoms and pathological manifestations

- Anemia
- Hypertension
- Fluid overload
- Nausea/ vomiting
- Hyperphosphatemia
- Hypocalcemia
- Hyperparathyroidism
- Metabolic acidosis
- Growth failure in children

# Treating symptoms and pathological manifestations -Anemia

erythropoietin

+/- Fe therapy

+/- folic acid/vit B12

# Erythropoietin

- A large glycoprotein
- Oral administration ineffective
- Given IV or SC injection
- Start when Hb  $<10\text{g/dl}$ ; Target : Hb 10-12g/dl
- Must replenish iron stores before starting treatment
- Monitor Fe status after starting treatment



# Erythropoietin - Adverse effects

- hypertension 20-30%
- vascular thrombosis
- flu like symptoms
- encephalopathy and fits

# Treating symptoms and pathological manifestations

- Anemia
- Hypertension
- Fluid overload
- Nausea/ vomiting
- Hyperphosphatemia
- Hypocalcemia
- Hyperparathyroidism
- Metabolic acidosis
- hyperkalaemia

Renal  
osteodystrophy

# Renal osteodystrophy

- **oral phosphate binders**
  - Ca carbonate
  - Ca acetate
  - Al hydroxide
  - Mg sulphate, Mg carbonate

Take With food

Binds phosphate in the gut

# Renal osteodystrophy

- Ca supplementation
  - Ca carbonate, Ca acetate
- Vitamin D
  - Conventional vitamin D ineffective
    - Calcitriol (1alpha, 25-dihydroxycholecalciferol)
    - Alphacalcidol (1alpha-hydroxycholecalciferol)

# Treating symptoms and pathological manifestations

- Fluid overload – loop diuretics eg. frusemide
- Nausea, vomiting – antiemetics  
eg. metoclopramide,  
domperidone

# hypertension

- Hypertension
    - **ACEI / ARB : drug of choice**
    - CCB (non-dihydropyridine)
    - beta blockers
    - alpha blockers
- } reduce proteinuria

Diuretics are ineffective

# Treating symptoms and pathological manifestations

- Hypertension- antihypertensives
- Fluid overload-diuretics
- Nausea/ vomiting
- Hyperphosphatemia
- Hypocalcemia
- Hyperparathyroidism
- Metabolic acidosis
- hyperkalaemia

# Hyperkalaemia

## A medical emergency

- Ca gluconate

10% Ca gluconate 10 ml IV over 10min  
reduces excitability of cardiac membranes

No effect on serum K<sup>+</sup> level

Acts quickly (within 10-15 minutes)

- Insulin

10U soluble insulin + 50ml 50% glucose IV over 5-10 min

Insulin : stimulates Na<sup>+</sup>/K<sup>+</sup> ATPase in muscle & liver  
Transports K<sup>+</sup> into cells → lowers serum K<sup>+</sup>

Action in 30-60min



# Hyperkalaemia

- Nebulized Salbutamol : shifts  $K^+$  into cells
- Cation exchange resins :
  - Na / Ca polystyrene sulphonate (Resonium)
  - Adsorbs  $K^+$  into gut lumen
  - Onset of action 4 hrs
  - For maintenance therapy

# Acidosis

- Acute severe - 8.4% Na HCO<sub>3</sub><sup>-</sup> (1ml = 1mmol)

IV

- Chronic - Na HCO<sub>3</sub><sup>-</sup> PO -daily

# Drugs used in post kidney transplant patients

# Drugs used in post KT patients

- Immunosuppressives are used to prevent rejection
  - Used in combination
  - Agents used are
    - ciclosporin
    - azathioprine
    - prednesolone
    - tacrolimus
    - mycophenolate mofetil
- } newer agents

# Drugs used in post kidney transplant patients

## Adverse effects

- Azathioprine
  - BM suppression
  - Hepatotoxicity
  - Increased incidence of infections particularly viral
- Ciclosporin
  - nephrotoxicity
  - hypertrichosis
  - hypertension

# Drugs used in Glomerulonephritis

# Drug treatment of Glomerulonephritis

- Depends on the type of GN.
- Specific Rx
  - Corticosteroids  
(oral prednisolone, IV methylprednisolone)
  - Cyclophosphamide oral / IV
  - Ciclosporin
  - Chlorambucil
- Rx of hypertension : ACEI are preferred
- Rx of fluid over load : thiazide / loop diuretic

