Renal Case Studies

Objective
- Importance of renal issues in rural general practice
- Approach to some important renal issues
- Introduce some useful clinical (renal) resources

Method
- Voluntary interactive approach using MCQs
- Most questions have more than one answers
- Interrupt me if you have a burning question

Kidney disease – a ‘reputed’ killer

1:3 population at risk
1:7 population have CKD
1:1400 have ESRD (Dx / Tx)
End stage renal failure: the ‘escalating scourge’

What is Chronic kidney disease?
- GRF < 60mls/m²/1.73m² for ≥ 3 months with or without evidence of renal damage
- Evidence of renal damage with or without decrease in GFR for ≥ 3 months
  - Microalbuminuria
  - Proteinuria
  - Glomerular haematuria
  - Structural abnormalities e.g. Scar in ultrasound scan
  - Pathological abnormalities e.g. Abnormal renal biopsy

Functions of kidney
- Excretion of waste products
- BP regulation
- Water balance
- Electrolyte balance
- Acid base balance
- Divalent ion balance
- Endocrine functions
- Erythropoiesis
- Others

Components of Excretion
- Filtration
- Reabsorption
- Secretion
- Excretion

Urine output is not a reliable marker of Renal failure

Creatinine clearance vs Serum Creatinine

Creatinine clearance: ml/m²
**MDRD Study:** Modification of diet in renal disease study

**eGFR**

**Stages & Priorities in CKD**

<table>
<thead>
<tr>
<th>Stage</th>
<th>GFR</th>
<th>Priorities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>90</td>
<td><em>Cardiovascular Risk</em>&lt;br&gt;Proteinuria, Hematuria&lt;br&gt;Hyperlipidemia&lt;br&gt;RR (RISK OF Worsening CKD)&lt;br&gt;<em>BP</em>&lt;br&gt;Proteinuria&lt;br&gt;<em>Smoking</em>&lt;br&gt;Life Style changes</td>
</tr>
<tr>
<td>Stage 2</td>
<td>50-89</td>
<td><em>Cardiovascular Risk</em>&lt;br&gt;Proteinuria, Hematuria&lt;br&gt;Hyperlipidemia&lt;br&gt;RR (RISK OF Worsening CKD)&lt;br&gt;<em>BP</em>&lt;br&gt;Proteinuria&lt;br&gt;<em>Smoking</em>&lt;br&gt;Life Style changes</td>
</tr>
<tr>
<td>Stage 3</td>
<td>30-49</td>
<td><em>Cardiovascular Risk</em>&lt;br&gt;Proteinuria, Hematuria&lt;br&gt;Hyperlipidemia&lt;br&gt;RR (RISK OF Worsening CKD)&lt;br&gt;<em>BP</em>&lt;br&gt;Proteinuria&lt;br&gt;<em>Smoking</em>&lt;br&gt;Life Style changes&lt;br&gt;Preparation for Tx&lt;br&gt;Nephro Referral in DM</td>
</tr>
<tr>
<td>Stage 4</td>
<td>15-29</td>
<td><em>Cardiovascular Risk</em>&lt;br&gt;Proteinuria, Hematuria&lt;br&gt;Hyperlipidemia&lt;br&gt;RR (RISK OF Worsening CKD)&lt;br&gt;<em>BP</em>&lt;br&gt;Proteinuria&lt;br&gt;<em>Smoking</em>&lt;br&gt;Life Style changes&lt;br&gt;Nephro Referral in DM&lt;br&gt;Preparation for Tx&lt;br&gt;Rx complications</td>
</tr>
<tr>
<td>Stage 5</td>
<td>&lt;15</td>
<td><em>Cardiovascular Risk</em>&lt;br&gt;Proteinuria, Hematuria&lt;br&gt;Hyperlipidemia&lt;br&gt;RR (RISK OF Worsening CKD)&lt;br&gt;<em>BP</em>&lt;br&gt;Proteinuria&lt;br&gt;<em>Smoking</em>&lt;br&gt;Life Style changes&lt;br&gt;Nephro Referral in DM&lt;br&gt;Preparation for Tx&lt;br&gt;Rx complications&lt;br&gt;Complications of RRT</td>
</tr>
</tbody>
</table>

**Mr. GT**

- 35-year old man
- Headache off and on over x 6 m
- No CVS, RS, GI, NS history
- Wt: 102Kg BP: 160/100 mm Hg
- Other Physical exam: Negative
- Family history of HTN +

**1. What is the target blood pressure?**

A. 140/90 mm Hg
B. 130/80 mm Hg
C. 125/75 mm Hg
D. The lower the better

**Lancet:** 2002, 360, 1903-13
AHA Statement on Rx of HTN - 2007

<table>
<thead>
<tr>
<th>Area of Concern</th>
<th>BP Target</th>
<th>Lifelong Management</th>
<th>Specific Drug Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>General CVD prevention</td>
<td>&lt;140/90</td>
<td>Yes</td>
<td>Any effective antihypertensive drug or combination</td>
</tr>
<tr>
<td>High CVD risk</td>
<td>&lt;130/80</td>
<td>Yes</td>
<td>ACE or ARB or CCB or thiazide diuretic or combination</td>
</tr>
<tr>
<td>Stable angina</td>
<td>&lt;130/80</td>
<td>Yes</td>
<td>β-blocker and ACE or ARB</td>
</tr>
<tr>
<td>UA/NSTEMI</td>
<td>&lt;120/80</td>
<td>Yes</td>
<td>β-blocker</td>
</tr>
<tr>
<td>STEMI</td>
<td>&lt;120/80</td>
<td>Yes</td>
<td>β-blocker or patient in hemodynamically unstable and ACE or ARB</td>
</tr>
<tr>
<td>LVD</td>
<td>&lt;120/80</td>
<td>Yes</td>
<td>ACE or ARB and β-blocker and anticoagulants (inpatient and discharge) and hydrazine/verapamil/β-blockers (inpatient)</td>
</tr>
</tbody>
</table>


2. Should we investigate him for secondary HTN?
A. Exhaustive investigations as he is young
B. No, because of +ve family history
C. Basic investigations for sec HT, if -ve Rx HTN
D. Investigations only if HTN persistent after 3 m

Mr. GT (35/M)

Prevalence of secondary HTN in various age groups

< 15 years
15 - 18 years
Adults

Secondary HTN
Essential HTN

When to suspect secondary HTN?
- Resistant hypertension
- HTN onset < 30 yrs, esp. < 18 yrs or > 50 yrs
- Acute worsening in previous stable BP control
- Negative family history
- Specific clinical features

Important causes of Secondary hypertension
- Structural: Coarctation of Aorta
- Renal vascular
  - Renal artery stenosis
  - Polycystic kidneys
- Endocrine:
  - Phaeochromocytoma
  - Glomerulonephritis
  - Cushing’s syndrome
  - Hyper PTH
- Drugs:
  - Oral contraceptives
  - Cyclosporin
- Obstructive sleep apnoea

3. What tests would you order at this stage?
A. Urinalysis, FBC, EUC, CMP, BSL
B. Ultrasound abdomen and renal artery Doppler
C. 24-hour urinary catecholamines
D. CT scan abdomen + CT renal angiogram

Mr. GT (35/M)
Work up of Secondary hypertension

**BASIC**
- Urinalysis
- Chemistry: BSL, EUC, CMP, TSH
- Imaging: CXR, US scan Abdo, Renal Doppler, 2-D Echocardiogram
- ECG
- 24-hr urine Catecholamines

**ADVANCED**
- Endocrine tests: stimulation / suppression tests
- Imaging: CTRA, MRA
- Invasive: Adrenal vein Aldo: Cortisol ratio, Renal vein renin

---

**Mr. GT (35/M)**
- U Prot: ++, WBC:100, RBC: 100
- BSL: 10.3, Creat: 105, eGFR: 59 K: 4.3
- Alb: 35, Chol: 6.5, Trig: 2.5
- Hb: 115, ESR: 85
- US Scan: normal sized kidneys, normal renal artery Doppler

---

4. What is the next step?

A. Urine culture, Abx only if +ve culture
B. Empirical Abx, repeat urinalysis after 1 wk
C. 24-hour urinary protein, HbA1c
D. Urgent referral to renal physician

---

**Urine microscopy: Red cells & white cells**

- Menstrual contamination
- Urinary infection
- Glomerulonephritis
- Interstitial nephritis

Presence of protein makes nephritis very likely

---

**Indications for nephrology referral**

- Any one with eGFR < 30mls/mt
- Diabetics with eGFR < 60mls/mt
- Rapid decline in renal function (>15% ↓ over 3m)
- Proteinuria > 1g/day
- Active urinary sediment
- Renal impairment with anaemia
- Uncontrolled hypertension
Mr. GT (35/M)

- 24-hour U Prot: 1.4g/day
- HbA1C: 7.5%
- Urinary catecholamines: negative

Local nephrologist is away for 2 months.
Second nearest nephrologist is 600 km away.

5. This is unlikely to be diabetic nephropathy because ...
   A. No long history of diabetes
   B. No evidence of diabetic retinopathy
   C. Ultrasound scan shows normal kidneys
   D. Urine microscopy is not compatible

Mr. GT (35/M)

Natural history of diabetic nephropathy

Diabetic nephropathy is present in 7% Type 2 diabetics at diagnosis

Microvascular complications in type I DM


6. Which of the following are appropriate?
   A. Await elective renal appointment after 3m
   B. Rush patient to nephrologist 600 km away
   C. ANA, ANCA, Compliments, IgA levels, Cryo
   D. Repeat EUC every 2 weeks for 1 month
### Types of glomerulonephritis
- **Primary**
  - Ig A nephropathy
  - Post-infectious
  - Other types
  - Rapidly progressive glomerulonephritis
    - Goodpasture's syndrome
    - Wegener's granulomatosis
    - Immune complex disease
- **Secondary**
  - Lupus nephritis
  - Vasculitis
  - Other types

### ‘Warning signs’ in a patient with nephritis
- Nephrotic proteinuria and nephrotic syndrome
- Severe hypertension
- Renal impairment at presentation
- Progressive renal impairment (RPGN)
- Systemic symptoms and signs

### 7. Which medications are appropriate at this stage
- **A. Metformin**
- **B. Insulin**
- **C. ACE inhibitors**
- **D. Prednisolone**

### Anti-diabetic treatment and renal disease
- Insulin used in many patients
  - Weight gain is the main issue
- Oral hypoglycaemics come with strings:
  - Metformin → not advisable if creatinine > 150umol/l
  - TZD (Pioglitazone/Roziglitazone) → fluid retention
  - Sulfonylureas & meglitinides → ↑ risk of hypo, but OK
  - Acarbose → drug levels high? avoid

### Both glycaemic & BP control are important in T2DM.
Is one of them more important?

#### Renal actions of Angiotensin II
“Efferent arteriolar constriction” & “intra-glomerular hypertension”
ACE Inhibition in chronic kidney disease

- Diabetic nephropathy with microalbuminuria
- Diabetic nephropathy with overt proteinuria
- Diabetic nephropathy with renal impairment
- Non-diabetic renal diseases with proteinuria
- Non-diabetic proteinuric CKD with renal impairment
- ? Modification of cardiovascular risk...

Cardiac outcomes with ACE inhibitor in ‘high CV risk’ patients

- CV Deaths
- Death from all causes
- Acute MI
- Revascularization
- Cardiac arrest
- CHF
- Diabetic complications

N = 9297
Follow up: 5 years


8. When to repeat EUC after starting ACE inhibitors?

A. 1 week
B. 2 weeks
C. 3 weeks
D. 4 weeks

- Expect up to 20% rise of Creatinine
- K < 6.0mmol/l is safe WHEN creatinine is not very high

- 55 mm Hg
- 110 mm Hg
- 50 mm Hg

Angiotensin II
8. Has the blood pressure target changed?

A. 140/90 mm Hg  
B. 130/80 mm Hg  
C. 125/75 mm Hg  
D. The lower the better

Mrs. LH

- 70 year old lady
- Constant headache since adolescence
- Chronic back pain since adulthood - NSAIDs
- Long (~ 10 years) use of BEX powder in past
- Recurrent (6 – 7/year) ‘bladder infections’
- Hypertension x 10 years

Mrs. LH (70/F)

- No oedema
- BP: 150/100 mm Hg
- Urine: 2+ protein, 70 WBC, 10 RBC, sensitive E.coli in urine
- BSL: 10 mmol/l
- Creatinine: 200 mmol/l (was 170 mmol/l 4 years ago)
- eGFR: 30 mls/mt
- Urate: 0.45 mmol/l

1. What is the likely cause of renal failure?

A. Diabetic nephropathy  
B. Analgesic nephropathy  
C. Polycystic kidney disease  
D. Chronic pyelonephritis

Dipstick proteinuria and Relative risk of dialysis at 10 years

Mrs. LH

Declining incidence of Analgesic nephropathy

Source: ANZDATA
2. Management strategies would include..

A. Prophylactic antibiotics
B. Aggressive BP control
C. Discontinuation of NSAID use
D. Intermittent catheterization for residual urine

- Residual urine > 50mls suspicious, > 100mls significant
- Presence of ureteric ‘jets’ excludes complete obstruction

3. Which of the following can be used long term in her

A. Trimethoprim
B. Norfloxacin
C. Nitrofurantoin
D. Cranberry


4. Regarding risk of contrast toxicity with CT scan...

A. CT is not needed. Do serial ultrasound
B. CT followed by IV Lasix to clear the contrast
C. N-Acetyl cystine prior to contrast use
D. IV fluids before and after contrast
Radio-contrast toxicity: risk factors

- Pre-existing renal dysfunction
- Diabetic nephropathy
- Heart failure
- Volume depletion
- Multiple myeloma (with older contrast agents)
- Large volume used and repeated use
- High osmolar contrast

Do you commonly use MIMS® on PDA in clinic

Do you commonly use UpToDate®

Do you commonly use Epocrates®

Very useful resources

MIMS on PDA: comes very handy-available free through CIAP in most health services
www.mims.com.au

EPOCRATES: a tremendous drug resource. Even the free version is very ‘precious’
www.epocrates.com

National Library of Medicine: Pubmed – often helps when you are trying to find an answer to a ‘burning question’

The ultimate: Impact of

- 91% → integral in decision making
- 83% → changed diagnosis
- 82% → changed management
- 47% → avoided getting cross consultations

Physician Survey
Massachusetts General Hospital (MGH) & Brigham and Women’s Hospital

Bit costly, but truly something money can’t buy

Life style changes for improved kidney health

- Stop smoking
- Lose weight
- Stop / at least cut down alcohol intake
- Regular exercise
- Restrict salt intake