Last updated by Renal department February 2015

Pyelonephritis

Diagnosis

- Loin pain, abdominal or pelvic pain, nausea, vomiting, fever (≥37.8ºC), and/or costovertebral angle tenderness.
- Symptoms of cystitis may or may not be present
- Rarely may present as
    - Septic shock
    - multiple organ system dysfunction,
    - acute renal failure.
- Complicated pyelonephritis refers to cases with underlying renal tract abnormalities, immunosuppressed patients, pregnancy and patients with renal transplants.

Initial Tests

- Pregnancy testing is appropriate
- Urinalysis on a MSU sample– collect carefully to avoid contamination:
    - The absence of pyuria on dipstick urinalysis suggests an alternative diagnosis
    - Positive nitrite testing on UA is a poor indicator of UTI (lacks sensitivity)
    - A completely normal urinalysis makes pyelonephritis unlikely and need not be sent for MSU unless the clinical picture makes an alternative diagnosis unlikely.
- MSU microscopy & culture
    - Pyuria : urine Wbc > 10 x 10^{6}/L in the absence of epithelial cells
    - In cases where the diagnosis is uncertain urine microscopy should be performed urgently
    - $\geq 10^{6}$ CFU per L of organisms,
        - note some patients with pyelonephritis have colony counts of 10^{3} to 10^{4} CFU per L – the diagnosis can still be made if there is pyuria and this colony count in the presence of typical symptoms
- Check FBC, UEC, LFTs, random BSL

Most common organisms

1. E. Coli (in 80% cases)
2. Klebsiella
3. Enterococcus
4. Staph Saprophyticus
5. Others

Treatment of uncomplicated pyelonephritis

- Many cases are managed with oral antibiotics as an outpatient
- Patients sick enough to be referred or self present to ED **often require a short admission and intravenous antibiotics but some may be treated initially as outpatients. Use empiric ciprofloxacin 500mg BD in such an outpatient case until organism and antibiotic sensitivities known.**

Antibiotic therapy

- **Empiric therapy** for those being admitted should be as follows:
    1. Single dose **gentamicin 4mg/kg Ivi** to maximum 560mg
        - CrCl>60 to be dosed 24 hourly (max 3 doses)
        - CrCl 40-60 to be dosed 36 hourly (max 2 doses)

        CrCl<40 4mg/kg Ivi single dose
        - These doses are from eTG table 2.23 revised October 2014 (See below)
        - No need for drug levels unless needing to treat 3 or more days, based upon antibiotic sensitivities
    2. **Cephazolin 1g 8th hrly ivi** until afebrile and symptoms resolved
    3. begin an appropriate **oral** antibiotic based upon laboratory sensitivities once afebrile and clinical symptoms settle
        - treat for 10-14 days
        - Other choice and duration of antibiotic therapy **must** be tailored to antimicrobial susceptibility findings.

- ESBL E.Coli infection is now seen even in cases of primary 'uncomplicated' pyelonephritis.
- patient can be discharged at this stage

Imaging

1. Ultrasound performed in ED is sufficient for initial exclusion of urinary tract obstruction
2. All patients should have formal ultrasound at a later stage. CT ***is more accurate for detecting renal calculi*** but US is just as useful in identifying stones requiring intervention and should remain the test of choice as ***ultrasound generally provides adequate information and avoids radiation***. [1]
    a. Approximately 1 in 6 will have an abnormality.
3. Imaging can be performed as an outpatient if needed and should not delay hospital discharge if the patient is recovering quickly.
4. Imaging is required **urgently** only for patients with:

- Symptoms of renal colic
- Delayed response to antimicrobial therapy
- Diabetes
- Infection with Pseudomonas or Proteus
- Relapse with the same pathogen
- Severe pyelonephritis with urosepsis
- Sepsis in the context of suspected obstruction

Seek immediate specialist advice for treatment of complicated pyelonephritis

Follow up

- Follow up with GP 1 week after ceasing antibiotics for clinical assessment and progress MSU to ensure organism eradicated.

- **Empirical aminoglycoside dosage for the treatment of infection in adults (Table 2.23) (Amended)**

Creatinine clearance (CrCl)	Dosing frequency	Maximum number of empirical doses	
	gentamicin		
more than 60 mL/min	4 to 5 mg/kg	24-hourly	3 doses (at 0, 24 and 48 hours)
40 to 60 mL/min	4 to 5 mg/kg	36-hourly	2 doses (at 0 and 36 hours)
less than 40 mL/min	4 mg/kg	single dose, then seek expert advice for subsequent dosing or selection of alternative drug	

1. Smith-Bindman R, Aubin C, Bailitz J, et al. Ultrasonography versus Computed Tomography for Suspected Nephrolithiasis. *New England Journal of Medicine.* 2014;371(12):1100-1110.