**Urinary Tract Infection**

1. Take an appropriate history and do the required testing to exclude serious complications of urinary tract infection (UTI) (e.g., sepsis, pyelonephritis, impacted infected stones).

History

Cystitis: Dysuria, frequency, urgency, hematuria and possibly the presence of suprapubic pain. History of prior UTI and/or renal stones.

Pyelonephritis: Symptoms of cystitis may be present and and is generally believed to be associated with fever, flank pain and systemic symptoms such as nausea and vomiting and CVA tenderness. Hx of prior UTI and/or renal stones.

Impacted infected stones: Renal colic, hematuria with fever and systemic signs.

Testing

1. Urinalysis: Midstream sample. Positive dipstick nitrite or positive leukocyte is sensitive (75%) and specific (82%).
2. Urine C&S: Positive will be colony count of more than 105 organisms per milliliter. This provides high specificity but poor sensitivity. However, colony counts of more than 102 obtained on a clean voided specimen from acutely dysuric women are also diagnostic of true infection. These women may also have pyuria on urinalysis (more than 2-5 WBCs per high-power field).
3. CBC, Lytes, Cr, BUN, Blood cultures 🡪 if there is fever and other systemic signs.
4. If suspecting a renal stone then imagining studies will be necessary.
   1. Ultrasound: sensitive for the diagnosis of urinary tract obstruction and can detect radiolucent stones missed on KUB; however, it may miss small stones and ureteral stones
   2. Non-contrast CT scan: it can detect both stones and urinary tract obstruction, and has become the gold standard for the radiologic diagnosis of stone disease since stones not visualized on KUB or IVP will usually be detected by CT scan
   3. IVP: it has a higher sensitivity and specificity than an abdominal plain film for the detection of stones and provides data about the degree of obstruction. It was previously the diagnostic procedure of choice, but is no longer because of potential contrast reactions, lower sensitivity, and higher radiation exposure. It has been replaced by non-contrasted helical CT as the test of choice.
5. Appropriately investigate all boys with urinary tract infections, and young girls with recurrences (e.g., ultrasound).

Rational for imaging studies

* Identify urinary tract abnormalities and possible need for surgical intervention
* Identify patients at risk for subsequent renal damage

Ultrasound: Given the potentially large benefit of detecting correctible malformations for a small number of children and the low risk of harm, we (uptodate.com) suggest Renal and Bladder U/S in for the following children:

* Girls < 3 yrs with first UTI
* Boys of any age with first UTI
* Children younger than two years of age with a first febrile UTI
* Children of any age with recurrent febrile UTIs
* Children of any age with a UTI who have a family history of renal or urologic disease or poor growth
* Children who do not respond as expected to appropriate antimicrobial therapy

Voiding cystourethrogram: for detection of Vesicoureteral reflux (VUR) is indicated in the following:

* Children of any age with two or more febrile UTIs
* Children of any age with a first febrile UTI who have a family history of renal or urologic disease; poor growth; hypertension; or non-*E. coli* organism. Urinary tract anomalies are more frequent among children with UTI caused by pathogens other than *E. coli*

1. In diagnosing urinary tract infections, search for and/or recognize high-risk factors on history (e.g., pregnancy; immune compromise, neonate, a young male, or an elderly male with prostatic hypertrophy).

UTI in pregnancy whether it is symptomatic or asymptomatic has been associated with an increased risk of preterm birth, low birth weight, and perinatal mortality. This is why it must be treated at all times.

Elderly male with BPH: The increase in UTI that occur in men of age 50-65 years of age parallels the increase in prostate size that occurs with hyperplasia. This enlargement leads to bladder outflow tract obstruction and a postvoid residual begins to develop in the bladder. This along with what is thought to be reduced antibacterial activity of prostatic secretions among men in this age group puts them at risk for UTIs.

1. In a patient with a diagnosed urinary tract infection, modify the choice and duration of treatment according to risk factors (e.g., pregnancy, immunocompromise, male extremes of age); and treat before confirmation of culture results in some cases (e.g.,pregnancy, sepsis, pyelonephritis).

Treatment of uncomplicated UTI

* Urine C&S is usually not necessary in the management of uncomplicated UTI. It should however be considered in patients suspected of having a complicated UTI, if the patient did not respond to the standard therapy or if the patient has recurrent UTIs.
* First line
  + TMP/SMX 2 tabs BID or 1 DS tab BID x 3 days
  + Trimethoprim 100mg BID or 200mg qdaily x 3days
  + Nitrofurantoin 50-100mg QID or Macrobid 100mg BID x 5 days (x 7days for nursing home population). Not to be used in infants <1 month of age or in renal failure CrCl <60mL/min.
* Second Line
  + Amoxicillin 500mg TID x 7 days (40% of bacteria are resistant)
  + Ciprofloxacin 250mg BID or 500mg of extended release qdaily x 3 days
* Third Line
  + Cephalexin 250-500mg QID x 7 days
  + Levofloxacin 250mg qdaily x 3 days

Treatment of UTIs in Nursing home/LTC patients

* Generally 7 days of treatment. For those presenting with fever or more severe symptoms 10-14 days is recommended
* Routine screening and treatment of asymptomatic bacteriuria in nursing home residents is not recommended.
* Treatment is the same as for Uncomplicated UTI with adjustment to the duration of therapy.

Treatment of complicated UTI

* Includes patients with structural or functional abnormalities such as: obstruction, chronic catheter, spinal cord injury etc. or any UTI in men.
* Culture required before Ab therapy.
* Duration: if cystitis with mild to moderate symptoms treat for 7-10 days. If upper tract (kidneys) symptoms or systemic signs such as fever, sepsis, vomiting treat for 10-14 days.
* First Line for mild to moderate
  + TMP/SMX 2 tabs BID or 1 DS tab BID
  + Trimethoprim 100mg BID or 200mg qdaily
  + Nitrofurantoin 50-100mg QID or Macrobid 100mg BID (Not to be used in upper kidney involvement or if there is obstruction or tissue infection)
  + Ciprofloxacin 500mg BID or 1g extended release qdaily
  + Levofloxacin 500mg qdaily
* Second line for mild to moderate
  + Amox/Clav 500mg TID
* First line for severe
  + Ampicillin 1g IV q6h + Gentamicin or Tobramycin 4-7mg/kg IV q24h
* Second line for severe
  + Cefotaxime 1-2g IV q12h
  + Ceftriaxone 1-2g IV q24h
  + Ciprofloxacin 200-400mg IV q12h
  + Levofloxacin 250mg IV q24h
  + Pip/Tazo 3g/0.375g IV q6h
* Third line for severe
  + Imipenem 500mg IV q6h
  + Meropenem 500-1000mg q8h

Treatment in Pregnancy

* Aways do f/u urine C&S after treatment
* Acute Cystitis
  + Cephalexin 250-500mg QID x 7 days
  + Amoxicillin 500mg TID x 7 days (there high E. coli resistance to this and so use after C&S confirmation)
  + Nitrofurantoin 50-100mg QID or Macrobid 100mg BID x 5 days
    - \*\* This is contraindicated in pregnant patients at term (36-42), during labour and in neonates due to the possibility of hemolytic anemia.
  + Second line Options
    - TMP/SMX 2 tabs BID or 1 DS tab BID x 3 days
    - Trimethoprim 100mg BID or 200mg qdaily x 3days
    - \*\* Avoid use of these antibiotics during the 1st trimester because of concerns that trimethoprim may limit the availability of folic acid and lead to fetal abnormalities.
    - \*\*Avoid TMP/SMX during the last 6 weeks of pregnancy as sulfonamides may displace bilirubin from albumin bidning sites causing kernicterus in infants.
* Pyelonephritis in pregnancy
  + Ceftriaxone 1-2g q24h x 10-14 days

Treatment for Pyelonephritis, Urosepsis

* Start empiric therapy after Blood and urine cultures have been taken.
* These patients need admission to hospital and parenteral antibiotics.
* IV fluids, and broad spectrum antibiotics to cover for pseudomonas species and other resistant gram negative rods.
* Enterobacteriaceae (Family of Gram negative bacteria that includes pathogens such as Salmonella, Escherichia coli, Yersinia pestis, Klebsiella and Shigella) account for 90% of cases
* Treatment choices
  + Ciprofloxacin 500mg PO BID or 400mg IV q12h x 10-14 days
  + Levofloxacin 500mg PO qdaily x 10 days OR 750mg PO qdaily x 5 days (for uncomplicated cases) OR Levofloxacin 250-500mg IV q24 x 10 days for severe cases.
  + Gentamicin 4-7mg/kg IV q24h +/- Ampicillin 1-2g IV q4-6h x 10-14 days for severe cases
  + Cefotaxime 1-2g IV q12h x 10-14 days for severe cases

1. Given a non-specific history (e.g., abdominal pain, fever, delirium) in elderly or very young patients, suspect the diagnosis and do an appropriate work-up.
2. In a patient with dysuria, exclude other causes (e.g., sexually transmitted infections, vaginitis, stones, interstitial cystitis, prostatitis) through an appropriate history, physical examination, and investigation before diagnosing a urinary tract infection.

* Vaginal discharge, external discomfort, absence of frequency or urgency and negative urine culture distinguishes vaginitis from UTI. Trichomonas vaginalis and Candida albicans are the most commonly responsible organisms.
* Women with dysuria and absence of bacteria on urine culture may have urethritis caused by C. trachomatis, Neisseria gonorrhoeae or HSV.
* Prostatitis: diminished urine flow and signs of bladder outflow obstruction (ex frequency, loss of stream, dribbling, hesitancy, urgency etc), dysuria, perineal pain. On rectal exam: the gland is gound to be enlarged, tender and boggy.

References

1. Goroll, Allan H. and Mulley, Albert G Jr. (2009). Primary Care Medicine Office Evaluation and Management of the Adult Patient. Lippincott Williams and Wilkins
2. Anti-infective Review Panel. Anti-Infective Guidelines for Community –acquired Infections. 2012 Edition.
3. Uptodate.com