URINARY TRACT INFECTION

Across The Lifespan

PEDIATRIC UTI
CLINICAL PRESENTATION

- Nonspecific findings
- Fever
- Irritability
- Poor feeding
- Abdominal pain
- Back pain
- Dysuria
- Frequency
- New-onset urinary incontinence

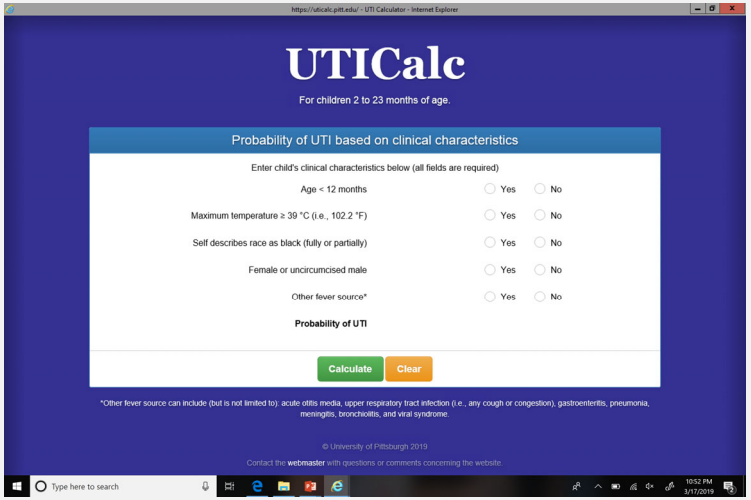
PEDIATRIC UTI HISTORY

- Incontinence
- Split or spraying stream
- Frequency
- Urgency
- Holding maneuvers
- Chronic constipation
- Sexually active
- Previous UTI or previous undiagnosed febrile illnesses in which urine culture was not obtained
- Vesicoureteral reflux (VUR)
- Family history of frequent UTI, VUR, and other genitourinary abnormalities
- Antenatally diagnosed renal abnormality

PEDIATRIC UTI EXAMINATION

- Temperature
- Blood pressure
- Growth and development
- Abdominal exam
- External genitalia
- Low back
- Other symptoms present to explain fever?

PEDIATRIC UTI DIAGNOSIS



- Urinalysis
- Culture
- STI testing

PEDIATRIC UTI TREATMENT

- 1st line
  - Cephalosporin
- If febrile, antibiotics for 10 days
- Antibiotics for 3-5 days with no fever
- Prophylactic antibiotics ONLY IF:
  - VUR of any grade
  - Risk of recurrence (febrile seizures, prolonged hospitalization, renal abscess, single kidney, bowel and bladder dysfunction)

CEPHALOSPORINS

- Cefuxine
  - 16mg/kg x1, 8mg/kg QD
- Cefdinir
  - 14mg/kg QD
- Ceftibutin
  - 9mg/kg QD

- Bactericidal
- Beta-lactam ring
- Inhibit enzymes in cell wall of bacteria

PEDIATRIC UTI

- US
  - Younger than 2 with first febrile UTI
  - Any age with recurrent febrile UTI
  - Family history of renal or urologic disease
  - Failure to respond to culture specific antibiotics
- VCUG
  - Any child with two or more febrile UTI
  - Any child with first febrile UTI with:
    - Abnormal renal US
    - Temp >102.2
    - Poor growth or HTN

FEMALE UNCOMPLICATED UTI

- Non-complicated UTI in adult female
- E.coli most common organism
  - Klebsiella
  - Proteus
  - Pseudomas
  - Enterococci
  - Staph

FEMALE UNCOMPLICATED UTI RISK FACTORS

- Anatomy
- Sex
- New partner
- Condoms with spermicide, diaphragms, etc…
- Congenital GU abnormality
- 1st UTI before 15
- Family history
- Post menopausal
- Incontinence
- Cystocele
- Elevated post-void residual

FEMALE UNCOMPLICATED UTI SIGNS AND SYMPTOMS

- Dysuria
- Frequency
- Urgency
- Suprapubic pain
- Hematuria

FEMALE UNCOMPLICATED UTI EVALUATION

- UA if:
  - New incontinence
  - Gross hematuria
  - CVA tenderness

FEMALE UNCOMPLICATED UTI EVALUATION

- Culture and sensitivity if:
  - Prior UACS with drug resistance in prior 3 months
  - Inpatient stay in prior 3 months
  - Recent use of fluoroquinolone, trimethoprim-sulfa, or broad-spectrum cephalosporin
  - Travel to parts of the world with high rates of multidrug resistant organisms
  - Underlying urology condition
  - Immunocompromised
  - Poorly controlled DM
  - Risk for resistant organisms

FEMALE UNCOMPLICATED UTI TREATMENT

- Treat based on signs and symptoms
- First-line
  - Nitrofurantoin 100mg PO BID x5-7 days
  - TMP-SMX DS 160/800mg PO BID x3 days
  - Fosfomycin 3 gram PO x1
  - Trimethoprim 100mg PO BID for 3 days

FEMALE UNCOMPLICATED UTI TREATMENT

- Second line therapy
  - Amoxicillin-clavulanate 500mg PO BID x5-7days
  - Cefpodoxime 100mg PO BID for 5-7 days
  - Cefdinir 300mg PO BID for 5-7 days
  - Cephalexin 500mg PO BID for 5-7 days
- Third line therapy
  - Ciprofloxacin 250 mg twice daily or 500 mg extended release daily for 3 days
  - Levofloxacin 250mg PO daily for 3 days

NITROFURANTOIN

- Inhibits protein synthesis, aerobic energy metabolism, DNA, RNA, and cell wall synthesis
- Bactericidal in urine if therapeutic levels are reached
- Administer with meals to improve absorption and prevent GI upset
- CrCl <60 mL/minute use with caution
- The Beers Criteria recommends avoiding use in geriatric patients ≥65 years with a CrCl <30 mL/minute
- Safe during second trimester
- Avoid in breastfeeding

TMP-SMX DS

- Sulfamethoxazole interferes with bacterial folic acid synthesis and growth via inhibition of dihydrofolic acid formation from para-aminobenzoic acid
- Trimethoprim inhibits dihydrofolic acid reduction to tetrahydrofolate resulting in sequential inhibition of enzymes of the folic acid pathway
- Take with or without food
- Caution with: asthma, CKD, elderly, concurrent use of spironolactone, ACE inhibitors, or ARBs, diabetic medications
- Avoid in pregnancy and with certain medications (coumadin, methotrexate, phenytoin, etc…)
  - ALWAYS CHECK FOR DRUG INTERACTIONS

FOSFOMYCIN

- Oral drink
- Bactericidal; inactivates enolpyruvyl transferase and inhibits cell wall synthesis
- May use in pregnancy and breastfeeding

BETA-LACTEM AGENTS

- Bactericidal; inhibits cell wall mucopeptide synthesis
- Dose adjustments if CrCl <30
- Safe for pregnancy and breastfeeding

FLUOROQUINOLONES

- Bactericidial; inhibits DNA gyrase
- May prolong QT interval
- Caution, even avoid use, with antiarrhythmics, antipsychotics, and tricyclic antidepressants
- Black box warning: May cause tendinitis and tendon rupture, peripheral neuropathy, and CNS effects
- May administer with most foods to minimize GI upset
- Avoid antacid use
- Dairy products ok, 2 hours before or after
- Caution and dose adjustment for CKD

COMPLICATED UTI

- UTI with the possibility of extending beyond the bladder
- Fever >99.9
- Chills, fatigue, malaise (s/s of systemic infection)
- Flank pain/CVA tenderness with pyuria regardless of temperature or other s/s
- Pelvic/perineal pain
- Nausea and vomiting

COMPLICATED UTI RISKS

- Immunosuppressed (HIV, steroid use, DM*)
- Pregnant
- Spinal cord injury (autonomic dysreflexia and increased spasticity)
- Male
- Pediatric
- Indwelling foley catheter, stent or drain
- Structural abnormality
- Urinary obstruction
- Renal insufficiency
- Urolithiasis

COMPLICATED UTI MICROBIOLOGY

- E.coli - most common
- Klebsiella
- Proteus
- Pseudomonas
- Enterococci
- Staph (MRSA and MSSA)

COMPLICATED UTI DIAGNOSIS

- UACS
  - Pyuria >5 WBC/HPF
- Pelvic
  - Rule out PID if s/s are nonspecific for UTI
- STI testing
- DRE
  - Rule out prostatitis
- CT
  - Abdomen and pelvis with and without contrast
  - CT without
  - Renal US

COMPLICATED UTI HOSPITALIZATION

- Septic
- Critically Ill
- Fever >101
- Pain
- Marked debility
- Inability to maintain oral hydration
- Need urology consultation

COMPLICATED UTI OUTPATIENT

- Follow-up in 48 hours
- If worsening symptoms or no improvement in 48 hours
  - Repeat UACS
  - CT if not done
  - Admit?

COMPLICATED UTI
TREATMENT IF RISK OF MDR, OR SEPSIS

- Treat with broad spectrum antimicrobial regimen with ESBL and MRSA coverage
- Imipenem 500mg IV every 6 hours
- Meropenem 1 gram every 8 hours
- Doripenem 500mg IV every 8 hours
- **PLUS**
- Vancomycin 15mg/kg every 12 hours
- Daptomycin 6mg/kg IV every 24 hours
- Linezolid 600mg IV every 12 hours

COMPLICATED UTI TREATMENT

- Ceftriaxone 1 gram IV once daily
- Piperacillin-tazobactam 3.375 gram IV every 6 hours
- Piperacillin-tazobactam 4.5 grams IV every 6 hours
- Cipro 400mg IV every 12 hours
- Cipro ER 1000mg PO daily
- Levaquin 750mg IV daily
- Levaquin 750mg PO daily

RECURRENT UTI

- >2 infections in 6 months
- >3 infections in 1 year

RECURRENT UTI
RISKS

- Diaphragm, spermicide use
- New partners
- First UTI prior to age 15
- Congenital GU abnormalities
- Incontinence
- Cystocele
- Post-menopausal
- Elevated PVR

RECURRENT UTI RISKS

UNRESOLVED

- Infection not cleared
- Bacterial resistance
- Renal dysfunction
- Non-compliance
- Fistula in urinary tract

RECURRENT

- Negative culture, but becomes positive again
- Bacterial persistence
- Foreign body
- Poorly draining bladder
- Prostatis

RECURRENT UTI DIAGNOSIS

- Refer to urology
- H&P
- UACS
- Cystoscopy and pelvic
- Renal labs
- PVR
- Imaging
- DRE

RECURRENT UTI
PREVENTION AND TREATMENT

- Behavior changes (different contraceptive)
- Void after sex
- Increase water intake
- Improve constipation

- Antimicrobial prophylaxis
  - Continuous
  - Based on prior culture and sensitivity
  - Use for 6-12 months
- Post-coital antibiotic
  - One dose after sex
- Cranberry supplement
- Topical estrogen
- Probiotics
- Antiseptics

PROSTATITIS

- Infection of the prostate gland
- Almost always occurs via the urethra. Bacteria migrates from the urethra or bladder through the prostatic ducts, with intraprostatic reflux of urine
- E. Coli, Proteus species, other Enterobacteriaceae (Klebsiella, Enterobacter, and Serratia species), Pseudomonas aeruginosa
- Acute or chronic
- Urine culture is not always positive

PROSTATITIS
SIGNS AND SYMPTOMS

- Acutely ill, with spiking fever, chills, malaise, myalgia
- Dysuria
- Irritative urinary symptoms: frequency, urgency, urge incontinence, dribbling, hesitancy, urinary retention
- Pelvic or perineal pain
  - Feel like they are sitting on something
- Pain at the tip of the penis
- On exam, the prostate is often firm, edematous, and exquisitely tender
- Elevated PSA
  - Chronic prostatitis

PROSTATITIS DIAGNOSIS

- H&P
- DRE
- UACS
- PSA?
- Blood cultures?

PROSTATITIS TREATMENT

- Bactrim DS, Cipro 500mg or Levaquin 500mg
  - Achieve high levels is prostatic tissue
- Culture specific antibiotics
- Younger than 35
  - Single dose ceftriaxone IM 250mg
  - Doxycycline 100mg BID x10 days OR azithromycin 1gram
- If insertive anal:
  - Single dose ceftriaxone IM, 250mg
  - Levofloxacin 500mg x10 days OR ofloxacin 300mg BID x10 days

- NSAIDs
- Chronic: at least 6 weeks of antibiotics
  - Yogurt daily, probiotics

UTI'S IN LTCF

- Most common site of infection
- Risk factors
  - Urinary catheters
  - benign prostatic hypertrophy and prostatitis
  - atrophic vaginitis and estrogen deficiency in women
  - Diabetes
  - Neurogenic bladder
  - Dementia
  - Dehydration
  - Functional impairment

UTI'S IN LTCF
DIAGNOSIS

- Rely on signs and symptoms
- Fever >38°C (100.5°F)
- Worsened urinary urgency or frequency
- Acute dysuria
- Suprapubic tenderness
- Costovertebral pain or tenderness
- UACS
  - *Dipstick testing should be used to rule out UTI, but positive leukocyte esterase or nitrite on dipstick does **not** rule in UTI
    - Can you justify why you checked a dipstick? S/S?

UTI'S IN LTCF

INDWELLING CATHETER

- Fever >100 or 2.4 degrees above baseline
- New CVA tenderness
- Rigors
- New onset delirium

WITHOUT CATHETER

- Acute dysuria OR
- Fever >100 or 2.4 degrees above baseline AND
- New or worsening urgency
- New or worsening frequency
- Suprapubic pain
- Gross hematuria
- CVA tenderness
- New or worsening incontinence

UTI'S IN LTCF TREATMENT

- Can consider treating as uncomplicated UTI
- May need to consider treating as a complicated UTI
- Consider treatment with beta lactams if:
  - Prior UACS with drug resistance in prior 3 months
  - Inpatient stay in prior 3 months
  - Recent use of fluoroquinolone, trimethoprim-sulfa, or broad-spectrum cephalosporin
  - Underlying urology condition
  - Poorly controlled DM
  - Risk for resistant organisms

UTI'S IN LTCF

- UACS
- Consider prior resistant infection and past culture results
- Treat for 7-14 days
- Intermittent catheterization is associated with a lower rate of UTI than long term indwelling catheterization
- Place new catheter with start of antibiotic

Bethany Parsell APRN, CNP, CUNP
OAAPN Board of Directors: Central Region Co-Director
Bon Secours Mercy Health Urology
bethanyoaapn@gmail.com
567-232-1310