To Treat or Not to Treat
Management of urinary tract infections in Pediatric patients
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Objectives
• Discuss incidence of UTI
• Discuss current guidelines for evaluation and management of UTI in patients with non neurogenic and neurogenic bladders
• Discuss lower urinary tract symptoms (LUTS) and what the causes could be if not a UTI
• Discuss management of asymptomatic bacteriuria
• Discuss importance of antibiotic stewardship

Disclosure
• I have nothing to disclose

Incidence of UTI
• Estimated 1.5 million office visits per year = 180 million dollars/year in healthcare costs
• Newborn-1 year: girls = boys (~ 2%)
• Over the age of 1 yo: girls > boys (7% vs. 2%)
• Urine culture is considered positive:
  – > 50,000 CFU on a catheterized sample
  – > 100,000 CFU on a voided sample

Risk factors
• Structural abnormalities of the urinary tract
  – Hypospadias, VUR, neurogenic bladder secondary to myelomeningocele or obstructive uropathy
• Uncircumcised boys under the age of 6 mos.
• Bladder and bowel habits
  – Infrequent voiding, constipation, CIC
• Sexual activity- 29% of girls with urinary symptoms have STI

Guidelines
• AAP- guidelines specific to children ages 2 – 23 months
  – Provides specific regarding bacterial colony count at which to treat and how urine should be collected
  – Provides recommendations on testing following UTI

References:
UTI Symptoms

- Lower urinary tract
  - Dysuria, frequency, urgency, foul smelling urine, urinary incontinence, gross hematuria, abdominal pain, suprapubic pain
- Upper urinary tract
  - Fever, nausea, vomiting, flank pain

UTI symptoms in neurogenic bladder patients

- Same as non neurogenic patients but if they perform intermittent catheterization there can be a few more
  - Pain with catheterization
  - Gross hematuria
  - Leaking between catheterization

Evaluation

- Physical exam - important in GU exam if child is willing. Can give you signs as to why LUTS (labial irritation, labial adhesions, meatal stenosis)
- Encourage clean catch mid stream samples for all others
- If bag sample not collected sample always do UA negative then this is UTI but if positive will need to do UC (possibly catheterized specimen if not toilet trained)
  - 75% false positive urine culture rate with post-neonatal organisms >90% of the time
  - Dipstick UA
    - Positive leucocyte esterase ~ 80% sensitive and 70% specific for UTI
    - Positive nitrite Presence of gram negative bacteria ~ 50% sensitive and 85% specific for UTI
    - Positive diabetes of glucose ~ 100% specific and 100% sensitive, when both are negative the negative value ~ 100%

Common uropathogens

- Escherichia coli (Ecoli) accounts for 80% of pediatric UTI
- Enterococcus
- Klebsiella

- In sexually active patient need to consider STI's - chlamydia, gonorrhea, trichomonias, ureaplasma, mycoplasma. Will need to request these to be done separate then standard urine culture.

Antibiotic treatment

- Tailor to UC susceptibility results
- Be familiar with local antibiogram and resistance patterns in your practice area
- Trimethoprim/Sulfa is developing increase resistance to Ecoli

- Try to choose narrow spectrum when treating
  - Choose one that is least likely to cause collateral damage - Collateral damage in a term used to refer to ecological adverse effects of antibiotic therapy, namely, the selection of drug-resistant organisms and the survival and development of colonization or selection with matching resistant organisms
  - Least likely:
    - amoxicillin (for cystitis only), Trimethoprim/Sulfa, Cephalexin
  - High impact collateral damage
    - 3rd generation cephalexin or - (ceftaxime, ceftriaxone) and Fluoroquinolones (ciprofloxacin and levofloxacin only 2 for UTI)
    - See for when absolutely necessary
  - Resistance develops more rapidly than other antibiotic classes and associated with:
    - Ecoli, MRSA, ST, S. bovis, VRE and Gonococcus with gonorrhea

- Tailor therapy to culture results.
- Empiric therapy
  - For inpatient or outpatient patients
  - Duration/Comments
  - Setting
    - Outpatient
    - Duration
      - Nitrofurantoin 5 days
      - Other agents: <6 months 10 days >6 months 7 days

  - Commones
    - Consider your culture and recent antibiotic use when selecting empiric therapy
    - Tailor therapy to culture results.

- Inpatient
  - Empiric therapy
  - Duration/Comments
    - Setting
      - Nitrofurantoin
        - 5 days
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        - <6 months 10 days >6 months 7 days
    - Commones
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**ANTIBIOTIC TREATMENT GUIDELINES FOR URINARY TRACT INFECTIONS IN CHILDREN**

(60 days through 17 years)

<table>
<thead>
<tr>
<th>Dosing</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceftriaxone 100 mg/kg once, then 50 mg/kg/DOSE IV Q12</td>
<td>Community Setting</td>
</tr>
<tr>
<td>Aztreonam* 30 mg/kg/DOSE IV Q6 (max: 2000 mg/DOSE)</td>
<td>Outpatient recommendations for preferred regimens.</td>
</tr>
<tr>
<td>Gentamicin* 7.5 mg/kg/DOSE IV Q24 (max initial: 300 mg/DOSE)</td>
<td>Duration/Comments</td>
</tr>
<tr>
<td>Aminoglycoside therapy following clinical improvement, as evidenced by improving fever curve and ability to tolerate PO. See Outpatient recommendations for preferred regimens.</td>
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<tr>
<td>Duration (IV + PO) ≥6 months: 7 days, unless delayed improvement &lt;6 months: 10 days, unless delayed improvement</td>
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**Antibiogram**

Michigan Medicine P&T Committee (7/18/2017), C&W Operations Committee (7/12/2017), CW Executive Committee (8/7/2017)

What else could it be

- Lower urinary tract symptoms such as frequency, urgency, dysuria, incontinence not always caused by bacterial UTI
- Viral infections: Adenovirus types 11 and 21, influenza A, polymavirus BK, and herpes simplex viruses
- In non-immunized or immunosuppressed children, herpes zoster cystitis presents similarly
- Infrequent voiding
- Constipation
- Perineal irritation
- Phimosis/Meatal stenosis
- Labial adhesions
- Foreign bodies
- Sexual abuse

Antibiotic resistance

- Antibiotic resistance is increasing. It is estimated that it has led to 2 million infections and 23,000 deaths/year in US
- 60% of antibiotic expenditures come from outpatient settings
- Modifiable risk factor is inappropriate antibiotic prescribing
- Almost half all antibiotic prescriptions may be inappropriate including antibiotic selection, duration, dosing

**Asymptomatic bacteriuria**

- Definition: The finding of positive urine cultures (≥100,000 colony-forming units of bacteria/ml of urine) of the same uropathogen from 2 consecutive urine samples in the absence of urinary symptoms.
- Most common organism: E coli
- Noted to spontaneously resolve over a period of time (median 2.5 years)
- Associated with school age and older girls
- Proper collection of clean catch urine sample to avoid contamination of perianal flora
- Treatment is NOT recommended unless patient is undergoing an invasive urological procedure, had a renal transplant or pregnant
- Studies have shown no difference between those treated with antibiotic vs placebo in developing symptomatic UTI or permanent renal damage

**Antibiotic resistance**

Decreasing number antibiotic prescriptions has been found to decrease secondary infections such as clostridium difficile

https://www.cdc.gov/drugresistance/biggest_threats.html
Antibiotic resistance

- Predictors of antibiotic resistance in UTI’s
  - Urinary tract abnormalities and bladder dysfunction
  - 1 course antibiotics in past 6 months
  - Antibiotic prophylaxis
  - Recent hospitalization
- Multi-drug resistant organism (MDRO)
  - Typical resistance to ≥ organism from ≥ drug classes
  - Resistance genes are often paired
- ESBL-organisms
  - 5-10% of UTI’s in children
  - Force use of second line drugs
  - Increase hospital length of stay and cost

References


Antibiotic stewardship

- In 2014 and 2015 CDC released Core Elements of Hospital Antibiotic Stewardship Programs
- 4 elements of Outpatient Antibiotic Stewardship
  - Commitment
  - Action for policy and practice
  - Tracking and reporting
  - Education and expertise

Questions ???

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THANK YOU