Urinary Tract Infections (UTI): Detection, Diagnosis, and Treatment
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November 2010

Introduction

- Community acquired infections vs. nosocomial acquired infections
- Community acquired infections account for more than 7 million doctor’s office visits every year
- Most common among women aged 20-50 (coincides with sexual activity) but rare in men of any age
- Patients can present with or without symptoms and screening for UTI’s varies among patient populations
- The best diagnostic tools include symptomatology and/or urinalysis

Etiology

- *Escherichia coli* is the most common cause of most UTI’s (gram negative)
- Other potential causes (stronger resistance profile)
  - *Enterobacter* spp.
  - *Serratia* spp.
  - *Pseudomonas* spp.
  - *Proteus* spp.
  - *Klebsiella* spp.

Risk Factors

- Female gender
- Sexually active
- Current urinary obstruction (stone)
- Pregnancy
- Genetics

Types of UTI’s

- Nosocomial infections are those related to catheter use and/or prolonged hospital stay
- Community infections are based on patient risk factors, lifestyle, etc

- Lower UTI’s are infections including urethritis and cystitis (infection of the bladder)
- Upper UTI’s are infections that are typically more advanced and include pyelonephritis (infection of the kidney), prostatitis, and intrarenal and perinephric abscesses

- Uncomplicated UTI’s are often the first infection of a female and may present asymptotically
- Complicated UTI’s are often recurrent infections of a female, associated with catheter use, or an infection in a male
Signs and Symptoms

- Dysuria
- Frequency
- Urgency
- Suprapubic Pain
- Cloudy and/or malodorous urine
- WBC or blood present
- Fever*
- Chills*
- N/V/D*
- Abdominal and/or lower back pain*

*Associated with pyelonephritides

Diagnosis

- Symptomatology
- Urinalysis (discussed later)

Treatment

- Must confirm with culture and sensitivity before treatment can begin (except in women where an uncomplicated UTI is suspected)
- Important to have knowledge of local resistance patterns (especially because the therapy of choice is seeing growing resistance in certain areas)
- Uncomplicated UTI
  - Bactrim DS® (TMP/SMX) BID x 3-5 days
  - Cipro® (ciprofloxacin) 250mg BID x 3 days
  - Levaquin® (levofloxacin) 250mg QD x 3 days
  - Macrobid® (nitrofurantoin) 100mg BID x 7 days
- Complicated UTI
  - Bactrim DS® (TMP/SMX) BID x 7-10 days
  - Cipro® (ciprofloxacin) 500mg BID x 7-14 days
  - Levaquin® (levofloxacin) 250mg QD x 10 days
  - Macrobid® (nitrofurantoin) 100mg BID x 7 days
- UTI during Pregnancy
  - Amoxil® (amoxicillin) 500mg BID x 7 days
  - Macrobid® (nitrofurantoin) 100mg BID x 7 days
- More advanced infections will require longer therapy regimens
- Follow-up in 2-4 weeks for eradication confirmation
Urinalysis 101

Introduction
- A urinalysis is the most common way to diagnose a UTI
- It is important that proper technique is utilized by both the patient and the healthcare provider
- Understanding a urinalysis is a key component in providing excellent patient care

Specimen Collection
- These are the best practice techniques for collecting urine for a urinalysis
  - Cleaning before the collection
    - The patient should be instructed to
      - If they wish to clean external genitalia before collection, they may. However, studies have shown that there is no benefit to this action.
  - A mid-stream catch is best
    - The patient should be instructed to
      - Begin urinating for a moment, begin collection, remove cup when approximately half full, then finish urinating (mid-stream catch)
      - DO NOT recommend the patient over-hydrate before performing a clean-catch. This will dilute the urine and negate results.
  - Prevent skin contact
    - The patient should be instructed to
      - Avoid touching the inside of the cup with any part of the body. This will contaminate the catch and void the results
      - If the patient does touch the inside of the cup, they should perform another mid-stream catch with a different cup
  - Urine should be examined promptly
    - The patient should be instructed to
      - Perform the mid-stream catch at the laboratory so that it can be analyzed quickly
      - If this is not possible, the patient should refrigerate the sample, however, waiting more than two hours significantly reduces the reliability of the results.
  - While it is impossible to guarantee all measures are taken to collect a clean sample, stressing instructions to the patient is important so that they receive the best care in a timely manner.
- IDSA Guidelines
  - For asymptomatic women, a UTI is defined as two consecutive clean-catch urine specimens with isolation of the same bacterial strain in quantitative counts of ≥10^5 cfu/mL
  - For asymptomatic men, a UTI is defined as a single clean-catch urine specimen with isolation of one bacterial strain in a quantitative count of ≥10^5 cfu/mL
  - For men and women with a catheter, a UTI is defined as a single catheterized urine specimen with isolation of one bacterial strain in a quantitative count of ≥10^5 cfu/mL
# Understanding the Urinalysis Test Results

**Reference Guide**

<table>
<thead>
<tr>
<th>Test Component</th>
<th>Normal Range</th>
<th>What Does it Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Color</strong></td>
<td>Yellow</td>
<td>ABNORMAL: can be caused by food, dyes, medications, ect (non-specific)</td>
</tr>
<tr>
<td><strong>Clarity</strong></td>
<td>Clear</td>
<td>CLOUDY: indicates excessive cellular material/protein</td>
</tr>
<tr>
<td><strong>Spec Gravity</strong></td>
<td>1.005 – 1.030</td>
<td>&lt;1.007: indicates hydration&lt;br&gt; &gt;1.010 indicates dehydration&lt;br&gt; Higher levels indicate kidney damage</td>
</tr>
<tr>
<td><strong>pH</strong></td>
<td>5.0 – 8.0</td>
<td>&lt;5: indicates acidic urine&lt;br&gt; &gt;8: indicates basic urine&lt;br&gt; Each indicates an acid/base issue within the kidney (non-specific)</td>
</tr>
<tr>
<td><strong>Glucose</strong></td>
<td>Negative</td>
<td>POSITIVE: indicates diabetes mellitus</td>
</tr>
<tr>
<td><strong>Bilirubin</strong></td>
<td>Negative</td>
<td>POSITIVE: indicates gallstones, hepatitis, cirrhosis, or other diseases effecting the liver (non-specific)</td>
</tr>
<tr>
<td><strong>Ketone</strong></td>
<td>Negative</td>
<td>POSITIVE: indicates diabetic ketosis or another form of calorie deprivation (non-specific)</td>
</tr>
<tr>
<td><strong>Protein</strong></td>
<td>Negative - Trace</td>
<td>&gt;150mg/24h: indicates proteinuria and an issue with the kidney (non-specific).&lt;br&gt; &gt;3.5g/24h: indicates nephritic syndrome</td>
</tr>
<tr>
<td><strong>Nitrite</strong></td>
<td>Negative</td>
<td>POSITIVE: indicates the presence of bacteria (most likely gram negative)</td>
</tr>
<tr>
<td><strong>Blood</strong></td>
<td>Negative</td>
<td>POSITIVE: indicates kidney damage (non-specific)</td>
</tr>
<tr>
<td><strong>Leuk Est</strong></td>
<td>Negative</td>
<td>POSITIVE: indicates the presence of WBC (infection)</td>
</tr>
<tr>
<td><strong>Urobilinogen</strong></td>
<td>0.2 – 1.0 mg/dL</td>
<td>&gt;1: indicates liver dysfunction (non-specific)</td>
</tr>
<tr>
<td><strong>WBC</strong></td>
<td>0 – 4/hpf</td>
<td>&gt;4: Indicates infection</td>
</tr>
<tr>
<td><strong>RBC</strong></td>
<td>0 – 3/hpf</td>
<td>&gt;3: indicates glomerular damage, stones, UTI, or other disease states (non-specific)</td>
</tr>
<tr>
<td><strong>Epithelial</strong></td>
<td>None Seen</td>
<td>PRESENT: indicates that the sample is contaminated through skin to cup contact. Results are void.</td>
</tr>
<tr>
<td><strong>Bacteria</strong></td>
<td>None Seen</td>
<td>ONE TYPE: indicated infection.&lt;br&gt; MULTIPLE TYPES: indicates contamination. Results are void.</td>
</tr>
<tr>
<td><strong>Mucous</strong></td>
<td>None Seen</td>
<td>PRESENT: indicates UTI, among other possible disease states (non-specific)</td>
</tr>
<tr>
<td><strong>Casts</strong></td>
<td>None Seen</td>
<td>PRESENT: indicate kidney damage</td>
</tr>
<tr>
<td><strong>Crystals</strong></td>
<td>None Seen</td>
<td>PRESENT: can be present in healthy individuals as well as those with a disease (non-specific)</td>
</tr>
<tr>
<td><strong>Culture</strong></td>
<td>Negative</td>
<td>POSITIVE: will be ordered to verify one isolate to guide therapy</td>
</tr>
</tbody>
</table>
UTI and Urinalysis Quiz

1) What is the most common pathogenic cause of UTI’s?
   b. *Escherichia coli*
   c. *Klebsiella* spp.
   d. *Pseudomonas* spp.

2) Which of the following are appropriate treatment options for a UTI?
   a. ciprofloxacin
   b. Bactrim DS
   c. nitrofurantoin
   d. all of the above

3) Which combination of urinalysis results *strongly* indicates a UTI?
   a. yellow, clear, negative for nitrites, and 0.2mg/dL of urobilinogen
   b. yellow, negative for ketones, negative for blood, and 1/hpf of WBC
   c. cloudy, positive for nitrites, positive for leuk est, and 3+/hpf of bacteria
   d. reddish, pH of 5.5, trace amounts of protein, and positive epithelial

4) What is one way you can tell if a urine sample is contaminated?
   a. Positive epithelial
   b. Many types of bacteria present
   c. Positive crystals
   d. A and B
   e. A and C

5) What is the proper method of collecting a urine sample?
   a. Give the patient clear instructions and stress the importance
   b. Have the patient perform a mid-stream catch
   c. Analyze the urine as soon as possible
   d. All of the above

References:


Mercer University School of Medicine. Savannah, GA. 2010.
