To Treat or Not to Treat, That is the Question

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To treat, or not to treat: that is the question:
Whether ‘tis nobler to withhold antibiotics,
Or to take arms and give antibiotics.
To bear the burden of not treating an infection and watching death devour
Or to treat and watch death devour from the evils of *Clostridium difficile*.
Oh my soul ponders, what choice do I make?
Case 1

- Elderly female (between 80 and 95)
- History of dementia
- Presented with altered mental status: she was weak for the past few days, no eating much, has constipation
- No dysuria, no urgency, no frequency, no fever
- Temp 98.0°F
Case 1 continued

- Urinalysis: WBC 28/hpf, RBC 5/hpf, leukocyte esterase 2+
- Urine culture >100,000 Staphylococcus species (coag neg) that is oxacillin-resistant
- Peripheral blood: WBC 7.4 Segs 54%, no bands
When the going gets tough;
   Go back to the basics.
UTIs
We Will Focus On

- Adults
- No instrumentation or foreign bodies (urinary catheters)
- Exclude pregnant women
Pathophysiology of UTIs

- Ascending infection
- Urethra $\rightarrow$ Bladder $\rightarrow$ Ureter $\rightarrow$ Kidneys
- Bladder “usually” sterile
- When you urinate you “flush” out the bacteria
- Stagnation of the urine is a risk for infection
- Certain specific bacteria cause UTIs ($E.\ coli$, $Klebsiella\ pneumoniae$, $Proteus\ mirabilis$)
Signs and Symptoms

- Dysuria, urgency, frequency, suprapubic pain, hematuria
- Pyelonephritis: fever and chills, flank pain, nausea/vomiting
Medicine 101

• History
• Physical
• Laboratory
Clean-catch Midstream Urine

- Technique
- Urine plated on culture media within 2 hours or refrigerated or kept in preservative
Nitrite

• Bacteria (Enterobacteriaceae) produce nitrite from nitrate

• However not S. saprophyticus, Pseudomonas or enterococci

• First urine in the morning since ≥ 4 hours for bacteria to convert nitrate to nitrite
Leukocyte Esterase

- Neutrophils produce as many as 10 proteins (enzymes) with esterase
UTI Challenges

• Diagnosis is not always straightforward
• Imperfect laboratory tests
• “rely on imperfect laboratory tests to augment clinical impressions” Wilson ML *Clinical Infectious Diseases* 2004(38)1150
Downside of the use of antibiotics

- Resistant bacteria
- Drug reaction
- *Clostridium difficile* colitis
- Drug-drug interactions (antibiotic and the patient’s other medications)
## % Susceptible

### 2013

<table>
<thead>
<tr>
<th></th>
<th>E. coli TMH</th>
<th>E. coli RIH</th>
<th>E. coli NPH</th>
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</thead>
<tbody>
<tr>
<td>Ciprofloxacin</td>
<td>69</td>
<td>71</td>
<td>83</td>
</tr>
<tr>
<td>Nitrofurantoin</td>
<td>92</td>
<td>93</td>
<td>95</td>
</tr>
<tr>
<td>TMP/SMX</td>
<td>75</td>
<td>73</td>
<td>83</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>50</td>
<td>50</td>
<td>63</td>
</tr>
</tbody>
</table>
Elderly Patients with Bacteriuria (they were not treated, followed for 18 months)

Am J Med 1986(80)208
Obtaining Urine for Culture

• Midstream clean-catch technique
• Refrigerated in apartment or nursing station immediately after collection
• By 2 to 3 hours after collection the urine was transported on ice to lab

Am J Med 1986(80)208
# Bacteriuria and/or Pyuria

<table>
<thead>
<tr>
<th></th>
<th>Apartment House Complex</th>
<th>Nursing Home</th>
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</thead>
<tbody>
<tr>
<td>Bacteriuria</td>
<td>Pyuria (%)</td>
<td>No Pyuria (%)</td>
</tr>
<tr>
<td>High-titer</td>
<td>36 (92)</td>
<td>3 (8)</td>
</tr>
<tr>
<td>Low-titer</td>
<td>9 (69)</td>
<td>4 (31)</td>
</tr>
<tr>
<td>None</td>
<td>62 (29)</td>
<td>151 (71)</td>
</tr>
</tbody>
</table>

57% no pyuria and no bacteriuria  48% no pyuria and no bacteriuria

Women, 68-103, mean 86 years  
No symptoms of a UTI

*Annals Internal Med* 1989(110)404
Bacteriuria and Pyuria

- 153 (63%) of 243 urine samples had bacteriuria
- 214 (88%) had pyuria

- Mean age 86 (50 to 95 years)
- **All had a high level of functional disability**
- 57 males
- 19 females
- Symptomatic bacteriuria were excluded (dysuria, frequency, urgency, hematuria, acute alteration in continence status, suprapubic discomfort, or signs of epididymo-orchitis or bacteremia)
- Specimens were immediately refrigerated

*Can J Inf Dis 1991(2)142*
Level of Pyuria

- 214 (88%) had pyuria
- 70 (29%) with 11 – 100 WBC/mm$^3$
- 99 (40%) with 101 – 1000 WBC/mm$^3$
- 45 (19%) with >1000 WBC/mm$^3$

*Can J Inf Dis 1991(2)142*
Asymptomatic Nursing Home Residents with Chronically Incontinent

- 214 residents (152 female, 62 male)
- Average age 85 years
- 45% pyuria (>10 WBC/hpf)
- 43% bacteriuria (>100,000 CFU)

*Journal of the American Geriatrics Society* 1996(44)420
Asymptomatic Nursing Home Residents with Chronically Incontinent Bacteriuria

<table>
<thead>
<tr>
<th></th>
<th>Bacteriuria</th>
<th>No bacteriuria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyuria</td>
<td>54 (25%)</td>
<td>42 (20%)</td>
</tr>
<tr>
<td>No pyuria</td>
<td>37 (17%)</td>
<td>81 (38%)</td>
</tr>
</tbody>
</table>

*Journal of the American Geriatrics Society 1996(44)420*
The Pee-in-a-Cup Test, circa 1500

Before X-rays and MRIs could peer inside the human body, physicians turned to bodily wastes, particularly urine, in order to make diagnoses. The practice of urroscopy arose from the observation that the color, consistency, smell, and even taste of urine change with different ailments. With a sample of the ailing person’s urine, physicians and laymen alike turned to widely popular illustrations known as urine wheels to make their diagnoses. While some associations were clearly flawed—such as the idea that turbidity could indicate that a woman was not a virgin—in many ways urroscopy paved the way for modern laboratory medicine.

Urine was collected in these bladder-shaped glass vessels, called mutules, and were held up to the light by physicians for close inspection. During the Middle Ages, the mutule became a symbol of a physician’s authority. American nephrologist Charles Diskin says, much like the stethoscope is today.

The theories behind urroscopy, which were rooted in the long-standing humoral theory of disease, grew increasingly intricate over time, sometimes leading to a poor understanding by the scribes and even the practitioners. In this rare manuscript of unknown authorship and origin, for example, some of the urine colors don’t match the descriptions and the contents of two of four circles surrounding the urine wheel have been incorrectly switched.

The madness of King George III—the British sovereign during the American Revolution—has long been thought to be a result of porphyria, an inherited disease that affects the nervous system. Meticulous notes kept by the King’s physician describe his frequent abdominal pains and blue urine. Porphyria, however, is not associated with blue urine, but red, Diskin notes. This has led to the theory that the king suffered from a condition known as hemocromatosis, in which a bacterial overgrowth of the colon turns the urine blue. “That would also explain his abdominal pains,” he adds. As for the King’s madness, well, “maybe he was just crazy.”