The Resistance

Lori Guelman, NP
Stanford Urology, 3/2014
Objectives

- Be able to list the differential diagnosis for UTIs
- Know when it is appropriate to treat UTIs
- Be familiar with current UTI guidelines
- Knowledgeable about bacterial resistance and the consequences
- Be able to list ways to reduce antibiotic use
Case Study – Amy

- 25 y/o female
- Symptoms: frequency, burning, urgency and hesitancy x 3 days
- PMH: negative
- Urine dip: pos leukocytes, pos blood
- Urine culture (optional)
**URINE CULTURE – The Good Ole’ Days**

Results: URINE CULTURE (Order# 377950451)  
Status: Final result  
2/4/2011  1:23 PM

**Provider Information**  
Authorizing Provider  
Lori R Guelman (S0052752)

**Collection Information**  
Collection Date: 2/2/2011  
Collection Time: 0830

**Component Results**  
Specimen: Clean catch urine  
Comments: None

Cult/Other Rslt (*): 100,000 col/ml [Escherichia coli]  
*please consult with a provider to determine if this level is significant for therapy, please call the laboratory for further testing.  
Performed at Stanford Clinical Laboratory, 3375 Hillview Avenue, Palo Alto, CA 94304, Dr Dan Arber, Laboratory Director

**Report Status**  
02/04/2011 FINAL

### Culture & Susceptibility

<table>
<thead>
<tr>
<th>Method</th>
<th>MIC mcg/mL</th>
<th>Susceptibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMPICILLIN</td>
<td>&lt;=2</td>
<td>SUSCEPTIBLE</td>
</tr>
<tr>
<td>CEFAZOLIN</td>
<td>&lt;=4</td>
<td>SUSCEPTIBLE</td>
</tr>
<tr>
<td>CIPROFLOXACIN</td>
<td>&lt;=0.25</td>
<td>SUSCEPTIBLE</td>
</tr>
<tr>
<td>GENTAMICIN</td>
<td>&lt;=1</td>
<td>SUSCEPTIBLE</td>
</tr>
<tr>
<td>LEVOFLOXACIN</td>
<td>&lt;=0.12</td>
<td>SUSCEPTIBLE</td>
</tr>
<tr>
<td>NITROFURANTOIN</td>
<td>&lt;=16</td>
<td>SUSCEPTIBLE</td>
</tr>
<tr>
<td>TRIMETHOPRIM/SULFAMETHOXAZOLE</td>
<td>&lt;=20</td>
<td>SUSCEPTIBLE</td>
</tr>
</tbody>
</table>

**Result History**  
URINE CULTURE (Order#377950451) on 2/4/11 - Order Result History Report

*Image of results page with marked results and additional notes.*
Amy – A/P

- Simple UTI, pan sensitive
- Cipro x 3d
- Follow-up prn
RESISTANCE – Today

Comments: none

Cult/Other Reslt (*):

>100,000 col/ml [Escherichia coli] If piperacillin/tazobactam is considered for therapy, please call the laboratory for further testing.

< 10,000 col/ml GRAM POSITIVE FLORA (including one or more of the following: Staph, Strep, Lactobacilli or Coryneforms)

Performed at Stanford Clinical Laboratory, 3375 Hillview Avenue, Palo Alto, CA 94304, Dr Dan Arber, Laboratory Director

Report Status: 10/06/2011 FINAL

<table>
<thead>
<tr>
<th>Culture &amp; Susceptibility</th>
<th>ESCHERICHIA COLI</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMPICILLIN</td>
<td>&gt;=32 RESISTANT</td>
</tr>
<tr>
<td>CEFAZOLIN</td>
<td>&lt;=4 SUSCEPTIBLE</td>
</tr>
<tr>
<td>CIPROFLOXACIN</td>
<td>&gt;=4 RESISTANT</td>
</tr>
<tr>
<td>GENTAMICIN</td>
<td>&lt;=1 SUSCEPTIBLE</td>
</tr>
<tr>
<td>LEVOFLOXACIN</td>
<td>&gt;=8 RESISTANT</td>
</tr>
<tr>
<td>NITROFURANTOIN</td>
<td>&gt;=512 RESISTANT</td>
</tr>
<tr>
<td>TRIMETHOPRIM/SULFAMETHOXAZOLE</td>
<td>&gt;=320 RESISTANT</td>
</tr>
</tbody>
</table>
The Antibiotic Paradox

1992 – Stuart Levy
- Excessive overuse of antibiotics
- Goals
  - Educate the public
  - Educate the providers

2013
- FDA request to decrease use of antibiotics in animals

http://www.nytimes.com/2014/03/09/opinion/sunday/the-fat-drug.html?_r=1
70 y/o female with h/o recurrent UTIs

Classic UTI symptoms

Treatment:
- Prescriber A – empiric Cipro
- Prescriber B
  - Sulfa
  - Ampicillin
  - Macrobid
  - Keflex

Urine culture negative

Symptoms persist...
Antibiotic-oholic

- Patient seen in Urology clinic
  - What is wrong with current picture?
  - What are the next steps?
- Other possible etiology
The Antibiotic Paradox
What are the Facts?
UTI Prevalence

- 33% of women get a UTI by 24 y/o
- 60% women get a UTI diagnosed in their lifetime
- 7+ million office visits for UTIs
- 1+ million ER visits in 2000

Jackson, MA. Orenstein & Wong, 1999
UTI Facts

- Empiric treatment
- About 50% symptomatic women have UTIs
  - Most common type of bacteria: E. Coli
    - Most common antibiotic: Cipro

Resistant Facts

- 2+ million people annually with antibiotic drug resistance
- 23,000+ deaths annually from directly related to drug resistant infections
- 250,000+ hospital patients with C. Diff directly related to antibiotic usage
- $20 billion direct healthcare costs

The Reality

- >50% of the time unnecessary use of antibiotics
- 1 out of 5 ER visits related to adverse reaction to antibiotics
- Domestic and international surveillance is suboptimal

So What?

- Longer hospital stays
- Increased exposure to more potent drugs
- Increased risk to expose others
- Increased morbidity and mortality
- Increased healthcare costs
- Reversing modern medicine

Let’s Start from the Beginning

- Review of Simple UTIs
- Pseudo-UTIs
- Complicated UTIs
- Case Studies
- Differential Diagnosis
- The Pathogens
Symptomatic urothelial inflammation due to microbial invasion, characterized by bacteriuria and pyuria” in an otherwise healthy, nonpregnant, adult woman without known anatomical or functional abnormalities of the urinary tract
Females have increased risk of UTIs

- Anatomy
- Genetics
- Incontinence surgery
- Behavioral/physiologic factors that alter vaginal flora
- Postmenopausal estrogen status
Case Study – Delores

- 75 y/o female with burning pre/post micturition, frequency, urgency and postvoid dribbling
- UA: positive leukocytes
- Urine culture: 100K mixed genital flora
- Treated with 3 days of Cipro, no improvement
- Diagnosis?
Atrophic Vaginitis

Changes in the vaginal epithelium from the reproductive years (right) to menopause (left).

Reproduced with permission from: the Anatomical Chart Company. Copyright © 2011 Lippincott Williams & Wilkins.
Case Study – Delores

- 75 y/o female with h/o burning with and after urination, frequency, urgency and postvoid dribbling
- No significant medical or surgical history
- UA: pos leukocytes, pos nitrites
- Urine culture: 100K E. Coli
- Diagnosis?
- No improvement of symptoms with antibiotics
Bacteriuria: What is it?

- **Definition**
  - The presence of bacteria in the urine not related to contamination

- **2 Types**
  - Symptomatic
  - Asymptomatic
Bacteriuria: How Common is It?

- Healthy premenopausal women 1–5%
- Postmenopausal women 2.8–18%
- Institutionalization – 23%
- Women with diabetes 9–27%
- Intermittent catheter dependent spinal cord injury patients 23–89%
- Long term foley catheter 100%
Bacteriuria

- Common problem in clinical practice
- Asymptomatic patients should NOT be treated
  - Cloudy or foul smelling urine are not symptoms
  - June 2012 study in Italy
- Exceptions

AAFP 2006
http://jama.jamanetwork.com/article.aspx?articleID=1832516
Should we treat Delores with antibiotics?
Bacteriuria & Pregnancy

- “Pregnant women should be screened for asymptomatic bacteriuria…” – Evidence rating A
- Increased risk of:
  - Preclampsia
  - Preterm delivery
  - Low birth weight
  - Pyelonephritis
  - Sepsis
- Treatment

AAFP 2006
High Risk/Complicated Patient

- Functional or structural abnormalities
  - Obstruction
    - Prolapse
    - Prostate
    - Stones
    - Uro/gyn surgery
    - diverticulum
What do you think about this?
>100,000 cfu/ml [Morganella morganii] NOTE: Enterobacter sp., Serratia sp., Citrobacter freundii, and Morganella morganii may develop resistance during 3rd generation cephalosporin treatment due to inducible chromosomal beta-lactamases. Consider re-culturing after 3 days of 3rd generation cephalosporin therapy if clinically indicated. (Identification done by matrix assisted laser desorption ionization) NOTE: This test's performance characteristics were determined by Stanford Clinical Micro. Lab. It has not been cleared or approved by the U.S. Food and Drug Administration. Such approval is not required for tests validated by the performing laboratory.

50,000 cfu/ml [Proteus mirabilis] Cefazolin MIC of <=4 mcg/ml used to define susceptibility to this drug. The Clinical and Laboratory Standard Institute recommends using <=2 mcg/ml as the cutoff. Urinary isolates with MIC of 4 mcg/ml can still be treated with cefazolin because cefazolin is concentrated in urine.

>100,000 cfu/ml [Serratia marcescens] NOTE: Enterobacter sp., Serratia sp., Citrobacter freundii, and Morganella morganii may develop resistance during 3rd generation cephalosporin treatment.

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Morganella morganii</th>
<th>Proteus mirabilis</th>
<th>Serratia marcescens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoxicillin/clavulanic acid</td>
<td>&gt;=32</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>&gt;=32</td>
<td>&lt;=2</td>
<td>Resistant</td>
</tr>
<tr>
<td>Cefazolin</td>
<td>&gt;=64</td>
<td>&lt;=4</td>
<td>&gt;=64</td>
</tr>
<tr>
<td>Ceftazidime</td>
<td>&lt;=1</td>
<td>SUSCEPTIBLE</td>
<td>&lt;=1</td>
</tr>
<tr>
<td>Ceftiraxone</td>
<td>&lt;=1</td>
<td>SUSCEPTIBLE</td>
<td>Susceptible</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>&lt;=0.25</td>
<td>&lt;=0.25</td>
<td>&lt;=0.25</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>4</td>
<td>SUSCEPTIBLE</td>
<td>SUSCEPTIBLE</td>
</tr>
<tr>
<td>Levofoxacin</td>
<td>&lt;=0.12</td>
<td>&lt;=0.12</td>
<td>&lt;=0.12</td>
</tr>
<tr>
<td>Nitrofurantoin</td>
<td>128</td>
<td>128</td>
<td>256</td>
</tr>
<tr>
<td>Piperacillin/tazobactam</td>
<td>&lt;=4</td>
<td>SUSCEPTIBLE</td>
<td>SUSCEPTIBLE</td>
</tr>
<tr>
<td>Tetracycline</td>
<td>&lt;=1</td>
<td>RESISTANT</td>
<td>&gt;=16</td>
</tr>
<tr>
<td>Trimethoprim/sulfamethoxazole</td>
<td>&lt;=20</td>
<td>SUSCEPTIBLE</td>
<td>RESISTANT</td>
</tr>
</tbody>
</table>
High Risk/Complicated Patient

- Foreign object
  - Indwelling catheter
  - Intermittent catheterization
- Nursing Homes
  - #1 reason for antibiotic use
  - Atypical UTI symptoms
Case Study – Foley Catheter

- 65 year old female with urinary retention RT vaginal mass
- Plan: LT indwelling catheter
- Saw her Oncologist with symptoms of bladder spasms, burning
- Treated with 10d course of Cipro for UTI
- Urine is clear but symptoms persist despite antibiotics
Patient comes to Urology clinic for help
Why is the antibiotic not helping?
Would a SPT be better?
What are the next steps?
Take home Points
High Risk/Complicated Patient

- Neurologic
  - Areflexic bladder – requires CIC
  - Spinal cord injury (SCI)
- Men
UTI Work-up

- History
- Physical Exam
- Urine tests
- Imaging
Urine Tests

- Urine collection
  - UA dipstick
  - Urine microscopy
  - Urine culture

- Other considerations
  - Vaginal contamination
  - Pyuria, bacteriuria

Imaging

- Not needed for uncomplicated UTIs
- Complicated UTIs
  - Renal us
  - Noncontrast CT
  - CT with contrast
Differential Diagnoses

- Overactive bladder
- Atrophic vaginitis
- Vaginal infections and sexually transmitted infection
- Painful bladder syndrome/interstitial cystitis
- Kidney/ureteral stones
- Neurogenic bladder
- Psychological factors
- Bladder cancer
- Post radiation cystitis
Urine Pathogens

- E. Coli
- Enterobacteriaceae
- Proteus
- Klebsiella
- Pseudomonas
- Citrobacter

What about:
- Staph
- Strep B
- Lactobacilli
The Resistance Begins

How Antibiotic Resistance Happens

1. Lots of germs. A few are drug resistant.

2. Antibiotics kill bacteria causing the illness, as well as good bacteria protecting the body from infection.

3. The drug-resistant bacteria are now allowed to grow and take over.

4. Some bacteria give their drug-resistance to other bacteria, causing more problems.

# Developing Resistance

## Timeline of Key Antibiotic Resistance Events

<table>
<thead>
<tr>
<th>Antibiotic Resistance Identified</th>
<th>Antibiotic Introduced</th>
</tr>
</thead>
<tbody>
<tr>
<td>penicillin-R <em>Staphylococcus</em></td>
<td>1940</td>
</tr>
<tr>
<td>tetracycline-R <em>Shigella</em></td>
<td>1959</td>
</tr>
<tr>
<td>methicillin-R <em>Staphylococcus</em></td>
<td>1962</td>
</tr>
<tr>
<td>penicillin-R <em>pneumococcus</em></td>
<td>1965</td>
</tr>
<tr>
<td>erythromycin-R <em>Streptococcus</em></td>
<td>1968</td>
</tr>
<tr>
<td>gentamicin-R <em>Enterococcus</em></td>
<td>1979</td>
</tr>
<tr>
<td>ceftazidime-R <em>Enterobacteriaceae</em></td>
<td>1987</td>
</tr>
<tr>
<td>vancomycin-R <em>Enterococcus</em></td>
<td>1988</td>
</tr>
<tr>
<td>levofloxacin-R <em>pneumococcus</em></td>
<td>1996</td>
</tr>
<tr>
<td>imipenem-R <em>Enterobacteriaceae</em></td>
<td>1998</td>
</tr>
<tr>
<td>XDR <em>tuberculosis</em></td>
<td>2000</td>
</tr>
<tr>
<td>linezolid-R <em>Staphylococcus</em></td>
<td>2001</td>
</tr>
<tr>
<td>vancomycin-R <em>Staphylococcus</em></td>
<td>2002</td>
</tr>
<tr>
<td>PDR-Acinetobacter and <em>Pseudomonas</em></td>
<td>2004/5</td>
</tr>
<tr>
<td>ceftriaxone-R <em>Neisseria gonorrhoeae</em></td>
<td>2009</td>
</tr>
<tr>
<td>PDR-Enterobacteriaceae</td>
<td>2010</td>
</tr>
<tr>
<td>ceftaroline-R <em>Staphylococcus</em></td>
<td>2011</td>
</tr>
</tbody>
</table>

Dates are based upon early reports of resistance in the literature. In the case of pan drug-resistant (PDR)-*Achromobacter* and *Pseudomonas*, the date is based upon reports of healthcare transmission or outbreaks. Note: penicillin was in limited use prior to widespread population usage in 1943.
4. DEVELOPING NEW ANTIBIOTICS AND DIAGNOSTIC TESTS

Because antibiotic resistance occurs as part of a natural evolution process, it can be significantly slowed but not stopped. Therefore, new antibiotics will always be needed to keep up with resistant bacteria as well as new diagnostic tests to track the development of resistance.

Tomorrow's Antibiotics: The Drug Pipeline

The number of new antibiotics developed and approved has steadily decreased in the past three decades, leaving fewer options to treat resistant bacteria.

Number of Antibacterial New Drug Application (NDA) Approvals vs. Year Intervals*

*Intervals from 1980-2009 are 5-year intervals; 2010-2012 is a 3-year interval. Drugs are limited to systemic agents. Data courtesy of FDA’s Center for Drug Evaluation and Research (CDER).
MOA of resistance

- How an antibiotic works
  - Antibiotic enters cell
  - At a minimal concentration
  - Acts on a target

- Resistant Bacteria disrupt one of the above steps above by
  - Decreased membrane permeability
  - Efflux pump
  - Altered target
  - Enzymatic change

Antimicrobials – Outdated guidelines

- TMP-SMX DS BID x 3 days
- Fluoroquinolones
- Nitrofurantoin BID x 7 days
- Fosfomycin 3g single dose
IDSA 2011 Simple Cystitis Treatment Guidelines

- Trimethoprim–sulfamethoxazole
  - DS BID x 3 days
- Nitrofurantoin
  - 100 mg BID x 5 days
- Fosfomycin trometamol
- *Pivmecillinam
- Fluoroquinolones

Fosfomycin

- **Fosfomycin trometamol**
  - Bactericidal
  - Broad Spectrum against gram negative bacteria
    - Escherichia coli
    - Enterobacter species
    - Serratia marcescens
    - Pseudomonas aeruginosa
    - Klebsiella pneumoniae
Bacterial Resistance to E. Coli

- Septra resistance rate is 18–30%
- Quinolones up to 20%
- Nitrofurantoin is less than 7%
- Fosfomycin is less than 2%
IDSA Algorithm for Simple Cystitis

1. Woman with acute uncomplicated cystitis
   - Absence of fever, flank pain, or other suspicion for pyelonephritis
   - Able to take oral medication

2. Consider alternate diagnosis (such as pyelonephritis or complicated UTI) & treat accordingly (see text)

3. Can one of the recommended antimicrobials* below be used considering:
   - Availability
   - Allergy history
   - Tolerance

   Nitrofurantoin monohydrate/macrocrystals 100 mg bid X 5 days
   (avoid if early pyelonephritis suspected)
   OR

   Trimethoprim-sulfamethoxazole 160/800 mg (one DS tablet) bid X 3 days
   (avoid if resistance prevalence is known to exceed 20% or if used for UTI in previous 3 months)
   OR

   Fosfomycin trometamol 3 gm single dose
   (lower efficacy than some other recommended agents; avoid if early pyelonephritis suspected)
   OR

   Piroxicillin 400 mg bid X 5 days
   (lower efficacy than some other recommended agents; avoid if early pyelonephritis suspected)

4. Fluoroquinolones (resistance prevalence high in some areas)
   - OR
   - β-lactams (avoid amoxicillin or amoxicillin alone; lower efficacy than other available agents; requires close follow-up)

*The choice between these agents should be individualized and based on patient allergy and compliance history, local practice patterns, local community resistance prevalence, availability, cost, and patient and provider threshold for failure (see Table 4)

Prescribe a recommended antimicrobial

Gupta K et al. Clin Infect Dis. 2011;52:e103-e120

© The Author 2011. Published by Oxford University Press on behalf of the Infectious Diseases Society of America. All rights reserved. For Permissions, please e-mail: journals.permissions@oup.com.
Treatment Duration

- Simple cystitis: 3–5d
- Complicated UTIs: 7–14d
- Education
  - Complete full course of antibiotics regardless of symptom relief
  - Don’t use left over antibiotics at home
Case Study – John

- 64 y/o male with h/o diabetes, HTN.
- Symptoms – burning with urination, increased hesitancy, urgency
- Urine culture
  - 100K E. Coli, ESBL
ESBL E. Coli UTIs

- Highly resistant bacteria
- Usually requiring IV antibiotics
- Used to only be seen in the hospital setting
- Commonly seen in the community

Goal
- Identify risk factors early
- Prevent resistance

Rodríguez-Baño J, Navarro MD
Visually Speaking...

E. Coli

$+ \text{ ESBL} =$
Retrospective Study – ESBL

- 2009–2010
- 400 isolates
- Risk Factors
  - Male
  - Institutionalized
  - Indwelling catheter
  - > 60 years of age
  - Co–morbidity
  - Recurrent UTIs
  - Prior use of abx
Retrospective Study – Findings

- Sensitive to fosfomycin and carbapenem
- 25% hospitalized patients on incorrect abx

Summary:
- 1. Know risk factors
- 2. Know how to treat and manage correctly
- 3. Refer to ID

Case Study – John

- Confirm culture sensitivity
- Options
  - Treat with PO fosfomycin
  - Refer to ID for IV treatment with carbapenem
  - Additional work-up
    - Cystoscopy
    - Renal us
Unresolved UTIs

- Determine if persistent vs recurrent bacteria
  - Mainly due to insufficient treatment
- Treat based on urine culture results
- If no resolution and no etiology found, consider additional work-up
Recurrent UTIs

- 3+ documented UTIs per year
- Reinfection
- Risk factors
Alternative Treatment Options for UTIs
Antibiotics

- Medications
  - Macrodantin
  - Bactrim
  - Keflex
  - Doxycyclin
  - Trimethoprim

- Daily vs Postcoital
Antibiotics are not always the answer
Post Menopausal

- Topical Estrogens
  - Estrace, premarin, vagifem
  - Evidence-based for VVA

- Nonhormonal alternatives
  - Moisturizers
  - Lubricants

More information can be found at:
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2800285/
Cranberry supplements

- Interferes with the attachment of bacteria to uroepithelial cells
- 7/2012 meta analysis, in archives of Internal Medicine

## Summary: Abx vs Supplements

<table>
<thead>
<tr>
<th>Treatment</th>
<th>UTI occurrence after 12 months</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bactrim</td>
<td>2.9 (1.8)</td>
<td>Higher resistance to E. Coli</td>
</tr>
<tr>
<td>Lactobacilli</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>Cranberry</td>
<td>4.0</td>
<td>None</td>
</tr>
</tbody>
</table>

- **Summary:**
  - Antibiotics superior
  - Antibiotics have bacterial resistance
  - Supplements may be “good enough”

Probiotics

They reach the intestine alive.

They can be ingested as food.

Aids digestion.

Prevent harmful bacteria from multiplying in the intestine.

It improves bowel movement.

They produce beneficial effect on health.
2011 study comparing Fluoroquinolones vs Chinese herbal medication

- Chinese herbal concoction included:
  - Talcum, Paeonia lactiflora, vulgare Mill, Cinnamomum, etc.
- Evaluated symptoms at
  - Day 5, last day of treatment, 1 week post treatment
- Results
  - 70% cured or improved 1 week post treatment
- Conclusion

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3252729/
Anything else?

- **Vitamin C**
  - Currently no evidence suggesting efficacy

- **OM-89 (Uro-Vaxom)**
  - Oral immunostimulant
  - Made with E. Coli strains
  - Small clinical trials show benefit

- **Bladder Instillations**
  - Gentamycin, neomycin
  - Clorpactin

Refractory Options

- Benefits vs risk
  - If symptoms mild, observation
  - If highly symptomatic, treat for longer duration
- Refer/consult with ID
Recommendations

- Good hygiene
  - Transfer of bacteria within hospital, community settings
- Prescribe responsibly
- Treat with certainty
  - Follow up with patient, recheck urine culture
- Treat with narrow spectrum antibiotics, when appropriate
- Patient education
Recommendations

- CDC outreach program

# Do’s and Do Not’s

<table>
<thead>
<tr>
<th>Do’s</th>
<th>Do Not</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urine dip, empirically, first line treatment should be Macrobid or</td>
<td>Empirically treat with Cipro as first line therapy</td>
</tr>
<tr>
<td>Bactrim</td>
<td></td>
</tr>
<tr>
<td>Treat with most appropriate antibiotic – least invasive first</td>
<td>Treat with IV if there is a PO available</td>
</tr>
<tr>
<td>Offer estrogen cream for postmenopausal women with recurrent UTIs</td>
<td>Empirically treat if first course of antibiotics failed</td>
</tr>
<tr>
<td>Obtain urine culture if symptoms persist</td>
<td>Treat if only symptoms are smelly and cloudy urine</td>
</tr>
<tr>
<td></td>
<td>Treat patients with indwelling catheters prophylactically</td>
</tr>
</tbody>
</table>
Red Flags

- Hematuria, in absence of UTI
- Pyuria, in absence of UTI
- Persistent urinary symptoms, despite negative urine cultures
Take Home Messages

- UTIs are over diagnosed and over treated
- Increasing bacterial resistance is the reality
- Treat and prescribe responsibly
- Know the alternative options for UTI symptoms
- GET SMART
Questions & Answers