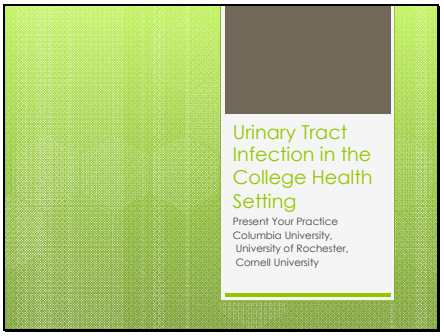
Urinary Tract Infection in the College Health Setting
Lisa Stankus, NP and P. Davis Smith, MD

Slide 1



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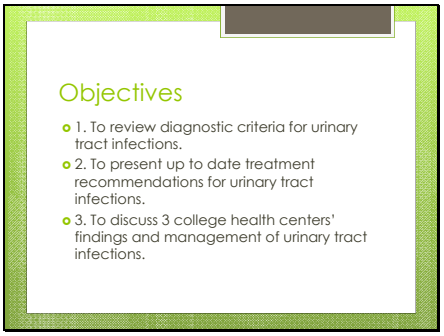

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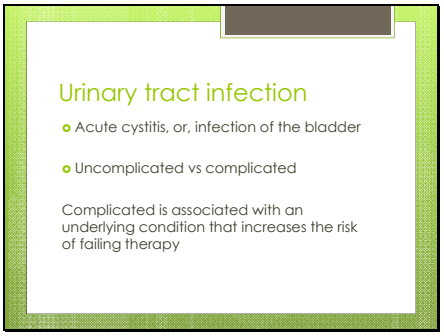

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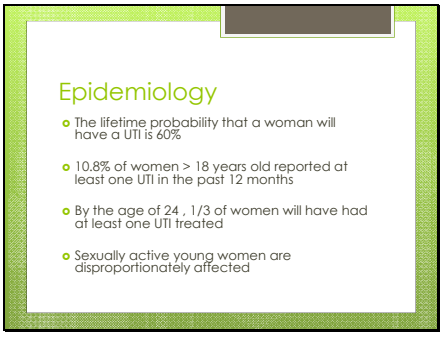

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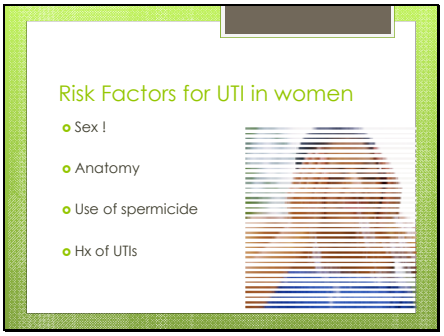

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MICROBIOLOGY

- Mainly e. coli
- Other species of Enterobacteriaceae:
  - Klebsiella pneumonieae
  - Proteus mirabilis
  - Staph saprophyticus

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CLINICAL MANIFESTATIONS

- Dysuria
- Frequency
- Urgency
- Suprapubic pain
- Hematuria
- vs pyelonephritis

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DIAGNOSIS

- Clinical history
- Physical examination
- Lab diagnosis

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Lab diagnosis (cont'd)

- Dipstick analysis
- Screening tool for diagnosis of UTI.
- Dipstick detects leukocyte esterase and nitrite in the urine.
- Also specific gravity, blood, pH

Leukocyte esterase used to detect >10 leukocytes per high power

Nitrite test fairly sensitive for detecting >10(5) CFU of enterobacteriaceae per mL of urine

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Dipstick analysis

- The positive predictive value (PPV) (96%)and the specificity (94%) of the nitrite test were high for all samples - Nys et.al 2006
- A negative nitrite with a positive leucocyte esterase (LE) showed a high PPV (79%) and sensitivity (82%).
- When both nitrite and LE tests were negative, ~ 50 % of samples were culture positive.
- Good to rule IN, not rule OUT .

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Common UTI bacteria

	E. Coli	Proteus	Klebsiella	Staph sapro
Gram negative	Yes	Yes	Yes	Gram positive
Nitrite producing	varies	yes	varies	NO

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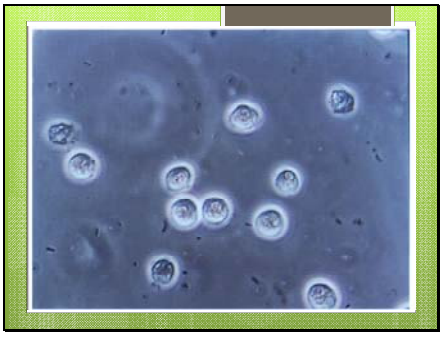

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Lab diagnosis

- Urinalysis - to assess for pyuria
- Pyuria is the presence of at least 8000 leukocytes per mL of uncentrifuged urine which corresponds to 2 to 5 leukocytes per high power field in centrifuged sediment

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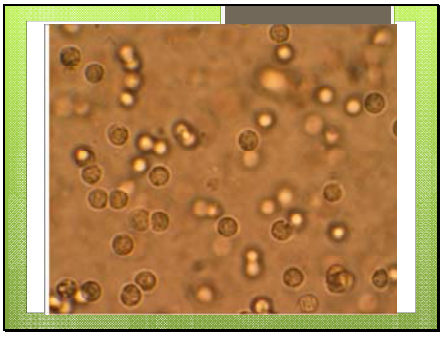
Pyuria

- Sterile pyuria is urine which contains white blood cells while appearing sterile by standard culturing techniques.
  - Sterile pyuria is listed as a side effect from some medications such as paracetamol (acetaminophen).
  - Its occurrence is also associated with certain disease processes, such as Kawasaki Disease and renal TB.
  - There are many known causes, including systemic or infectious disease, structural and physiological reasons, intrinsic renal pathology, or drugs.

Slide 17



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Youtube clip

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Lab diagnosis (cont'd)

- Indications for Urine culture in young women
  - Suspicion of a complicated infection
  - Atypical symptoms
  - Failure to respond to initial therapy (?resistance)
  - Recurrent symptoms less than one month after treatment of a previous UTI for which no culture was done

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ACOG 2008 Treatment guidelines

- In nonpregnant, premenopausal women, screening for and treatment of asymptomatic bacteriuria is not recommended
  - Level of evidence A
- Antibiotic class should be changed when resistance rates are higher than 15% to 20%
  - Level of evidence A
- Patients with acute pyelonephritis should complete 14 days of total antimicrobial therapy, regardless of whether treatment is on an inpatient or outpatient basis
  - Level of evidence A

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ACOG 2008 Treatment guidelines cont'd

- For uncomplicated acute bacterial cystitis in women, antibiotics should be administered for 3 days
  - Level of evidence, A
- Urine culture is not required for the initial treatment of a symptomatic lower UTI with pyuria and/or bacteriuria
  - Level of evidence, B
- For the treatment of acute uncomplicated cystitis, beta-lactams, including first-generation cephalosporins and amoxicillin, are less effective than the preferred antimicrobials listed
  - Level of evidence, C

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2010 IDSA Guidelines

- IDSA GUIDELINES: Kalpana Gupta, Thomas M. Hooton, Kurt G. Naber, Björn Wullt, Richard Colgan, Loren G. Miller, Gregory J. Moran, Lindsay E. Nicolle, Raul Raz, Anthony J. Schaeffer, and David E. Soper. International Clinical Practice Guidelines for the Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women: A 2010 Update by the Infectious Diseases Society of America and the European Society for Microbiology and Infectious Diseases *Clin Infect Dis. (2011) 52(5): e103-e120 doi:10.1093/cid/ciq257*

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Microbial Spectrum

- 75%–95% of cases of uncomplicated cystitis and pyelonephritis are caused *Escherichia coli*
- The balance are caused by other species of Enterobacteriaceae
  - *Proteus mirabilis*
  - *Klebsiella pneumoniae*
  - *Staphylococcus saprophyticus*

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Resistance

- In evaluating choice of empiric antimicrobial therapy for uncomplicated UTIs, local antimicrobial susceptibility patterns of *E. coli* in particular should be considered.
- The resistance patterns of *E. coli* strains causing uncomplicated UTI varies considerably between regions and countries.
  - What does this really mean for our well-travelled students?

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Slide 27

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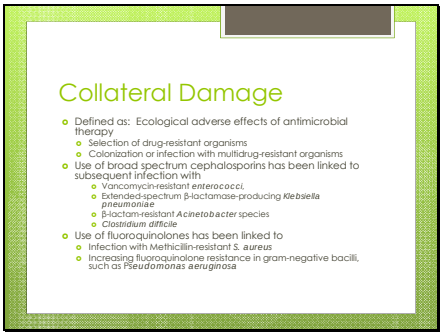

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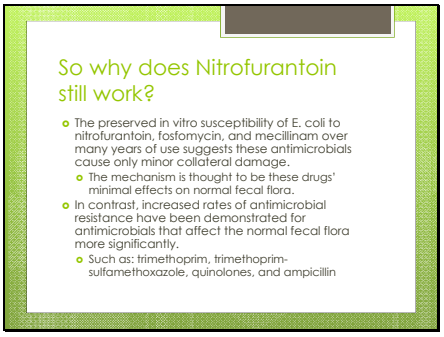

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Can we still use Bactrim?

- Trimethoprim-sulfamethoxazole (160/800 mg [1 double-strength tablet] twice-daily for 3 days) is an appropriate choice:
  - If local resistance rates of uropathogens causing acute uncomplicated cystitis do not exceed 20%.
  - Or if the infecting strain is known to be susceptible.

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What about that Fosfowhatsis stuff?

- Fosfomycin trometamol (Monurol) (3 g in a single dose)
  - An appropriate choice for therapy where it is available
    - Minimal resistance
    - Minimal propensity for collateral damage
  - But it appears to have inferior efficacy compared with standard short-course regimens

Slide 33

What about fluoroquinolones?

- Ofloxacin, ciprofloxacin, and levofloxacin, are highly efficacious in 3-day regimens, but:
  - They have a propensity for collateral damage
  - They should be reserved for important uses other than acute cystitis
- These agents should be considered alternative antimicrobials for acute cystitis

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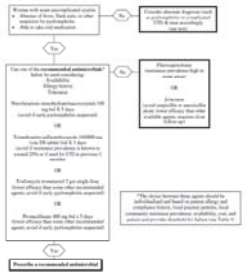
Do we need to risk Collateral Damage?

- For uncomplicated cystitis…
  - There is minimal risk of progression to tissue invasion or sepsis
  - Studies of placebo demonstrate a 25%-42% rate of clinical cure
- Uncomplicated UTI is one of the most common indications for antimicrobial exposure in an otherwise healthy population
  - Even small collateral damages will add up

Slide 35



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Case #1

- + urgent urination + painful urination. No frequent urination and No blood in urine.
  Treated 2 weeks ago and still having soreness and itching. Urine is cloudy. Completed medication but symptoms never completely resolved.
  No mid-back pain, No vomiting, and No fever.
  + vaginal discharge (white). No abdominal pain.
  Treated for yeast 9/9/11
  + Are you sexually active + unprotected intercourse (prior to last menses. No unprotected coitus since menses). No possible pregnancy

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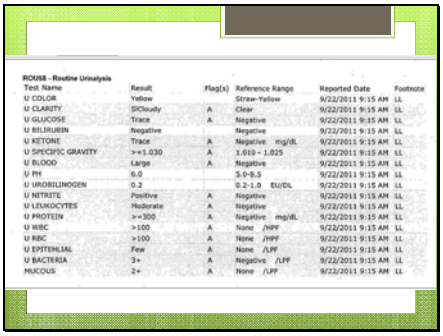

ROUS8 - Routine Urinalysis

Test Name	Result	Flag(s)	Reference Range	Reported Date	Footnote
U COLOR	Yellow		Straw-Yellow	9/22/2011 9:15 AM	LL
U CLARITY	SlCloudy	A	Clear	9/22/2011 9:15 AM	LL
U GLUCOSE	Trace	A	Negative	9/22/2011 9:15 AM	LL
U BILIRUBIN	Negative		Negative	9/22/2011 9:15 AM	LL
U KETONE	Trace	A	Negative mg/dL	9/22/2011 9:15 AM	LL
U SPECIFIC GRAVITY	>=1.030	A	1.010 - 1.025	9/22/2011 9:15 AM	LL
U BLOOD	Large	A	Negative	9/22/2011 9:15 AM	LL
U PH	6.0		5.0-8.5	9/22/2011 9:15 AM	LL
U UROBILINOGEN	0.2		0.2-1.0 EU/DL	9/22/2011 9:15 AM	LL
U NITRITE	Positive	A	Negative	9/22/2011 9:15 AM	LL
U LEUKOCYTES	Moderate	A	Negative	9/22/2011 9:15 AM	LL
U PROTEIN	>=300	A	Negative mg/dL	9/22/2011 9:15 AM	LL
U WBC	>100	A	None /HPF	9/22/2011 9:15 AM	LL
U RBC	>100	A	None /HPF	9/22/2011 9:15 AM	LL
U EPITHELIAL	Few	A	None /LPF	9/22/2011 9:15 AM	LL
U BACTERIA	3+	A	Negative /LPF	9/22/2011 9:15 AM	LL
MUCOUS	2+	A	None /LPF	9/22/2011 9:15 AM	LL

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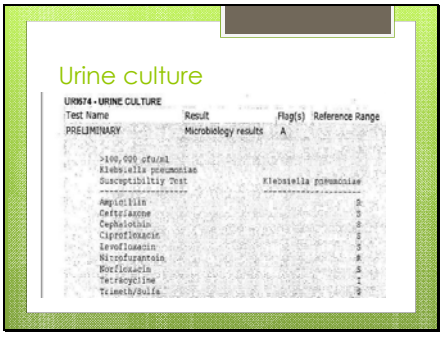

Urine culture

URN674 - URINE CULTURE

Test Name	Result	Flag(s)	Reference Range
PRELIMINARY	Microbiology results	A	

>100,000 cfu/ml
Klebsiella pneumoniae

Susceptibility Test	Klebsiella pneumoniae
Ampicillin	R
Ceftriaxone	S
Cephalothin	R
Ciprofloxacin	S
Levofloxacin	S
Nitrofurantoin	R
Norfloxacin	S
Tetracycline	I
Trimeth/Sulfa	S

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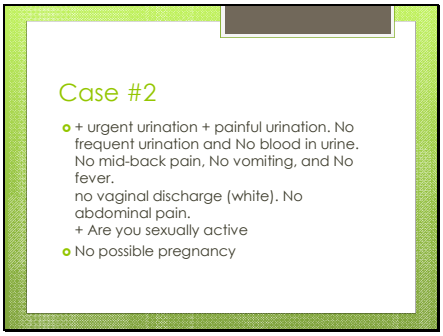

Case #2

- + urgent urination + painful urination. No frequent urination and No blood in urine. No mid-back pain, No vomiting, and No fever.
  no vaginal discharge (white). No abdominal pain.
  + Are you sexually active
- No possible pregnancy

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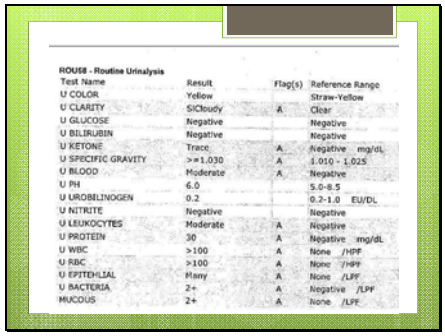

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Test Name	Result	Flag(s)	Reference Range
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U CLARITY	SlCloudy	A	Clear
U GLUCOSE	Negative		Negative
U BILIRUBIN	Negative		Negative
U KETONE	Trace	A	Negative mg/dL
U SPECIFIC GRAVITY	>=1.030	A	1.010 - 1.025
U BLOOD	Moderate	A	Negative
U PH	6.0		5.0-8.5
U UROBILINOGEN	0.2		0.2-1.0 EU/DL
U NITRITE	Negative		Negative
U LEUKOCYTES	Moderate	A	Negative
U PROTEIN	30	A	Negative mg/dL
U WBC	>100	A	None /HPF
U RBC	>100	A	None /HPF
U EPITHELIAL	Many	A	None /LPF
U BACTERIA	2+	A	Negative /LPF
MUCOUS	2+	A	None /LPF

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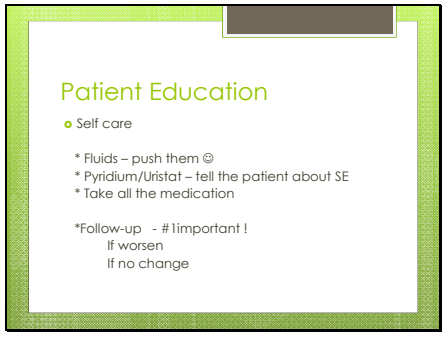

Patient Education

- Self care

  * Fluids – push them ☺
  * Pyridium/Uristat – tell the patient about SE
  * Take all the medication

  *Follow-up - #1important !
  If worsen
  If no change

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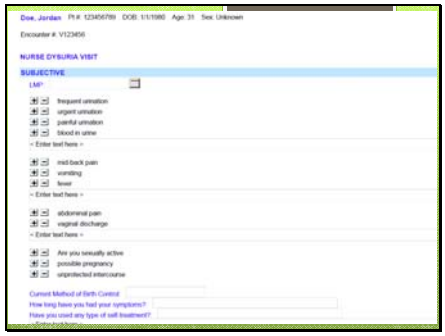

Doe, Jordan Ph # 123456789 DOB: 1/1/1990 Age: 31 Sex: Unknown

Encounter # V123456

NURSE DYSURIA VISIT

SUBJECTIVE

LMP

frequent urination
urgent urination
painful urination
blood in urine
< Enter text here >

mid-back pain
vomiting
fever
< Enter text here >

abdominal pain
vaginal discharge
< Enter text here >

Are you sexually active
possible pregnancy
unprotected intercourse

Current Method of Birth Control

How long have you had your symptoms?

Have you used any type of self-treatment?

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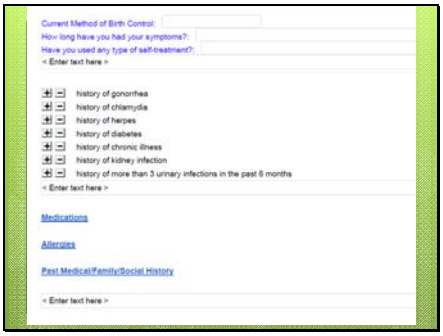

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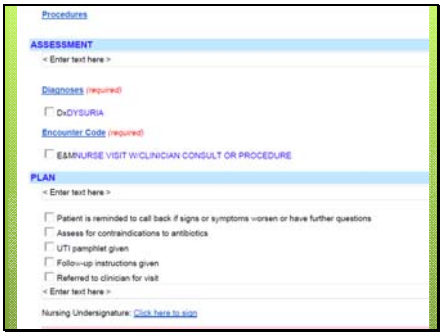

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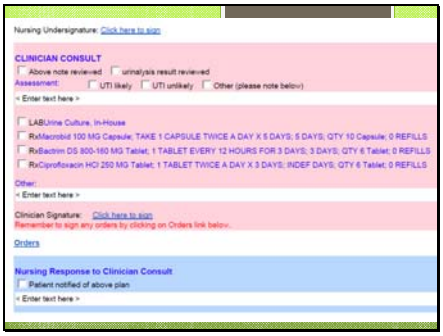

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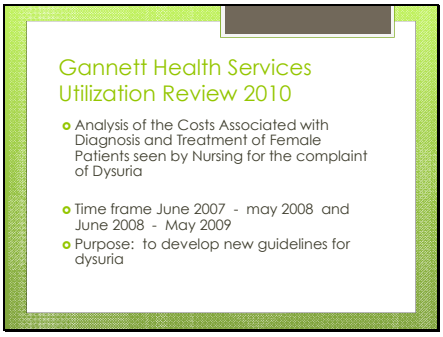

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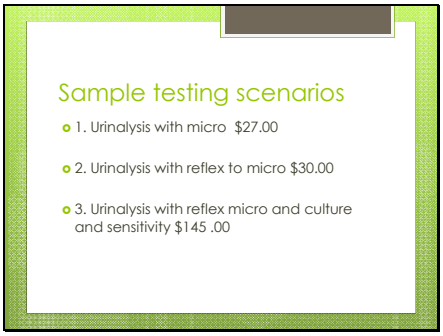

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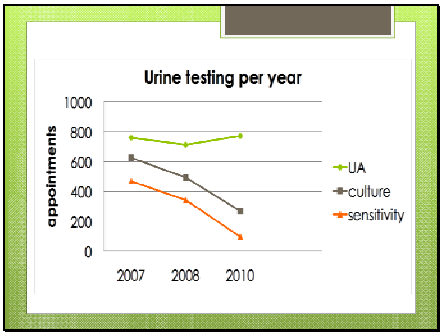

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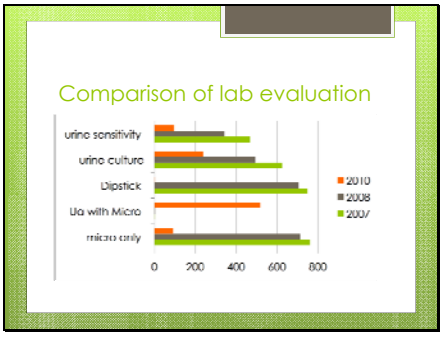

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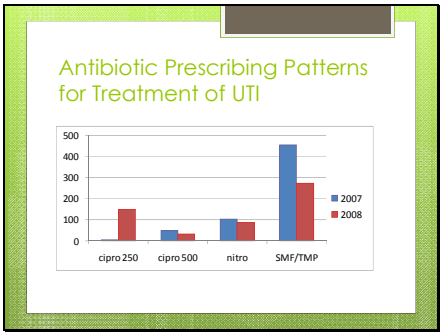

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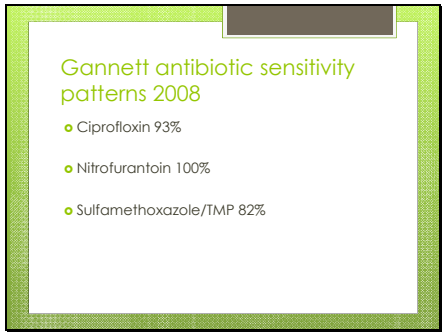

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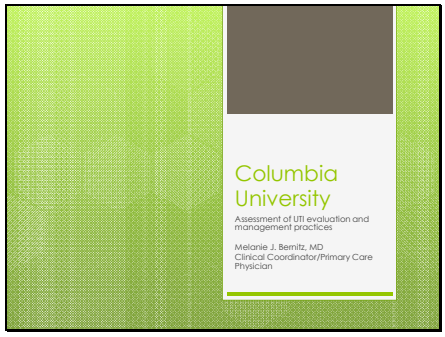

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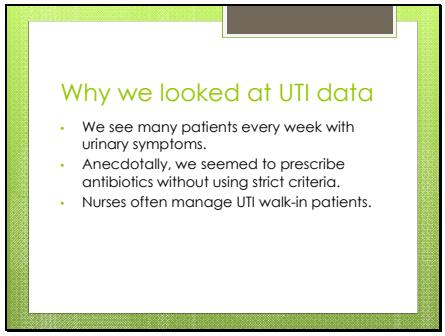

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Applied 3 key questions to this QI:

- What are we trying to accomplish?
  - Better evidence-based management of UTI symptoms.
- How will we know that a change is an improvement?
  - Lower return rate of patients.
  - Lower prescribing rate of antibiotics.
  - Lower rate of negative urine cultures.
- What changes can we make that will result in an improvement?

Slide 56

UTI QI Method

- EHR report
  - All patients with a diagnosis of urinary frequency, UTI, cystitis and dysuria
  - April 20, 2007 – October 30, 2007.
- All paper and electronic charts reviewed
  - Diagnosis
  - Urine dip results
  - Urine culture – if sent and result
  - Antibiotics prescribed
  - Return visits

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UTI QI Results

- 91 visits met criteria.
  - 72 unique patients
    - 60 with 1 visit
    - 7 with 2 visits
    - 5 with 3+ visits
- 86 urine dips sent
- 83 cultures sent

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UTI QI Results

- 32 of 83 cultures sent had no growth
  - 18 of the 32 patients were treated with antibiotics empirically.
    - 2 of these patients had a negative urine dip.
    - 7 patients had urine dips positive only for blood.
    - No patients who had positive cultures had urine dips that were positive only for blood.
  - None of the 32 no growth cultures were nitrite positive

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Positive Cultures

- 50 cultures were positive for 1 or more organism.
  - 31 of the positive cultures grew out E. Coli (62%)
    - 6 of the 31 (19%) E. Coli cultures were resistant to bactrim
      - No other organisms (19/50) were bactrim-resistant
- All 8 patients that were nitrite positive on dipstick had positive cultures

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Positive Cultures

- 9 patients with positive cultures were not empirically treated with antibiotics.
  - Presenting symptoms were either minimal, or urine dip was negative for LE, blood and nitrite.
  - All patients were recalled when the culture results came back
    - 2 had resolved spontaneously,
    - 7 were treated with appropriate antibiotics.

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Positive cultures cont'd

- 5 patients were empirically treated with cipro or nitrofurantoin because of a patient report of prior bactrim-resistant UTI.
  - In all cases the urine culture was either sensitive to bactrim or showed no growth.

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Adverse Events

- 1 patient developed a rash on bactrim and was switched to cipro (and had a negative culture)
- 1 patient developed nausea and vomiting on bactrim and was switched to cipro (and also had a negative culture)

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UTI Practice Changes

- Urine dip results will be documented in the EHR (prior to this QI, they were filed in the paper chart).
  - The template was changed to allow easy input of urine dip results.
- If a urine dip is negative, no antibiotics are prescribed.
  - Urine culture is sent if the patient complains of symptoms of dysuria, urgency or frequency.

Slide 64

Practice Changes cont'd

- If a urine dip is positive for blood only, no antibiotic is given and a urine culture is sent.
- If a urine dip is positive for nitrites, antibiotics are prescribed and no culture is sent.

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Practice Changes cont'd

- If a urine dip is positive for LE and blood, and the patient is symptomatic, treat empirically. Do not send culture.
- For patients who were empirically treated and return with symptoms within 30 days, a urine culture is sent, and treatment given if above criteria are met.

Slide 66

UTI Follow Up

- Over the next 6 months data was collected to evaluate:
  - The number of cultures being sent.
    - Predicted to decrease.
  - Number of antibiotic prescriptions being written.
    - Predicted to decrease.
  - Percentage of UTI's resistant to bactrim.
    - If >20%, we would change our use of bactrim as a first line drug.

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UTI Follow Up

- The EHR was used to repeat the QA project, from November 1, 2007 – April 30, 2008.
- Diagnoses/Urine Dips/Cultures:

	4/20/07 – 10/31/07	11/1/07 - 4/30/08
# of visits	91	87
# of UDips	86 (95%)	75 (86%)
# of UCx	83 (91%)	53 (61%)

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Did the previous practice changes make a difference?

- Number of cultures being sent:
  - Reduced from 91% of visits to 61%
- Number of antibiotic prescriptions being written:
  - Unchanged
- Bactrim Resistance
  - Increased from 19% to 33%

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Further practice changes to be instituted

- To further reduce number of cultures being sent (especially no growth cultures):
  - No culture will be sent if dip is positive for blood only or is negative.
    - Schedule provider appointment.
  - If UDip has trace or small LE, send cx and do not treat until cx results back.
  - If UDip has moderate or large LE, do not send cx and treat with antibiotics.

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Further practice changes to be instituted

- Bactrim resistance has exceeded 20%
  - First line treatment is now macrobid or cipro.
- Improve documentation
  - Provider must add addendum to nursing note if protocol is not followed with reasons
- Better reading of dips
  - Attempt to read dip even if uristat has been taken

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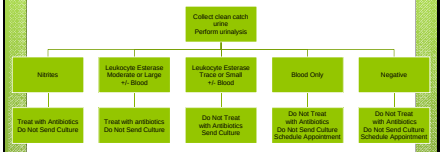

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UTI Further Follow Up

- The QI evaluation has been repeated annually (data from 6 month intervals have been combined to reflect 12 month intervals).

	5/1/07 – 4/30/08	5/1/08 – 4/30/09	5/1/09 – 4/30/10	5/1/10 – 4/30/11
Total number of visits	178	175	182	181
Number of urine dips	161 (90%)	175 (100%)	181 (99%)	180 (99%)
Number of urine cultures	136 (76%)	82 (45%)	82 (45%)	100 (55%)
Number of antibiotic prescriptions	129 (72%)	100 (57%)	121 (66%)	118 (65%)

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No Growth Cultures

	5/1/07 – 4/30/07	5/1/08 – 4/30/09	5/1/09 – 4/30/10	5/1/10 – 4/30/11
No growth Culture	56 (43%)	49 (48%)	35 (43%)	60 (54%)
Antibiotic Rx	30 (54%)	11 (22%)	12 (34%)	18 (30%)

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Positive Cultures

	5/1/07 – 4/30/08	5/1/08 – 4/30/09	5/1/09 – 4/30/10	5/1/10 – 4/30/11
Positive Cultures	77	54	46	50
E. Coli	52 (68%)	37 (69%)	33 (72%)	46 (92%)
Bactrim Resistant	13(25%)	5 (14%)	10 (30%)	12 (26%)
Cipro Resistant	n/a	0	5 (15%)	3 (7%)
Nitrofurantoin Resistant	n/a	n/a	n/a	1 (2%)

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Did our changes result in an improvement?

- Number of cultures being sent:
  - Reduced from 91% of visits in first 6 month cycle, to 76% in first year, and has decreased further to 55%.

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Improvements cont'd

- Number of antibiotic prescriptions being written:
  - Decreased from 72% of all visits to 65% of all visits.
  - Fewer antibiotics were given to patients when the urine culture was subsequently negative (reduced from 54% to 30%).
  - There has been little variation in the number of antibiotics that are added after positive cultures come back (stable at 4.5%).

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Improvements cont'd

- Antibiotic Resistance:
  - Having seen an increase in bactrim resistance to 33% after the first 2 series, our first line antibiotic was changed to cipro.
  - We began to see a significant amount of cipro resistance (15%), and per IDSA guidelines have changed our first line antibiotic to nitrofurantoin.

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Recurrent UTI's

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Recurrent UTI's

- Most recurrences are thought to represent reinfection rather than relapse
  - Arbitrarily defined as a relapse if the infecting strain is the same and the recurrence occurs within two weeks of the completion of treatment for the original infection
- Common among young, healthy women
  - Generally have anatomically and physiologically normal urinary tracts.

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Recurrent UTI Epidemiology

- Study of college women with their first UTI
  - 27 percent experienced at least one culture-confirmed recurrence within the six months following the initial infection
    - 2.7 percent had a second recurrence during this same time period
  - When the first infection is caused by Escherichia coli, women appear to be more likely to develop a second UTI within six months than those with a first UTI due to another organism

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Biologic/Genetic factors

- Women with recurrent UTI have been shown to have an increased susceptibility to vaginal colonization with uropathogens, even during asymptomatic periods.
  - This difference appears to partially result from a greater propensity for uropathogenic coliforms to adhere to the uroepithelial cells.

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Behavioral risk factors

- Not well-studied.
- In one large case-control study, the frequency of sexual intercourse was the strongest risk factor for recurrent UTI in a multivariate analysis

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Behavioral risk factors cont'd

- Other risk factors identified were:
  - Spermicide use during the past year
  - Having a new sex partner during the past year
  - Having a first UTI at or before 15 years of age
  - Having a mother with a history of UTIs

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Not risky

- No associations were found in this large study or earlier studies with:
  - Pre- and postcoital voiding patterns
  - Frequency of urination
  - Delayed voiding habits
  - Wiping patterns
  - Douching
  - Use of hot tubs
  - Frequent use of pantyhose or tights
  - Body mass index [34]

Urinary Tract Infection in the College Health Setting
Lisa Stankus, NP and P. Davis Smith, MD

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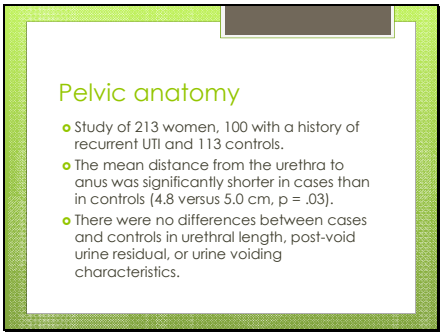

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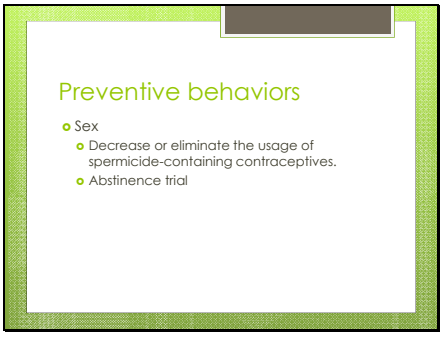

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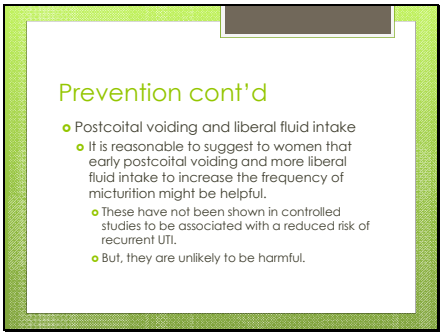

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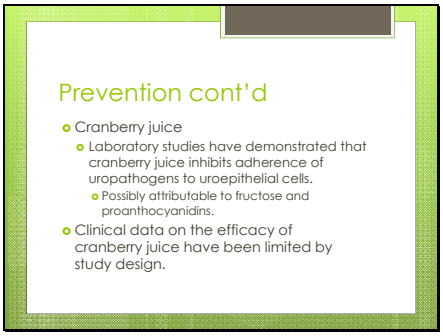

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