Antimicrobial Stewardship for Catheter-Associated Urinary Tract Infections: Early Impact of Guideline Implementation

Christine Ciaramella, PharmD[1], Marco R. Scipione PharmD[1], Yanina Dubrovskaya PharmD[1], Donald Chen, MD[1,2], Steven Bock, RN[1], John Papadopoulos BS, PharmD[1], Sapna Mehta, MD[2]

[1]NYU Langone Medical Center, [2]NYU School of Medicine, New York, NY

Contact Information
Marco R. Scipione, Pharm.D., BCPS (AQ-ID)
Clinical Coordinator, Infectious Diseases
NYU Langone Medical Center
545 First Avenue, GBH-SC2-097
New York, NY 10016
marco.scipione@nyumc.org

Presentation # 992

ABSTRACT

Background: Institution specific urinary tract infection (UTI) guidelines were implemented in July 2011. Our guidelines recommend cefepime (CEF) for empiric treatment of symptomatic catheter-associated UTI (CA-UTI) based on local susceptibility patterns. The purpose of this study was to evaluate initial antibiotic therapy for CA-UTI after guideline implementation.
Methods: A retrospective chart review of patients with CA-UTI, between 9/1/2010-7/1/2011 (before guideline implementation; BGI) and 9/1/2011-7/1/2012 (after guideline implementation; AGI) was conducted. Initial antibiotic therapy; clinical outcomes; and percentage of those who received appropriate empiric therapy based on *in-vitro* activity were evaluated.
Results: Overall, 84 patients with CA-UTI were reviewed (54 BGI and 30 AGI). Duration of urinary catheter prior to positive culture was 6 days in both groups. *Escherichia coli* (37% vs. 23%, p=NS), *Enterococcus species* (19% vs. 29%, p=NS), and *Pseudomonas aeruginosa* (12% vs. 26%, p=NS) were the most common pathogens. Sixteen (30%) patients BGI and 6 (20%) patients AGI had a polymicrobial urine culture (p=NS). Vancomycin (35% vs. 17%, p=NS), ciprofloxacin [CIP] (30% vs. 17%, p=NS), and piperacillin-tazobactam (17% vs. 23%, p=NS) were the most common antibiotics used for initial therapy. Only 21 (39%) patients BGI and 12 (40%) patients AGI had a CA-UTI without a concurrent infection. CIP use was still high (48% vs. 25%, p=NS) and CEF use was still low (10% vs. 8%, p=NS) in these patients. Resistance to CIP was 38%, while resistance to CEF was 9% among urinary Gram-negative isolates. Forty-nine (91%) patients BGI and 26 (87%) patients AGI received appropriate initial therapy based on *in-vitro* activity. Clinical success was similar in both groups (89% vs. 87%, p=NS).
Conclusion: There was no change in initial antibiotic selection after guideline implementation. Despite low compliance with our guidelines, most regimens provided adequate coverage based on *in-vitro* susceptibilities. CIP should not be used as initial therapy due to high resistance. Additional stewardship measures such as education and coordinated order sets are needed to promote greater guideline adherence.

BACKGROUND

- Catheter-associated urinary tract infections (CA-UTI) are one of the most common health-care associated infections worldwide.[1]
  - Indwelling urethral catheter, indwelling supra-pubic catheter or intermittent catheterization are a large reservoir for antimicrobial resistant organisms.
  - Result in a considerable amount of antimicrobial use in hospitals.[2]
- In 2009, the Infectious Diseases Society of America (IDSA) published guidelines for the diagnosis, prevention and treatment of CA-UTI in adults.
  - Recommendations for treatment of choice for CA-UTI are not provided, but importance of using local antimicrobial susceptibility data to guide empiric treatment is emphasized.[1]
  - Antimicrobial stewardship should aid in adjusting empiric therapy based on culture and susceptibility results .
  - Duration of therapy should be shortened if there is prompt resolution of clinical symptoms in order to avoid prolonged courses of broad spectrum antibiotics.[2]
- Guidelines for the treatment of urinary tract infections (UTI) were implemented in July 2011 at NYULMC.
  - Previously, ciprofloxacin was used for the empiric treatment of UTI including those associated with catheters.
  - Because of high resistance among *Enterobacteriaceae*, antimicrobial stewardship developed guidelines for empiric therapy of CA-UTI, recommending cefepime as initial empiric therapy for symptomatic CA-UTI along with removal or changing of the indwelling catheter, if possible.
  - Duration of therapy of 7 days is recommended with prompt resolution of symptoms or 10-14 days with a delayed response.
  - These guidelines were approved by the hospital pharmacy and therapeutics committee, disseminated to clinicians, and posted on the antimicrobial stewardship web site.

OBJECTIVE

The objective of this study was to evaluate the epidemiology of CA-UTI and to evaluate initial antibiotic therapy used to treat CA-UTI before and after guideline implementation.

REFERENCES

1. Dellit TH, Owen RC, McGowan JE et al. Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America Guidelines for Developing an Institutional Program to Enhance Antimicrobial Stewardship. Clinical Infectious Diseases 2007; 44:159-177.
2. Hooton TM, Bradley SF, Cardenas DD et al. Diagnosis, Prevention, and Treatment of Catheter-Associated Urinary Tract Infection in Adults: 2009 International Clinical Practice Guidelines from the Infectious Diseases Society of America. Clinical Infectious Diseases 2009; 50:625-663.

Disclosure: The authors of this presentation have nothing to disclose concerning possible financial or personal relationships with commercial entities.

METHODS

- A retrospective chart review of patients with a symptomatic CA-UTI.
- Data collection:
  - Patients identified from an infection control database of all patients with CA-UTI.
  - Before implementation of guidelines (baseline group): Sept 1, 2010 to July 1, 2011.
  - After guideline implementation (AGI group): Sept 1, 2011 to July 1, 2012.
- A two month period between study groups was allowed so that guidelines could be posted to hospital intranet and to allow for education of medical staff through training sessions .

Inclusion Criteria

- Positive urine culture with indwelling urinary catheter at the time of or within 48 hrs prior to specimen collection.
- Signs and symptoms of UTI.

Exclusion criteria

- < 18 years of age
- Admitted to ICU at the time of urine culture (n=97)
- Candida species growing exclusively from urine culture (n=32)
- Patient did not receive antimicrobials for the treatment of a UTI (n=9)

Endpoints

- Antimicrobial therapy used to treat CA-UTI before and after guideline implementation.
- Percentage of patients who received appropriate empiric therapy based on in-vitro activity against isolated pathogen.
- Clinical outcomes for patients with CA-UTI before and after guideline implementation.
  - Negative repeat urine culture at least 48 hours after the initiation of antibiotics.
    OR
  - Clinical documentation of improvement in fever, WBC, or clinical symptoms.
- Microbiological clearance was evaluated for patients who had a follow up culture at end of therapy (EOT) or after initiation of treatment.

RESULTS

Table 1. Patient characteristics

	Baseline Group n=54	AGI Group n=30
Age, median years (range)	74 (21-94)	72 (44-90)
Gender, female	37 (69)	21 (70)
Underlying co-morbidities		
Major surgery	30 (56)	12 (40)
Malignancy	16 (30)	13 (43)
Cardiovascular disease	14 (26)	9 (30)
Diabetes	14 (26)	9 (30)
Chronic kidney disease	11 (20)	8 (27)
Immunosuppression[a]	3 (6)	11 (37)
Genitourinary abnormality	12 (22)	8 (27)
Neurogenic bladder	4 (7)	1 (3)
Benign prostate hyperplasia	3 (6)	6 (20)
Genitourinary obstruction	4 (7)	1 (3)
Recent surgery	3 (6)	2 (7)
Urinary retention	3 (6)	3 (10)
Bladder cancer	1 (2)	0
Length of hospitalization, median days (range)	22 (4-179)	19 (3-59)
Prior hospitalization within 30 days	15 (28)	3 (10)
Duration of urinary catheterization prior to positive urine culture, median days (range)	6 (2-28)	6 (3-27)
Duration of urinary catheterization, median days (range)	11 (1-32)	8 (1-32)
Length of hospitalization prior to positive urine culture, median days (range)	10 (3-86)	7 (3-46)
Urinary catheter removed	40 (74)	23 (77)
During treatment course	21 (53)	12 (52)
Prior to treatment course	19 (47)	11 (48)

All values shown as n(%), unless otherwise specified
[a]All p-values > 0.05, except immunosuppression (p=0.0001)

RESULTS

Table 2. Patient characteristics

	Baseline Group n=54	AGI Group n=30
Reported β-lactam allergy	20 (37)	7 (23)
Rash/urticaria	9 (45)	3 (43)
Unknown	6 (30)	4 (57)
Anaphylaxis/angioedema	5 (25)	0
Prior antibiotics within 30 days	37 (69)	20 (67)
Vancomycin	18 (49)	5 (25)
Piperacillin/tazobactam	10 (27)	6 (30)
Fluoroquinolone	8 (22)	2 (10)
Carbapenem	5 (14)	5 (25)
Cefepime	4 (11)	1 (5)
Concurrent infection	31 (57)	17 (57)
Pulmonary	15 (48)	9 (53)
Bacteremia	6 (19)	2 (12)
Catheter-related	2 (33)	1 (50)
Intra-abdominal	2 (33)	1 (50)
Skin and soft tissue	2 (33)	0
Skin and soft tissue	6 (19)	3 (18)
Intra-abdominal	5 (16)	4 (24)
Central nervous system	2 (6)	0

Figure 1. Antibiotic use in all patients (N=84)

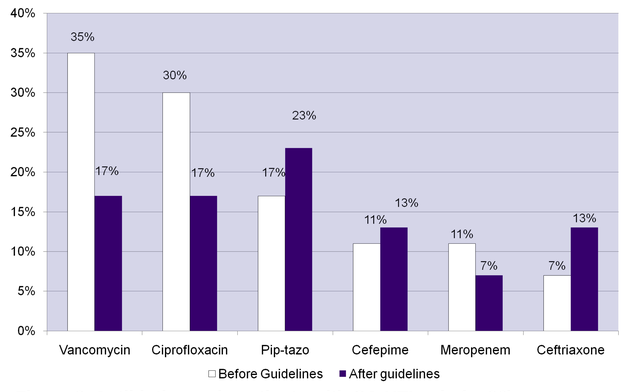

Figure 2. Antibiotic use in patients with CA-UTI only (n=36)

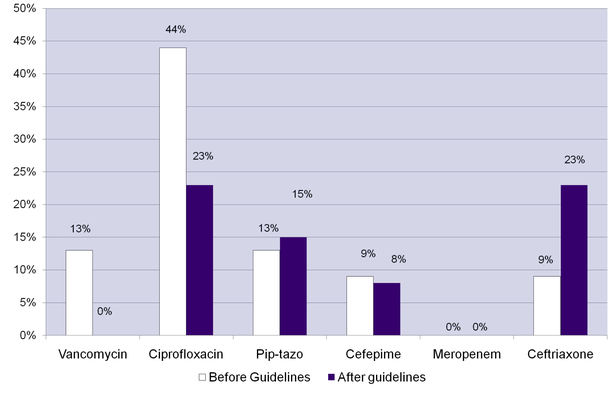

Table 3. Microbiology Data

	Baseline Group (n=54)	AGI Group (n=30)
Escherichia coli	22 (41)	8 (27)
Enterococcus spp.	11 (20)	10 (33)
Vancomycin-resistant	4 (36)	4 (40)
Proteus spp.	9 (17)	0
Pseudomonas aeruginosa	7 (13)	9 (30)
Klebsiella spp.	7 (13)	5 (17)
Enterobacter spp.	3 (6)	3 (10)
Staphylococcus aureus	2 (4)	0
Methicillin-resistant	1 (50)	0
Other	8 (15)	1 (3)

All values shown as n(%). All p-values >0.05

Table 5. Susceptibility Data

	All Patients (N=84)
Gram-positive organisms	n=25
Ampicillin[a]	9/9 (100)
Oxacillin[b]	1/2 (50)
Vancomycin	
Staphylococcus aureus	2/2 (100)
Enterococcus spp.	10/18 (55)
Gram-negative organisms	n=69
Imipenem/cilastatin	61/67 (91)
Cefepime	61/67 (91)
Piperacillin/tazobactam	41/47 (87)
Gentamicin	53/65 (82)
Ceftriaxone	44/66 (67)
Ciprofloxacin	41/66 (62)

All values shown as n(%). [a]Only reported for Enterococcus spp. [b]Only reported for Staphyloccocus spp.

Table 4. Clinical outcomes

	Baseline Group	AGI Group
All patients	n=54	n=30
Initial treatment with *in-vitro* activity	49 (91)	26 (87)
Clinical success	46 (85)	26 (87)
Initial antibiotic		
Escalated	12 (22)	10 (33)
De-escalated/streamlined	15 (28)	7 (23)
Continued	27 (50)	13 (43)
Duration of therapy, median days (range)	8 (1-36)	9 (1-37)
> 7 days	29 (54)	16 (53)
Microbiologic clearance of urine culture at EOT	22/34 (65)	15/18 (83)
Patients with CA-UTI only	n=23	n=13
Initial treatment with *in-vitro* activity	21 (91)	11 (85)
Clinical success	19 (83)	12 (92)
Initial antibiotic		
Escalated	3 (13)	2 (15)
De-escalated/streamlined	5 (22)	3 (23)
Continued	15 (65)	8 (62)
Duration of therapy, median days (range)	6 (1-14)	7 (3-16)
> 7 days	10 (43)	5 (38)
Microbiologic clearance of urine culture at EOT[a]	4/10 (40)	7/7 (100)

All values shown as n(%), unless otherwise specified. [a]All p-values >0.05, except microbiological clearance at EOT (p=0.035)

CONCLUSIONS

- A review of epidemiological data shortly after guideline implementation justifies our recommendation to avoid the use of fluoroquinolones as empiric therapy for CA-UTI.
- Low adherence to guidelines and identification of Enterococcus as a possible major pathogen warrant additional intervention including more education and implementation of order-sets.