The Journal of Emergency Medicine, Vol. 49, No. 6, pp. 998–1003, 2015

0736-4679/$ - see front matter

http://dx.doi.org/10.1016/j.jemermed.2015.06.028

Brief Reports

RESISTANCE PATTERNS OF *ESCHERICHIA COLI* IN WOMEN WITH UNCOMPLICATED URINARY TRACT INFECTION DO NOT CORRELATE WITH EMERGENCY DEPARTMENT ANTIBIOGRAM

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☐ **Abstract—Background: Urine cultures are not always performed for female Emergency Department (ED) patients with uncomplicated urinary tract infection (UTI). Accordingly, hospital, and even ED-specific, antibiograms might be skewed toward elderly patients with many comorbidities and relatively high rates of antimicrobial resistance, and thus do not accurately reflect otherwise healthy women. Our ED antibiogram indicates *Escherichia coli* resistance rates for ciprofloxacin, levofloxacin, and trimethoprim-sulfamethoxazole (TMP-SMX) of 42%, 26%, and 33%, respectively. Objectives: This study aims to compare resistance rates of urinary *E. coli* from otherwise healthy women with uncomplicated UTI and pyelonephritis in the ED to rates in our ED antibiogram. Methods: Females > 18 years old with acute onset of urinary frequency, urgency, or dysuria with pyuria identified on urinalysis (white blood cell count > 10/high-power field) were prospectively enrolled in the ED of an urban, academic medical center. Exclusion criteria indicating a complicated UTI were consistent with Infectious Diseases Society of America guidelines. Susceptibility patterns of *E. coli* to ciprofloxacin, levofloxacin, and TMP-SMX in the study group were compared to our ED antibiogram. Results: Forty-five patients grew *E. coli.* Pyelonephritis was suspected in nine (20%) subjects. Compared with the ED antibiogram, significantly lower rates of resistance to ciprofloxacin (2% vs. 42%, $p < 0.001$), levofloxacin (2% vs. 26%, $p < 0.001$), and TMP-SMX (16% vs. 33%, $p = 0.016$) were observed. Six patients grew non-*E. coli* uropathogens. All were susceptible to both levofloxacin and TMP-SMX. Conclusions: ED antibiograms may overestimate resistance rates for uropathogens causing uncomplicated UTIs. In cases where nitrofurantoin cannot be used, fluoroquinolones and possibly TMP-SMX may remain viable options for treatment of uncomplicated UTI and pyelonephritis in women.** © 2015 Elsevier Inc.

☐ **Keywords—urinary tract infection; antibiotic resistance; antibiogram; community-acquired infection; pyelonephritis**

INTRODUCTION

Uncomplicated urinary tract infection (UTI) is a common indication for antimicrobial therapy in women. The most recent guidelines issued by the Infectious Diseases Society of America (IDSA) for treatment of uncomplicated cystitis and pyelonephritis recommend that a suspected pathogen be <20% resistant to selected empiric treatment (<10% for fluoroquinolones for pyelonephritis), as use of an agent

The data were presented at the American College of Emergency Physicians Scientific Assembly in October 2014.

RECEIVED: 6 February 2015; FINAL SUBMISSION RECEIVED: 4 May 2015;
ACCEPTED: 12 June 2015

to which the uropathogen has in vitro resistance is associated with clinical failure (1–3). Recent international surveillance studies have demonstrated increasing resistance to fluoroquinolones and trimethoprim-sulfamethoxazole (TMP-SMX) among community-acquired uropathogens (4). Therefore, nitrofurantoin is the recommended first-line therapy for uncomplicated cystitis in women. However, in cases where nitrofurantoin cannot be used for UTI (eg, allergy, creatinine clearance < 40 mL/min), or in cases of pyelonephritis, more information is needed to guide the clinician in prescribing effective empiric therapy (5).

Urine cultures are not always performed for women presenting to the Emergency Department (ED) with a suspected uncomplicated UTI (6,7). Accordingly, susceptibility data reported in an institution's antibiogram might be skewed toward patients with many comorbidities and higher rates of antimicrobial resistance, and might not relate to the population of healthy women presenting to the ED for treatment of a community-acquired UTI and pyelonephritis (1,7). The same concept applies even for ED-specific antibiograms. In fact, the IDSA guidelines recommend considering local *Escherichia coli* resistance patterns to guide empiric antibiotic selection for an uncomplicated UTI (1). Although the bedside clinician may understand that the institutional antibiogram represents a population of more complicated patients, there currently are no data available demonstrating the true difference in susceptibility between an antibiogram and otherwise healthy patients who normally are not cultured. At our institution, an ED-specific antibiogram is published separately from the intensive care units (ICU) and other hospital areas. Given that the ED sees a spectrum of patients ranging from the otherwise healthy to the critically ill, it might be expected that the ED-specific antibiogram is less skewed toward the type of patients who harbor resistant pathogens than the overall institution or ICU antibiograms.

According to our ED-specific antibiogram, the rates of *E. coli* resistance to TMP-SMX and fluoroquinolones are >20% for each (1). Although nitrofurantoin can be used in some cases, the need for alternative therapy is frequent, particularly for pyelonephritis. Our study aims to prospectively compare the resistance rate of *E. coli* isolated from urine of otherwise healthy women who present to the ED with symptomatic uncomplicated UTI or pyelonephritis to the *E. coli* resistance rate reported in our ED-specific antibiogram.

MATERIALS AND METHODS

Participants

The study took place at a large, urban, academic medical center in Baltimore, Maryland. Institutional review board approval was obtained. Females > 18 years of age who presented to the ED with acute onset of urinary frequency, urgency, or dysuria with pyuria identified on urinalysis (white blood cell [WBC] count > 10/high power field [HPF]) and clinically suspected uncomplicated cystitis or pyelonephritis were asked if they would participate in the study; written consent was obtained from those who agreed. At our institution, patients ≤ 18 years of age are treated in the pediatric ED. The following patients were excluded: those who had a known urologic abnormality or comorbidity, those with an indwelling Foley catheter or who had a catheter removed within the previous 14 days, anyone with a history of kidney stones, those with diabetes mellitus, those who did not speak English, those who had received TMP-SMX prophylaxis within the previous 6 months, anyone with the human immunodeficiency virus (HIV) with no CD4 count on file or a CD4 count < 350 cells/mm^3, those who had been transferred from another health care facility, and those who were pregnant (8). Pregnant women were excluded, as these patients are considered to have complicated infections according to the IDSA guidelines (1) .

Design

The design is a prospective cohort study. *E. coli* resistance rates in urine cultures from a convenience sample of prospectively enrolled women with uncomplicated UTI were compared to retrospective data from an ED-specific antibiogram from 2 years prior to the study. Because the study period was restricted to staff hours, an attempt was made to identify patients consecutively. The study period was January to July 2014.

Measurements

Urine cultures were obtained on all urine specimens that demonstrated a WBC count > 10/HPF on urinalysis. At our institution, bacteria colony counts ≥ 10^3 colony-forming units (CFU)/mL are reported as a positive culture. Urine cultures containing three or more organisms of approximately the same quantity are reported as mixed microbial flora and were considered contaminated and excluded, in accordance with standard microbiology laboratory protocol.

All urine specimens were collected by midstream clean-catch technique. Antimicrobial susceptibility testing for levofloxacin and TMP-SMX was performed using Vitek2 (Biomerieux, Durham, NC), and ciprofloxacin mean inhibitory concentration was determined via Etest® test (Biomerieux). Mean inhibitory concentration breakpoints for ciprofloxacin, levofloxacin, and TMP-SMX susceptibility were ≤ 1 μg/mL, ≤ 2 μg/mL, and ≤ 38 μg/mL SMX, respectively, in accordance with guidelines from the Clinical Laboratory Standards