Creation of an emergency department-specific urine antibiogram and evaluation of urinary tract infection prescribing practices at a tertiary academic medical center

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BACKGROUND

- Inpatient hospital settings have been the focus of most antimicrobial stewardship (AS) practices; however there has been a recent shift to include outpatient populations.
- In June 2019, the Joint Commission published requirements for accredited ambulatory healthcare organizations in the United States to implement AS, which included urgent and immediate care practice sites (1).
- Results from cultures collected in the University of Minnesota Medical Center (UMMC) emergency departments (EDs) are reviewed by a team of nurses. who create an abbreviated treatment plan under physician supervision.
- Many institutions across the US have implemented pharmacist-driven culture review protocols in ED settings (2-3).

OBJECTIVES

- To evaluate microbiological data and prescribing practices for urinary tract infection (UTI) patients in the UMMC EDs.
- To create an ED-specific urine isolate antibiogram in accordance with the Clinical and Laboratory Standards Institute (CLSI) M39-A4 guidelines.
- **Primary Endpoints:** Susceptibilities of organisms isolated from culture, antibiotic prescribed at discharge (agent, dose, frequency, and duration)
- **Secondary Endpoints:** 96-hour ED readmission, 30-day inpatient readmission, empiric drug-bug mismatch rates

METHODS

- This retrospective cohort study included adult patients admitted to two different EDs at UMMC and diagnosed with a UTI between January 1st, 2018 and December 31st, 2018.
- Patients were excluded if they were subsequently admitted to an inpatient unit. Repeat urine isolates growing the same organism as the index isolate were excluded from the antibiogram.
- Diagnosis of cystitis versus pyelonephritis was based on ICD-10 coding.
- Data including urinalysis and culture results, susceptibilities, empiric outpatient antibiotic selection, and readmissions were collected.

RESULTS

Table 1. 2018 Antibiotic Susceptibility Rates for ED *E. coli* Urine Isolates at UMMC (n = 258)

Antibiotic	AMP	SAM	CFZ	CRO	CIP	NIT	SXT
Combined (%)	49.2	55.8	85.7	94.2	82.6	94.6	69.4
Cystitis (%)	56.8	64.2	90.5	95.8	86.3	93.7	71.6
Pyelonephritis(%)	44.7	50	82	92.7	82	94.7	68.7

ESBL rate = 16/258 (6.2%)
AMP = ampicillin; SAM = ampicillin/sulbactam; CFZ = cefazolin; CRO = ceftriaxone; CIP = ciprofloxacin; NIT = nitrofurantoin; SXT = sulfamethoxazole/trimethoprim

Table 2. Frequently Prescribed Antibiotics for UTIs in the ED

Cystitis (n = 124)	Pyelonephritis (n = 226)
NIT (29.8%)	CIP (32.3%)
LEX (25%)	CDR (14.2%)
CIP (14.5%)	NIT (12.8%)
CDR (12.1%)	LEX (11.5%)
SXT (10.5%)	LVX (10.2%)

CDR = cefdinir; LEX = cephalexin; LVX = levofloxacin

- A total of 350 unique isolates meeting criteria were evaluated for antibiogram inclusion.
- No organism other than *E. coli* (Table 1) exceeded the total number of isolates (n = 30) needed to create an antibiogram, based on CLSI recommendations.
- Drug-bug mismatches were more common in patients with pyelonephritis, and occurred in a total of 19.1% of all patients.
- 96-hour ED re-admission and 30-day inpatient readmission rates were 4.3% and 9.1%, respectively.

CONCLUSION

- Based on the ED-specific urine antibiogram generated, NIT (cystitis) and CIP (pyelonephritis) could be considered first-line agents for empiric treatment of UTIs in our institution's EDs.
- SXT should be avoided as empiric treatment for UTIs given *E. coli* resistance rates exceeded 20%.
- A high rate of oral beta-lactam prescribing was noted for both cystitis and pyelonephritis diagnoses (>30%), despite IDSA guideline recommendations not including these as first-line treatment options for uncomplicated UTIs.
- The ESBL rate in our *E. coli* urine isolates (6.2%) was found to be relatively low compared to recent literature findings (36%) (4).
- Diagnosis of cystitis versus pyelonephritis was based on ICD-10 coding, and diagnoses were not corroborated against documented signs and symptoms.
- Appropriateness of urinalysis and urine culture collection was not assessed.

NEXT STEPS

- These data will be used to develop a treatment algorithm / educational tools aimed at improving appropriateness of UTI antibiotic prescribing in the ED.
- Drug-bug mismatch patients will be further analyzed to determine if pharmacist-driven prescription and culture review would be more effective than the current state to ensure optimal patient outcomes.
- These urine antibiogram results will be combined with future years' data to create a more robust antibiogram with the inclusion of other organisms.

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