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Emergency department antimicrobial stewardship intervention bundle to optimize antibiotic prescribing for urinary tract infections and skin and soft tissue infections

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Background

- In 2016, the Centers for Disease Control and Prevention (CDC) established Core Elements of Outpatient Antimicrobial Stewardship to provide guidance for antimicrobial stewardship in the outpatient setting, including ambulatory clinic and emergency department (ED) settings
- A robust body of literature on efficacy of antimicrobial stewardship initiatives in the ED is currently lacking; however, available data does demonstrate a benefit of ED-specific guidelines, protocols, and pocket cards on antimicrobial use in the ED
- To date, the majority of current literature encompasses initiatives targeting uncomplicated urinary tract infections (UTI) and few studies have investigated the impact of optimization of the electronic medical record functionality to provide antimicrobial recommendations at the time of prescribing

Objective

- To describe the implementation and assess the impact of a multi-intervention antimicrobial stewardship bundle on ED discharge antibiotic prescribing for urinary tract infections (UTI) and skin and soft tissue infections (SSTI)

Methods

- **Study Design:** retrospective, quasi-experimental, pre-post implementation study of targeted adult ED subpopulation

Table 1: Study Outcomes

Primary Outcome	Secondary Outcomes
• Percentage of prescriptions matching discharge order set antibiotic regimens for UTI and SSTI (agent selection and duration of therapy)	• Percentage of prescriptions matching order set recommendations (by individual indication) • Percentage of prescriptions matching recommended agent selection or duration of therapy only • Rate of combination therapy utilization (TMP-SMX plus cephalexin) • 30-day all-cause hospital admission

Table 2: Study Inclusion and Exclusion Criteria

Inclusion	Exclusion
• All adult patients (ages ≥ 18 years) discharged from a Lee Health emergency department who received an antibiotic prescription associated with one of the following ICD-10 diagnosis codes:	• Patients with prescriptions associated with multiple ICD-10 diagnosis codes

Urinary Tract Infection	Skin and Soft Tissue Infection
• N10.X • N30.00 • N30.01 • N39.X	• L02.X • L03.X

Figure 1: Study Groups

Intervention

Figure 2: Timeline of Intervention Bundle Development and Implementation

Phase 1: Baseline Antimicrobial Prescription Data Review (July – October 2021)

Antimicrobial prescription data (including agent, dose, and dispense quantity) was extracted and classified into indication groups by primary ICD-10 codes associated with the ED visit using groupings recommended within the MITIGATE toolkit. Summary data was reviewed with ED department leadership.

Phase 2: ED Discharge Order Set Development (November 2021 – January 2022)

Antimicrobial regimens for each condition were developed by the antimicrobial stewardship pharmacists, endorsed by the system interdisciplinary antimicrobial stewardship committee, and approved by emergency medicine physician representatives from each ED location.

Phase 3: Emergency Medicine Pharmacist and Prescriber Education (January – February 2022)

Verbal and written education provided on order set recommendations and supporting literature (facilitated by antimicrobial stewardship pharmacists and information systems staff members)

Phase 4: Prescriber Data Feedback (Anticipated Fall 2022)

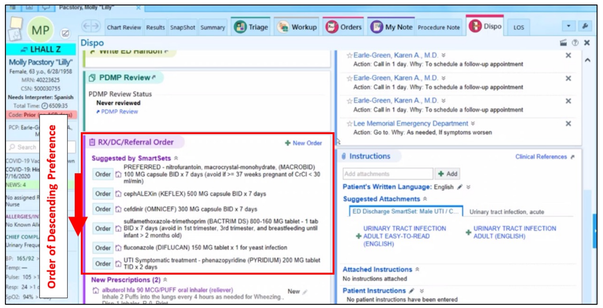
Monthly dissemination of prescription data at the system-level and ED location-level

Table 3: Implemented ED Discharge Order Sets (Epic SmartSets)

Adults	Pediatrics
UTI • Female UTI/Simple Cystitis • Male UTI/Complicated Cystitis • Pyelonephritis • Prostatitis **SSTI** • Purulent Skin Infections • Non-Purulent Skin Infections • Dog/Cat/Human Bite	**UTI** • Pediatric UTI **SSTI** • Purulent Skin Infections • Non-Purulent Skin Infections • Dog/Cat/Human Bite

UTI: Urinary Tract Infection; SSTI: Skin and Soft Tissue Infection

Figure 3: Example ED Discharge Order Set (Male UTI/ Complicated Cystitis)



Simulated patient in training environment. No protected health information included

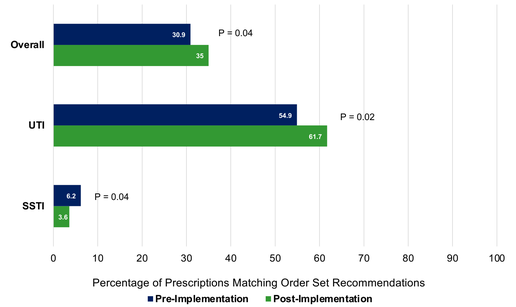
Results

Table 4: Prescription Indication by Associated ED Visit Diagnosis

	Pre-Implementation (n=1173)	Post-Implementation (n=1200)	P-value
UTI	596 (50.8)	648 (54)	0.12
SSTI	577 (49.2)	552 (46)	0.12
Purulent	233 (40.4)	233 (42.2)	
Non-Purulent	344 (59.6)	319 (57.8)	

Data presented as n (%)
UTI: urinary tract infection; SSTI: skin and soft tissue infection
UTI Diagnosis Codes: N10.X, N30.00, N30.01, N39.X
SSTI Diagnosis Codes: L02.X (purulent) and L03.X (non-purulent)

Figure 4: Prescription Matching Order Set Recommendations (Agent Selection + Duration of Therapy)



Results (continued)

Figure 5: Matching Agent Selection

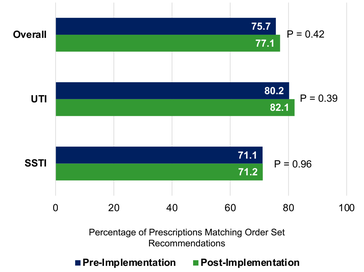


Figure 6: Matching Duration of Therapy

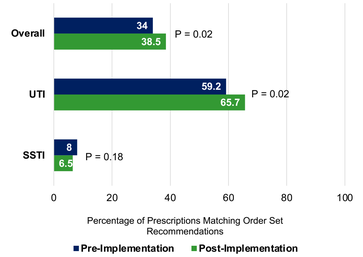


Figure 7: Inappropriate Combination Therapy for SSTI (TMP-SMX + Cephalexin)

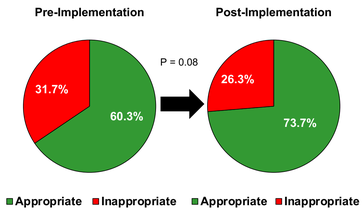
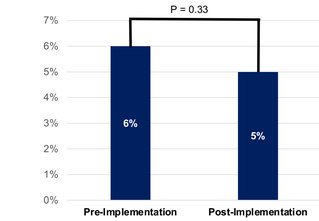


Figure 8: 30-Day All-Cause Hospital Admission



Discussion

- This novel multi-intervention ED antimicrobial stewardship bundle was associated with overall immediate improvements in antibiotic prescribing for discharged patients. This finding was driven by improvement in UTI-associated prescriptions.
- Limitations of the analysis included the short time from implementation of order sets and inconsistencies in education between ED locations.
- The findings related to SSTI prescribing may have resulted due to underutilization of SSTI order sets at the time of analysis
- This analysis was unable to assess the impact of prescriber data feedback, an effective antimicrobial stewardship tool based on previous literature.
- Future directions of research will include evaluation of methods to improve SSTI prescribing, implementation of prescriber data feedback, and expansion of this intervention to include additional ambulatory infectious disease indications.

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