# Impact of Indication-based Antibiotic Order Sentences on Optimal Prescribing in the Emergency Department: A Quasi-experiment

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## Introduction

- Prior data suggested suboptimal antibiotic prescribing in the emergency department (ED)
- Common ED antimicrobial stewardship strategies are passive or labor intensive and include implementing guidelines, culture review, and prescriber education
- Antibiotic order sentences (AOS) are a non-interruptive tool that meets prescribers at the point of care

## Methods

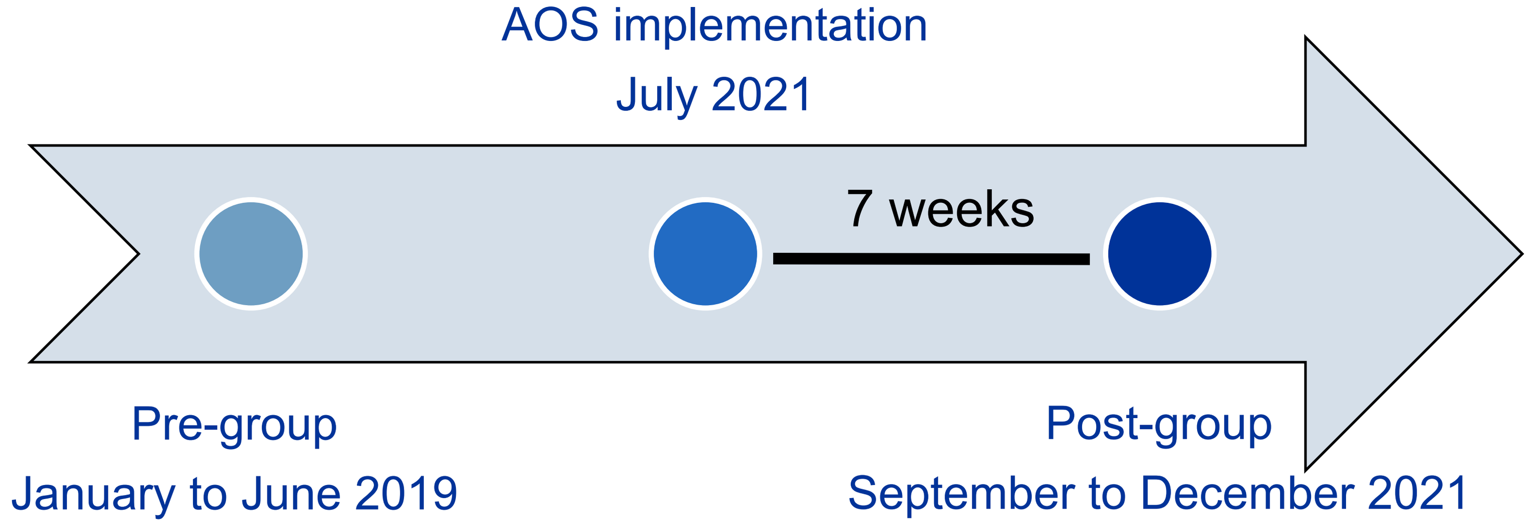
### Study Design and Endpoints

This was an IRB-approved quasi-experiment in 5 hospital and 1 satellite EDs. The study aims were to:

1. Compare prescribing differences and patient outcomes before and after AOS implementation
2. Characterize the impact of AOS on optimal prescribing for LRTI, UTI, and ABSSSI
3. Identify patient- or healthcare-related factors associated with optimal prescribing

**Subjects:**

- Inclusion: ≥ 18 years of age, received an antibiotic prescription (trimethoprim/sulfamethoxazole, cephalexin, ciprofloxacin, levofloxacin, clindamycin, doxycycline) on ED discharge for an uncomplicated infection (LRTI, UTI, ABSSSI)
- Exclusion: admission to hospital or observation unit, active cancer, history of transplant, chronic dialysis, confirmed or suspected SARS-CoV-2 infection




**Primary Endpoint**: optimal antibiotic discharge regimen based on correct selection, dose per renal function, and short-course duration of therapy per institutional and national guidelines

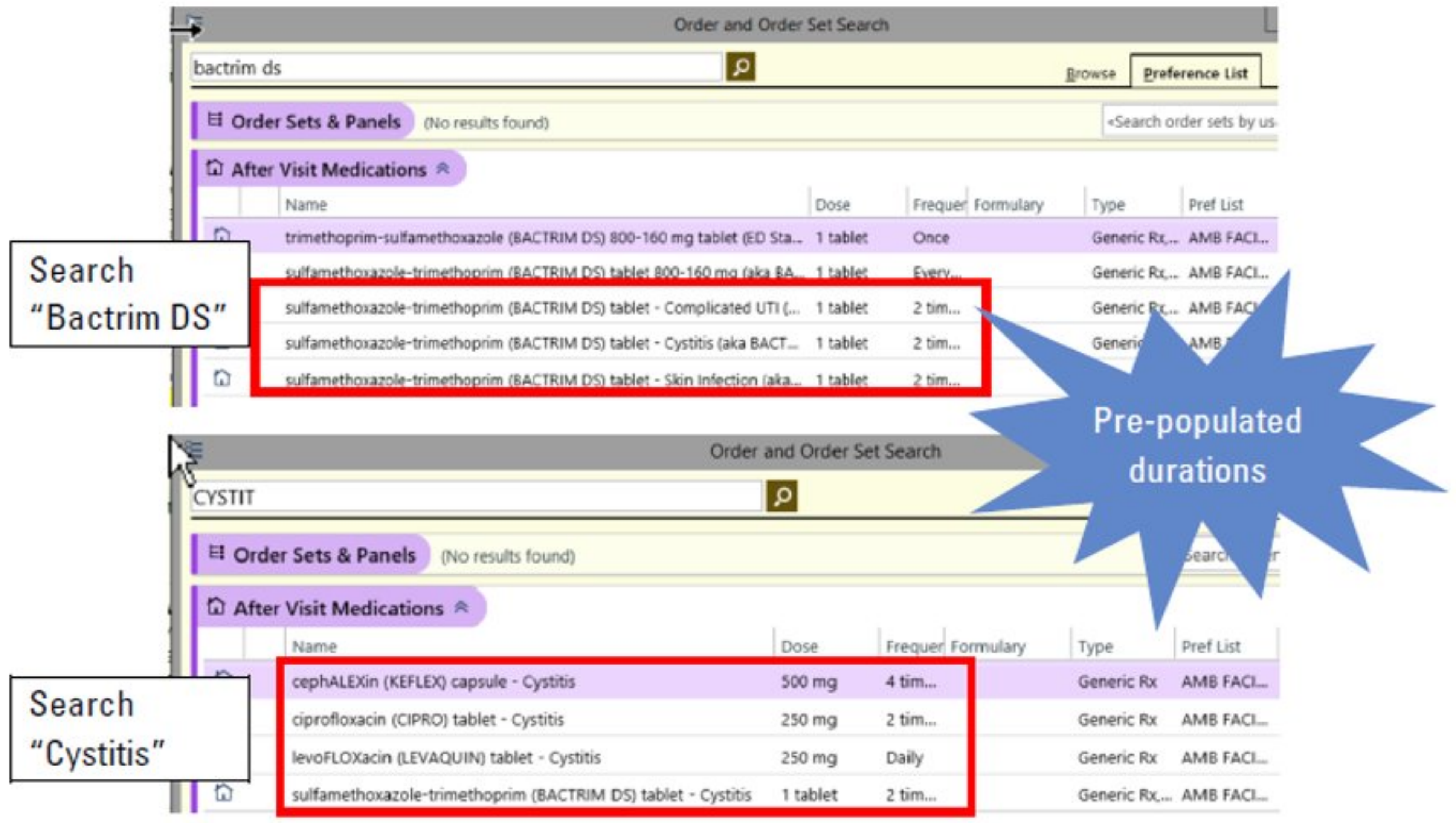
**Secondary Endpoints within 7 days of ED visit**: non-ED outpatient visit, antibiotic escalation, *Clostridioides difficile* infection, adverse drug event

**Analysis:** a sample size of 113 per group was calculated with a two-tailed α of 0.05, 90% power, and an effect size of 20%. This was then increased by an additional 30% to 147 patients per group to increase generalizability across settings and infection types.

- Data was reported as counts and percentages or median with interquartile range (IQR)
- Bivariate analyses were performed using χ2, Fisher's exact test, or Mann-Whitney *U* test
- Multivariable logistic regression was performed with IBM SPSS Statistics® to determine factors associated with optimal prescribing. Variables identified as plausible or with a P<0.2 from bivariate analyses were considered for conditional backwards regression using an *n*-to-k ratio of 1:10

## Results

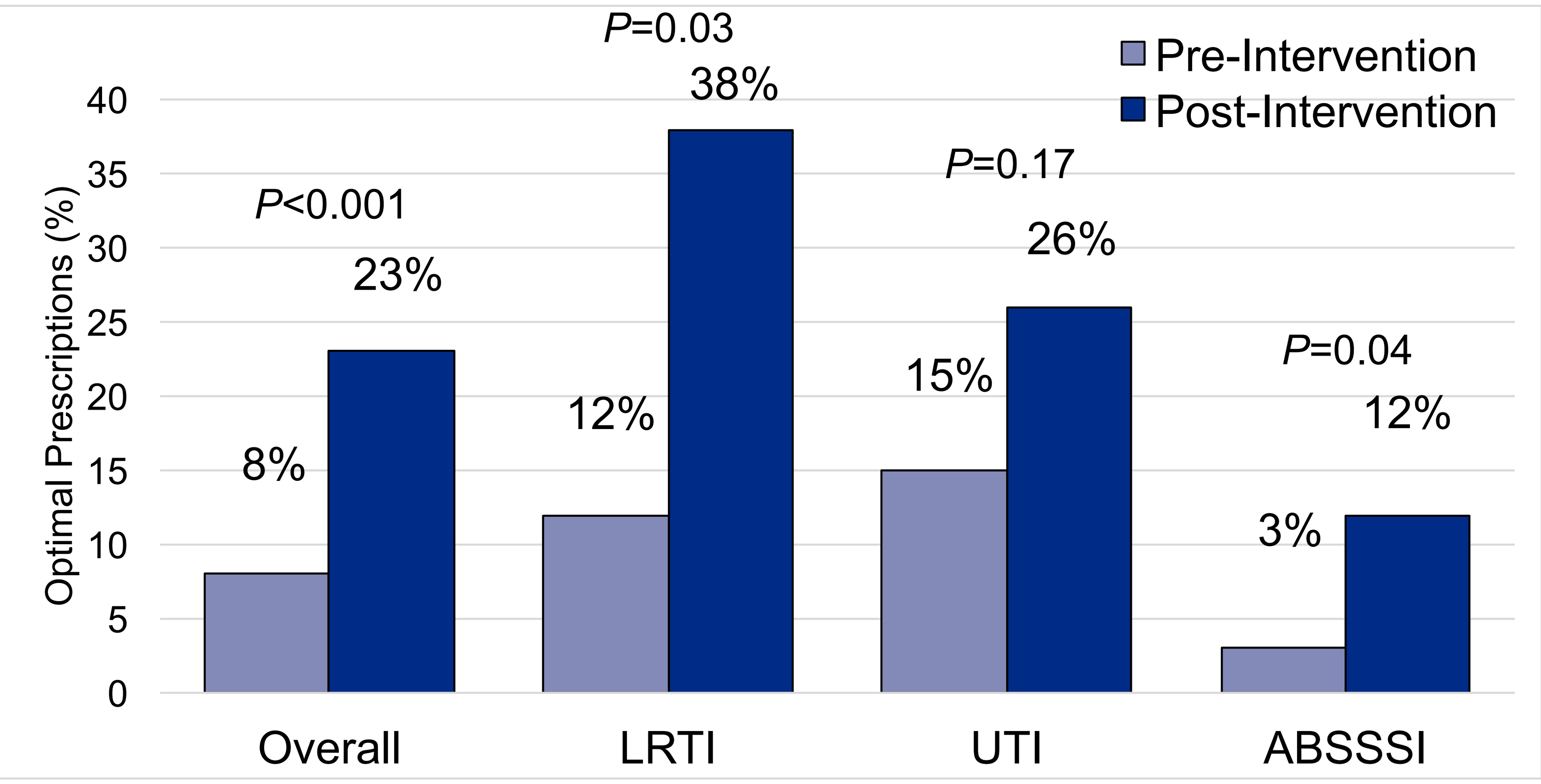
### AOS Intervention




### Baseline & Clinical Characteristics

| Variable (n, % or median, IQR) | Pre-Intervention (*n*=147) | Post-Intervention (*n*=147) | *P*-value |
|---|---|---|---|
| **Patient Characteristics** | | | |
| **Age, years** | **40 (26-58)** | **48 (31-66)** | **0.003** |
| Female, sex | 108 (74) | 94 (64) | 0.08 |
| Race | | | |
| White | 84 (57) | 93 (63) | 0.28 |
| Black | 50 (34) | 46 (31) | 0.62 |
| Allergy to beta-lactam | 26 (18) | 21 (14) | 0.43 |
| Chronic heart disease | 20 (14) | 21 (14.3) | 0.87 |
| Chronic lung disease | 33 (22) | 48 (33) | 0.05 |
| Renal disease | 11 (8) | 10 (6.8) | 0.82 |
| Diabetes | 29 (20) | 29 (20) | 1.0 |
| **Infection Characteristics** | | | |
| Lower Respiratory Tract Infection | 25 (17) | 29 (20) | 0.55 |
| **COPD exacerbation** | **6/25 (24)** | **19/25 (66)** | **0.003** |
| **Community-acquired pneumonia** | **9/25 (76)** | **10 (35)** | **0.002** |
| Urinary Tract Infection | 46 (31) | 61 (42) | 0.07 |
| Cystitis | 19/46 (41) | 18/61 (30) | 0.20 |
| Pyelonephritis | 27/46 (59) | 43/61 (71) | 0.20 |
| **Acute bacterial skin and skin structure** | **76 (52)** | **57 (39)** | **0.03** |
| Abscess or purulence | 38/76 (50) | 33/57 (58) | 0.37 |
| Diabetic foot infection | 4/76 (5) | 0 | 0.14 |
| Community-acquired polymicrobial infection | 3/76 (4) | 0 | 0.26 |
| Bite injury | 2/76 (3) | 1/57 (2) | 1.0 |

### AOS Implementation Improved Antibiotic Prescribing




| Secondary Endpoints Within 7 Days of ED Visit | Pre-Intervention (*n*=147) | Post-Intervention (*n*=147) | *P*-value |
|---|---|---|---|
| Any outpatient contact | 31 (21) | 28 (19) | 0.66 |
| Escalation of antibiotics | 10 (7) | 7 (5) | 0.62 |
| *C. difficile* infection | 0 | 0 | - |
| Adverse drug event | 2 (1) | 4 (3) | 0.68 |

### Factors Associated with Optimal Prescribing

| Variable (n, %) | UnAdjOR (95% CI) | *P*-value | AdjOR (95% CI) | *P*-value |
|---|---|---|---|---|
| **AOS Intervention** | **3.4 (1.7-6.8)** | **<0.001** | **3.6 (1.7-7.2)** | **<0.001** |
| **Cephalexin prescriptions** | **0.6 (0.3-1.1)** | **0.068** | **0.5 (0.26-0.98)** | **0.04** |
| Fluoroquinolone prescriptions | 3.9 (1.4-10.6) | 0.012 | Not tested | -- |
| Pyelonephritis† | 3.0 (1.6-5.9) | <0.001 | Not tested | -- |
| Chronic lung disease† | 2.4 (1.2-4.5) | 0.008 | Not tested | -- |
| Black or African American race | 1.6 (0.8-3.0) | 0.173 | Not tested | -- |
| Clindamycin prescriptions | 0.8 (0.8-0.9) | 0.032 | Not tested | -- |
| ABSSSI: presence of purulence or abscess | 0.06 (0.01-0.4) | <0.001 | Not tested | -- |

†Covaries with AOS intervention

Hosmer and Lemeshow *P*=0.68

## Summary

- AOS are a lean process intervention associated with improved antibiotic prescribing
- Improved optimal prescribing in common, uncomplicated infections
- AOS has the potential to expand to beyond the ED setting

Abbreviations: Acute bacterial skin and skin structure infection (ABSSSI); interquartile range (IQR); institutional review board (IRB); lower respiratory tract infection (LRTI); urinary tract infection (UTI)