



Development of a Pediatric Emergency Department Uropathogen Antibigram and Empiric Urinary Tract Infection Treatment Algorithm

Akshith M. Dass, PharmD¹; Eleanor K. Broadbent, PharmD²; Caitlin Schanz, BS, PharmD Candidate³; Elizabeth B. Hirsch, PharmD³; Laura Norton, MD, MS⁴; Kimberly D. Boeser, PharmD, MPH, BCIDP¹

¹M Health Fairview, University of Minnesota Medical Center, Minneapolis, MN ; ²Boston Medical Center, Boston, MA;

³University of Minnesota College of Pharmacy, Minneapolis, MN; ⁴M Health Fairview, University of Minnesota Masonic Children's Hospital, Minneapolis, MN

A collaboration between University of Minnesota, University of Minnesota Physicians and Fairview Health Services

ABSTRACT

BACKGROUND: Antimicrobial stewardship efforts in adult ED settings lead to improved patient outcomes and fewer adverse events. However, there are limited data on incorporation of multiple interventions to assist with empiric and definitive antibiotic therapy selection, particularly in the pediatric ED setting. The purpose of this project was to create an antibiogram and empiric UTI treatment algorithm for use in a pediatric ED.

METHODS: This is a multi-phase program implementation in a pediatric ED. Patients aged 2 months -18 years presenting to the ED between January to December 2018 with an ICD10 code for cystitis or pyelonephritis and collection of urine culture were included. Patients were excluded if they were admitted to an inpatient unit or had a polymicrobial urine culture result. The antibiogram was prepared by including the first isolate of a species from each patient in the given time frame using Clinical and Laboratory Standards Institute recommendations.

RESULTS: A total of 145 unique patients with 160 ED encounters were included in phase I of the project. Median patient age was 5 years (IQR 1.4-8). Discharge diagnosis for 75% of the 160 ED encounters was pyelonephritis. Urogenital flora was cultured from 19.4% of cultures and 21.2% of cultures were without any growth. The most common pathogen isolated was *E. coli* (39.4%). For ages 2 months – 18 years, susceptibility of urinary *E. coli* isolates was 95.5% for nitrofurantoin, 92.5% each for ceftriaxone and ciprofloxacin, and 85.1% for cefazolin. Cefdinir and cephalexin were the empiric antibiotics prescribed on discharge 76.3% of the time. After consideration of factors such as antimicrobial stewardship and spectrum of activity, cephalexin was chosen as the treatment of choice for the 2 months – 11 years age group. For children ≥ 12 years, nitrofurantoin was selected as preferred treatment for uncomplicated cystitis while cephalexin was selected as preferred treatment for pyelonephritis.

CONCLUSION: An empiric UTI treatment algorithm incorporating local antimicrobial susceptibility pattern alongside recommendations from national organizations was created. Phase II of the project will evaluate the implementation of the algorithm to determine its impact on readmission rates and antibiotic/pathogen mismatch.

BACKGROUND

- Antimicrobial decisions made in the emergency department (ED) have important downstream implications
- Call to action for antimicrobial stewardship in the ED published in 2013
 - Develop ED specific guidelines and nationally developed measures
 - Involve ED pharmacist in program interventions and measure

OBJECTIVES

- To describe prescribing practices, 96-hour ED re-visit and 30-day admission rates of pediatric patients with UTI treated in the ED
- To develop a pediatric ED-specific uropathogen antibiogram, and an empiric UTI treatment algorithm

METHODS

- Multi-phase program implementation at a pediatric emergency department of a tertiary academic medical center
- Retrospective chart review of patients in calendar year 2018

INCLUSION

- Age > 2 months – 18 years
- Presented to the ED with complaints of urinary tract infection symptoms*
- ICD10 code for cystitis or pyelonephritis
- Collection of urine culture
- Discharged from ED

EXCLUSION

- Admission to an inpatient unit
- Polymicrobial urine culture result

*defined by reports of abdominal/back pain, urinary dysuria/frequency/urgency, urinary incontinence, history of UTI, fever, ill appearance, suprapubic tenderness

RESULTS

Table 1. Unique patient characteristics

| | n = 145 |
|------------------------------------|----------------|
| Female | 112 (77.2) |
| Age, years (median, IQR) | 5 (1.3-8) |
| Encounter Characteristics | n = 160 |
| Pyelonephritis | 120 (75.0) |
| Empiric therapy | n = 160 |
| Cefdinir | 63 (39.4) |
| Cephalexin | 59 (36.9) |
| Outcomes | n = 160 |
| Urine Culture / Drug mismatch | 83 (51.9) |
| ED re-admit within 96 hours | 4 (2.5) |
| Inpatient admission within 30 days | 5 (3.1) |

Results are presented as n (%), unless otherwise specified

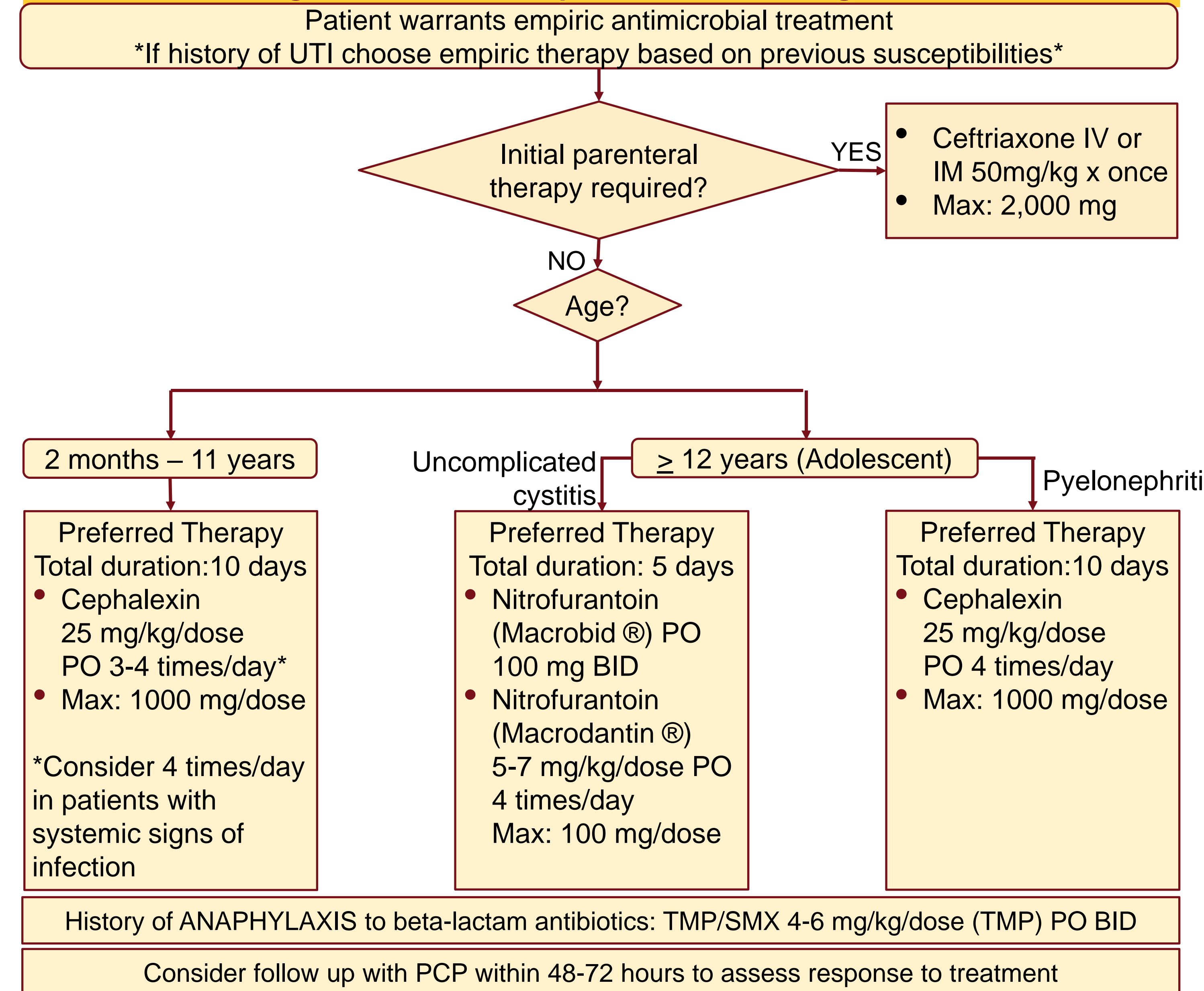
Table 2. Antibiogram for 2018 urinary *E. coli* isolates per CLSI guidelines

| | Cefazolin | Ceftriaxone | Ciprofloxacin | Nitrofurantoin | TMP/SMX |
|----------------|------------------|------------------|------------------|------------------|------------------|
| <i>E. coli</i> | 85.1% (57/67) | 92.5% (62/67) | 92.5% (62/67) | 95.5% (64/67) | 67.2% (45/67) |

- TMP/SMX: trimethoprim/sulfamethoxazole
- The figures listed indicate the percentages of organisms that are susceptible; figures in parenthesis indicate the number of strains tested; Cefazolin MIC ≤ 16 mg/L as susceptible for uncomplicated UTIs

RESULTS

Figure 1. Preferred empiric UTI treatment algorithm



CONCLUSION

- Created uropathogen antibiogram and empiric UTI treatment algorithm based on local susceptibility pattern
- Future steps:
 - Establish treatment algorithm as standard of care
 - Collect post-intervention data
 - Implement pharmacist driven culture call-back