



Epidemiology and resistance patterns of nursing home uropathogens in four states, 2018-2019

School of Medicine
and Public Health
UNIVERSITY OF WISCONSIN-MADISON

Lindsay Taylor¹, Jessica Irvine¹, Sally Jolles¹, Corinne Kowal², Taissa Bej², Raymond Podzorski³, Robin Jump⁴, Christopher Crnich^{1,5}
(1) Department of Medicine, University of Wisconsin School of Medicine and Public Health, Madison, WI, (2) Cleveland VA Hospital, Cleveland, OH, (3) St. Mary's Hospital Microbiology Lab, Madison, WI, (4) University of Pittsburg Medical Center, Pittsburg, PA, (5) William S. Middleton VA Hospital, Madison, WI



ABSTRACT

Background: Urinary tract infections (UTIs) are the most common indication for antibiotic treatment in nursing homes (NHs) and are often treated empirically before culture results return. A previous study of uropathogens recovered from residents in Georgia NHs revealed high resistance to commonly used antibiotics, including ciprofloxacin. Here, we describe the distribution and key resistance patterns of uropathogens recovered from residents of NHs in Wisconsin, Ohio, Kentucky, and Indiana.

Methods: Results of urinary cultures from NH residents performed between 2018 and 2019 were obtained from contracting microbiology laboratories. Culture results were de-identified by an honest broker. Urine culture data was standardized across laboratories and years using key collision and nearest neighbor clustering methods (Figure 1). Non-pathogenic isolates were excluded. The 5 most common isolates were identified and mean susceptibilities to antibiotics commonly used for empiric treatment of UTIs were examined. Data standardization and analysis were performed in Open Refine and R.

Results: There were 11,007 urine cultures obtained from 5,642 NH residents living in 67 NHs. A total of 4,398 potential uropathogens were identified (avg. per NH = 66; range = 2-279). *Escherichia coli* (43.1%), *Klebsiella* spp. (14.6%), *Proteus* spp. (14.3%), *Enterococcus* spp. (9.5%), and *Pseudomonas* spp. (4.6%) were the most commonly identified uropathogens. Resistance rates for the majority of evaluated bug-drug combinations (9/14) exceeded 20% (Table 1). Nitrofurantoin was the only antibiotic with a resistance rate <20% for *E. coli* isolates. When resistance was assessed cumulatively across the top 5 organism, 48.5% of isolates were resistant to ciprofloxacin and 21.3% of isolates were resistant to ceftriaxone (when excluding isolates with intrinsic resistance).

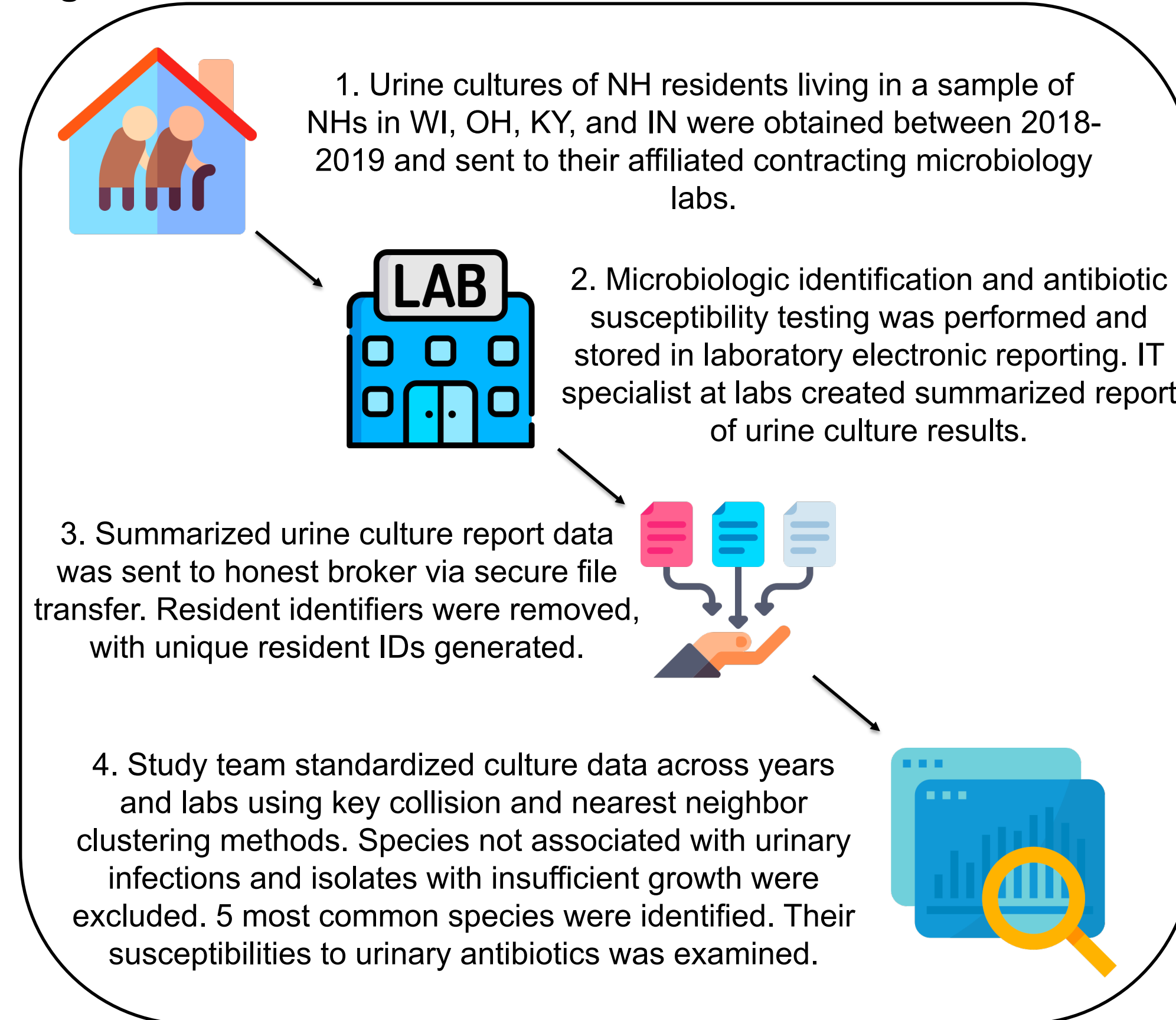
Conclusions: Consistent with a recent study conducted in Georgia NHs, high levels of resistance to commonly used antibiotics amongst uropathogens recovered from NH residents in four states were identified in the current study. These suggest a need for NH-specific UTI treatment guidelines and tools to support empiric antibiotic decision-making at the local facility level.

BACKGROUND

- Urinary tract infections are the most frequent indication for antibiotics in NHs, and frequently require empiric treatment before return of culture results (1)
- Resistant pathogens have been associated with over one-third of UTIs in NH residents residing Georgia (2)
- Our aim was to characterize the epidemiology and resistance phenotypes of uropathogens of NH residents from 4 states.

METHODS

Figure 1. Schema of urine culture data collection and standardization



RESULTS - 1

- 11,007 urine cultures were obtained from 5,642 unique NH residents living in 67 different NHs during the 2-year period
- 4,398 potential uropathogens were identified (average per NH = 66; range 2-297).
- The most common isolate was *Escherichia coli* (43.1%). **Figure 2** highlights the isolate composition of uropathogens recovered.
- The majority (12 out of 17) of evaluated drug-bug combinations reveal >20% of species isolates were resistant (**Table 1**).
- Examination of resistance patterns of the pooled 5 most common uropathogen species shows nearly half of isolates were resistant to ciprofloxacin (49%) (**Figure 3**).

RESULTS - 2

Table 1. Proportion of resistant uropathogens by species to urinary antibiotics

Organism	Count	Proportion of isolates resistant to tested antibiotic (%)				
		TMP-Sulfa	Nitrofurantoin	Ciprofloxacin	Cephalexin	Ceftriaxone
<i>Escherichia coli</i>	1896	40.7	11.0	53.5	40.4	24.9
<i>Klebsiella</i> spp.	640	19.3	55.9	18.1	43.2	23.1
<i>Proteus</i> spp.	627	44.6	R	64.3	24.6	8.3
<i>Enterococcus</i> spp.	416	R	16.2	65.2	R	R
<i>Pseudomonas</i> spp.	204	R	R	21.6	R	R

Figure 2. Distribution of uropathogens recovered from NH urine cultures

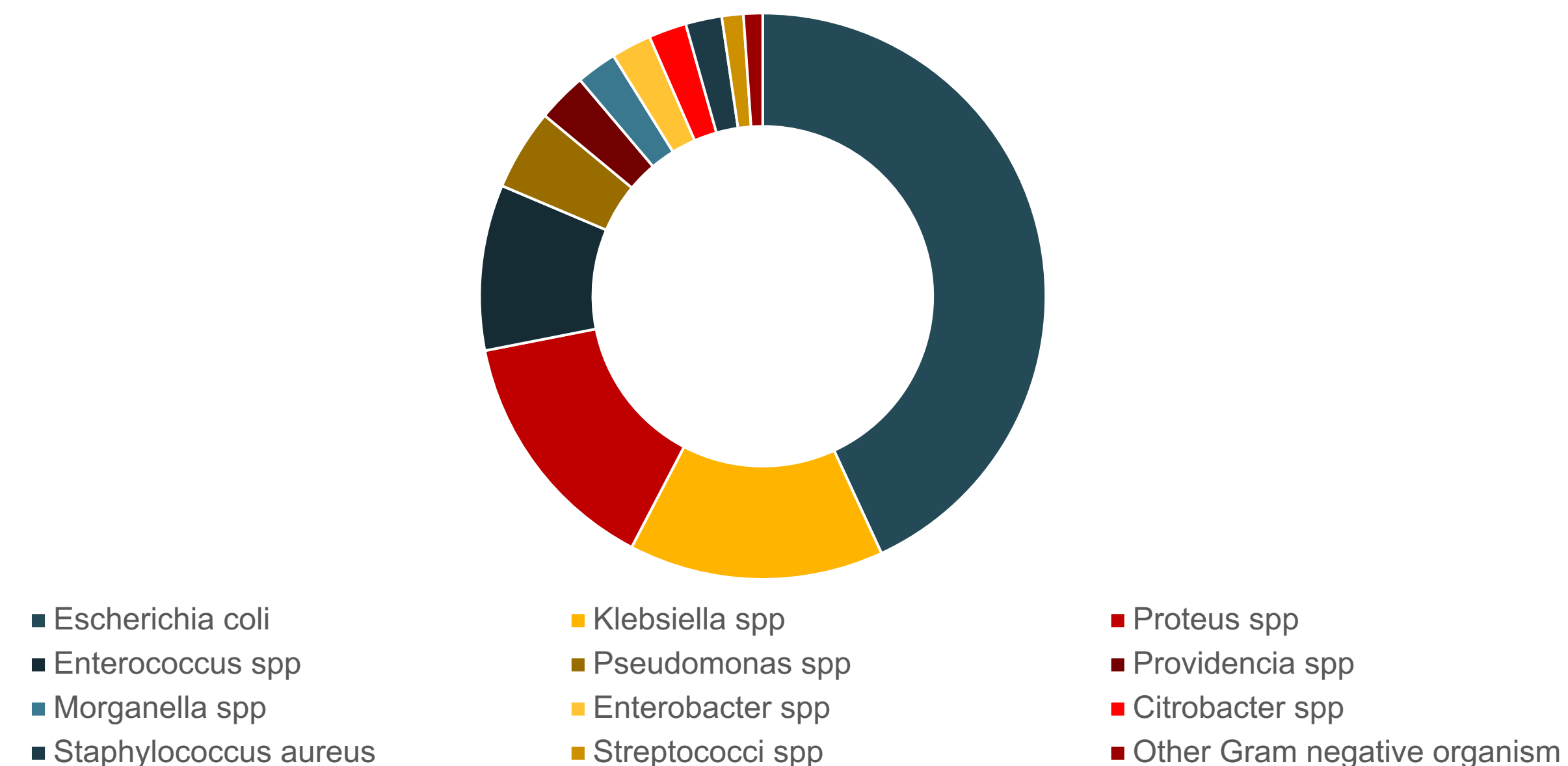
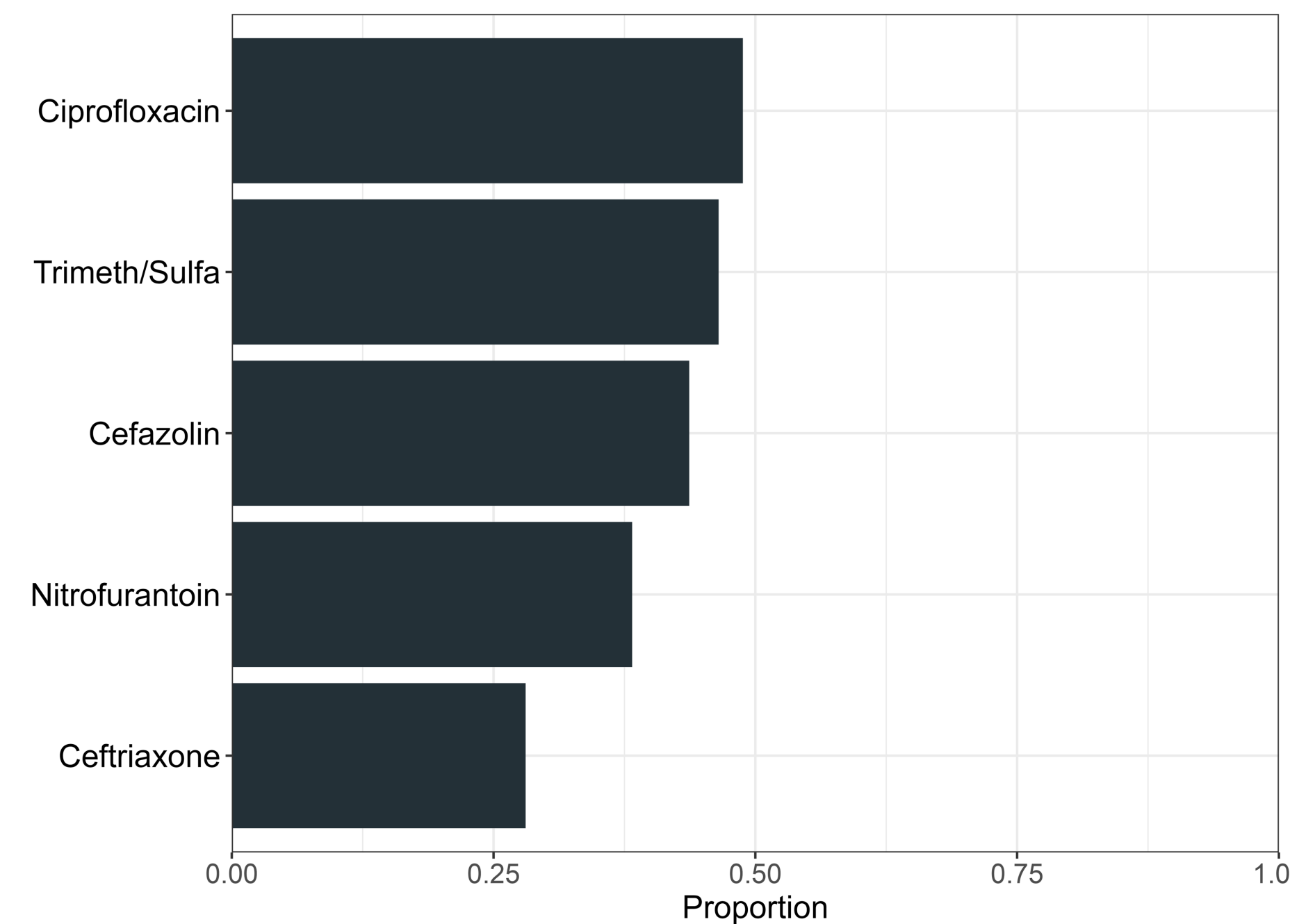


Figure 3. Weighted-incidence of resistant uropathogens to urinary antibiotics



CONCLUSIONS

- High levels of resistance to commonly used antibiotics amongst uropathogens recovered from NH residents in four states were identified in our study.
- The greatest resistance was noted to ciprofloxacin, a commonly used empiric choice.
- These suggest a need for NH-specific treatment guidelines and tools to support empiric antibiotic decision-making at the local facility level.

REFERENCES

1. Thompson ND, Penna A, Eure TR, et al. Epidemiology of Antibiotic Use for Urinary Tract Infection in Nursing Home Residents. *J Am Med Dir Assoc.* 2020;21(1):91-96. doi:10.1016/j.jamda.2019.11.009
2. Fridkin SK, Pack J, Licitra G, et al. Creating reasonable antibiograms for antibiotic stewardship programs in nursing homes: Analysis of 260 facilities in a large geographic region, 2016-2017. *Infect Control Hosp Epidemiol.* 2019;40(8):839-846. doi:10.1017/ice.2019.112