Presentation Type:
Poster Presentation

National Trends of Prevalence of Fluroquinolone Resistance Among Healthcare-Associated *Escherichia coli* Infections

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Background: *Escherichia coli* is the third most common pathogen responsible for healthcare-associated infections (HAIs), but it is increasingly resistant to multiple antibiotics. Antimicrobial susceptibility test (AST) results for fluoroquinolones (FQs) among *E. coli* implicated in select HAIs are reported to the NHSN surveillance system. Trend analyses in the prevalence of FQ resistance among healthcare-associated *E. coli* infections reported to NHSN have not been previously assessed. **Objective:** We investigated the national trends of prevalence of FQ resistance among *E. coli* HAIs in acute-care hospitals from 2009 through 2018. **Method:** We analyzed *E. coli* AST data from central-line–associated bloodstream infections (CLABSIs), catheter-associated urinary tract infections (CAUTIs), and surgical site infections (SSIs) reported to the NHSN between 2009 and 2018. Fluoroquinolone resistance is defined as the number of *E. coli* isolates that tested resistant or intermediate to at least 1 of 3 quinolones (ciprofloxacin, levofloxacin, and moxifloxacin), divided by number of pathogens tested for susceptibility, multiplied by 100. To evaluate the trends of fluoroquinolone resistance over time, we conducted an interrupted time-series analysis using a generalized linear mixed model with a logistic function. Substantial HAI definitional changes, most consequentially CAUTI in 2015 and a directional incidence change in 2018, were treated as interruptions to the outcome. Regression models adjusted for patient-level (ie, age, gender, HAI type) and facility-level characteristics (ie, facility type, teaching status, number of beds in intensive care units, and average length of stay) were obtained from the NHSN annual hospital surveys. Random-intercept and slope models were evaluated with covariance tests and were included to account for differential baseline fluoroquinolone resistance and trends among reporting facilities. Data were analyzed using SAS with statistical significance defined at alpha = 0.05. **Results:** During 2009–2018, the number of *E. coli* isolates with AST results for FQ reported to NHSN (Fig. 1) increased. After adjusting for covariates, fluoroquinolone resistance significantly increased from 2009 through 2015 at an average of 4.2% per year (Fig. 2, $\beta 1$). There was no significant change in fluoroquinolone resistance from 2015 through 2017 (Fig. 2, $\beta 1 + \beta 3$). In 2018, there was 6.4% decline in fluoroquinolone resistance compared to 2017 (Fig. 2, $\beta 4$) **Conclusions:** An increasing trend of fluoroquinolone resistance from 2009 through 2015 was observed, and fluoroquinolone resistance was stable during 2015–2017. Despite a relatively brief decline in fluoroquinolone resistance in 2018, the absolute change was small (~2%). Sustaining this decline warrants continued efforts in infection prevention and antimicrobial stewardship.

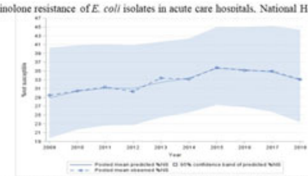
Figure-1. Fluroquinolone-resistant *E. coli* isolates in acute care hospitals, National Healthcare Safety Network, 2009-2018

Year	No. facilities reported[1]	No. *E. coli* tested	No. *E. coli* non- susceptible to fluroquinolones[2]	Crude % non-susceptible[2] (%NS)
2009	635	3,640	1,073	29.48
2010	855	4,315	1,315	30.48
2011	1,350	6,871	2,154	31.35
2012	2,280	15,214	4,617	30.35
2013	2,324	16,079	5,368	33.39
2014	2,356	16,937	5,613	33.14
2015	2,520	19,281	6,894	35.76
2016	2,488	18,963	6,663	35.14
2017	2,471	18,275	6,387	34.95
2018	2,471	17,313	5,730	33.10

[1]reported at least 1 *E. coli* healthcare-associated infection
[2]Fluroquinolone non-susceptible defined as resistant or intermediate to at least 1 of 3 quinolones (ciprofloxacin, levofloxacin, moxifloxacin)

Fig. 1.

Figure-2. Trends in fluroquinolone resistance of *E. coli* isolates in acute care hospitals, National Healthcare Safety Network, 2009-2018



Summary of model coefficients, odds ratios, and annual percent change of fluroquinolone resistance

Effect of generalized linear mixed model[a]	parameter estimate	standard error	p-value	Odds ratio (95%CI)	percent change per year[b] (95%CI)
Time trend before 2015 (β_1)	0.04	0.01	<.0001	1.04 (1.03, 1.06)	4.24 (2.85, 5.65)
Immediate effect of Interruption at 2015 (β_2)	0.09	0.03	0.0017	1.09 (1.03, 1.15)	9.03 (3.31, 15.06)
Change in slope direction after 2015 (β_3)	-0.06	0.01	<.0001	0.94 (0.92, 0.97)	-5.82 (-8.21, -3.37)
Time trend in 2015-17 ($\beta_1 + \beta_3$)	-0.02	0.01	0.1053	0.98 (0.96, 1.00)	-1.83 (-3.99, 0.39)
Immediate effect of Interruption at 2018 (β_4)	-0.07	0.03	0.0262	0.94 (0.88, 0.99)	-6.4 (-11.7, -0.78)

[a] Generalized linear mixed model for the following patient-level and hospital characteristics as fixed effects: patient-level characteristics = HAI type, age, gender; Facility-level characteristics = affiliation with medical school, facility type, total number of beds in intensive care units and average length of stay in a hospital, which are derived from annual hospital survey and may vary annually
[b] Percent change = (Odds ratio-1) x 100;
Note: "Fluroquinolone-resistance" defined as as resistant or intermediate to at least 1 of 3 quinolones (ciprofloxacin, levofloxacin, moxifloxacin)

Fig. 2.

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Nationwide Survey of Antimicrobial Dispensation and Training in Pharmacies and Nonpharmacy Stores in the Dominican Republic

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Background: Antimicrobial use in low- and middle-income countries (LMICs) can play a major role in the development of antimicrobial resistance (AMR). In many LMICs, antimicrobials can be dispensed without prescriptions; they often available in pharmacies and nonpharmacy stores alike. We conducted a nationwide survey to describe the availability and antimicrobial dispensation practices in pharmacies and nonpharmacy stores in the Dominican Republic. **Methods:** A survey was administered to staff responsible for dispensing antimicrobials at pharmacies and nonpharmacy stores in the Dominican Republic. Stores were randomly selected from March through November 2019 in 7 cities representing all geographic regions of the Dominican Republic. Data on availability of antimicrobials and staff education on antimicrobial use were obtained. Case scenarios with commons symptoms were used to survey staff on antimicrobial use recommendations. Symptoms included dysuria, throat pain, diarrhea, fever, and cough. The availability of antimicrobials ordering by phone and via online delivery was assessed for each store. **Results:** Staff from 125 stores were invited to participate; 34 pharmacies and 48 nonpharmacy stores participated and 43 refused to participate. Overall, 200 antimicrobial use recommendations were given in pharmacies and 43 in nonpharmacy stores. The most common type of antimicrobial use recommendations were aminopenicillins (Fig. 1). Staff received prior training or education on antimicrobials in 61% of pharmacies

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Figure 1. Total number of recommendations by antimicrobial in pharmacies and non-pharmacy stores

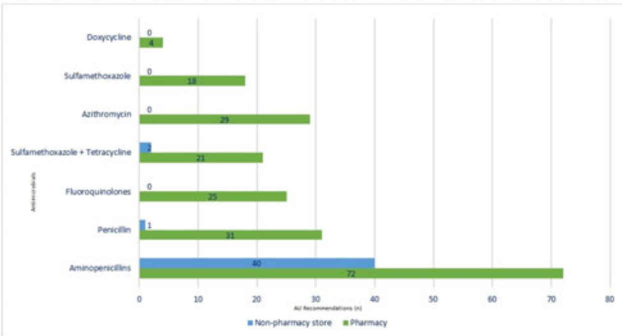

Fig. 1.

Figure 2. Antimicrobial recommendations by symptom in pharmacies

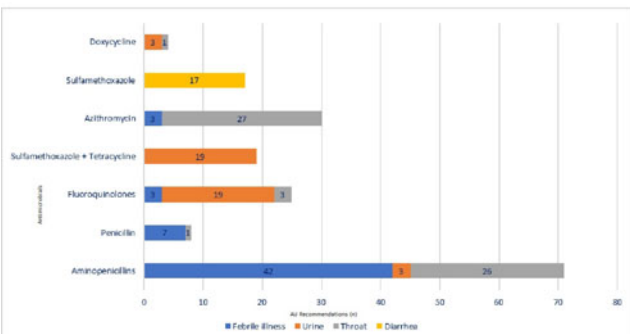

Fig. 2.

Figure 3. Antimicrobial recommendations by symptom in non-pharmacy stores

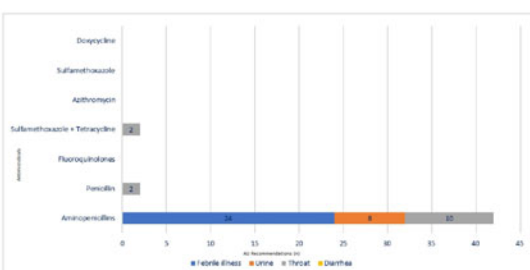

Fig. 3.

and 0% of nonpharmacy stores. Antimicrobial recommendations by case scenario in pharmacies and nonpharmacy stores are shown in Figs. 2 and 3. Antimicrobials are available for phone order in 80% of pharmacies and 90% of nonpharmacy stores. No antimicrobials were available via online delivery apps. **Conclusions:** Antimicrobials are widely available in the Dominican Republic and can be obtained without a prescription, in person or via delivery. Staff at pharmacy stores recommended different antimicrobials by symptom, whereas staff at nonpharmacy stores commonly recommended aminopenicillins for all symptoms. Training or education on antimicrobial use was common for staff at pharmacy stores but nonexistent for staff at nonpharmacy stores. In LMICs with easy access to antimicrobials, frontline staff in pharmacies and nonpharmacy stores are gatekeepers for antimicrobial use and may represent an important target for outpatient antimicrobial stewardship initiatives.

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Naturally Emerging Cohorting Behavior of Healthcare Workers and Its Implications for Disease Spread

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Background: Mobility patterns of healthcare workers (HCWs) (ie, the spatiotemporal distribution of patient rooms they visit) have a significant impact on the spread of healthcare acquired infections (HAIs). **Objective:** In this project, we used fine-grained data from a sensor deployment at the medical intensive care unit (MICU) in the University of Iowa Hospitals and Clinics (UIHC) to study the mobility patterns of HCWs and their impact on HAI spread. **Methods:** We analyzed 10 days of data from a 20-bed MICU sensor deployment. For parameters t1 and t2, each pair of rooms *i* and *j* is assigned a weight $W(i, j)$ representing the number of times an HCW spends at least t1 seconds in room *i* followed by at least t1 seconds in room *j*, within t2 seconds of each other. $W(i, j)$ is a measure of HCW traffic going from room *i* to room *j*; we study the correlation between $W(i, j)$ and the distance between rooms *i* and *j*. Additionally, we perform 2 disease-spread simulations: (1) a base simulation, obtained by replaying observed HCW mobility traces and (2) a perturbed simulation, which is the same as the base simulation, except that we replace each HCW who visits a room by a random available HCW. Thus, the perturbed simulation removes correlations in the observed HCW mobility traces. **Results:** We

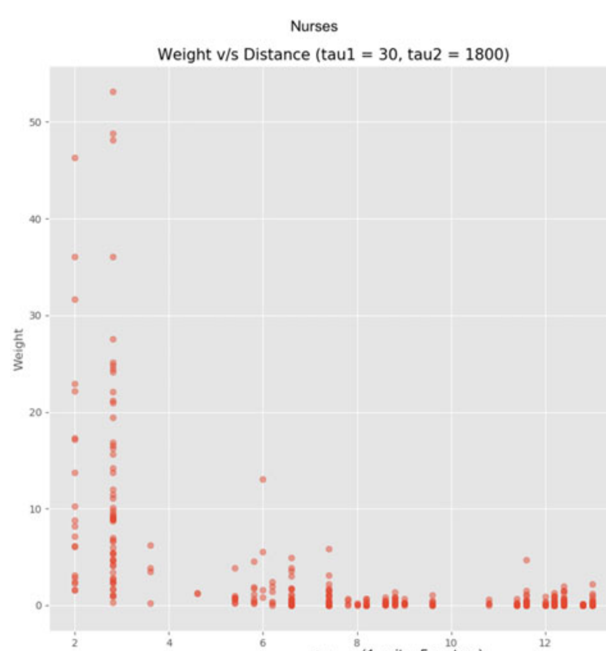

Fig. 1.

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