

Risk Factors for the Development of Gastrointestinal Colonization With Fluoroquinolone-Resistant *Escherichia coli* in Residents of Long-Term Care Facilities

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Abstract

Background: Infections due to fluoroquinolone-resistant *Escherichia coli* (FQREC) are associated with significant morbidity and mortality. An improved understanding of fluoroquinolone-resistant *Escherichia coli* (FQREC) acquisition is needed in the long-term care setting. The objective of this study was to assess risk factors for the development of new FQREC gastrointestinal tract colonization in residents of long-term care facilities (LTCFs), including the impact of antibiotic exposure during LTCF residence.

Methods: A prospective cohort study was conducted from 2006 to 2008 at three LTCFs within an academic long-term care network. Residents initially colonized with fluoroquinolone-susceptible *E. coli* (FQSEC) were followed with serial fecal sampling for new FQREC colonization for up to 12 months or until discharge or death. A Cox proportional hazards regression model was developed to identify risk factors for new FQREC colonization, with antibiotic and indwelling device exposures modeled as time-varying covariates.

Results: Fifty-seven (47.5%) of a total of 120 residents became newly colonized with FQREC, with a median time to colonization of 57 days (interquartile range, 28-155). Fecal incontinence (hazard ratio [HR] 1.78, 95% confidence interval [CI] 1.04-3.06, $P=0.04$) was significantly associated with FQREC acquisition. Receipt of amoxicillin-clavulanate (HR 6.48, 95% CI 1.43-29.4, $P=0.02$) and the presence of a urinary catheter (HR 3.81, 95% CI 1.06-13.8, $P=0.04$) during LTCF stay increased the risk of new FQREC colonization.

Conclusions: Acquisition of FQREC was common, with nearly half of residents developing new FQREC colonization. Further studies are needed on optimal interventions to limit the emergence of FQREC in the long-term care setting, including antibiotic stewardship programs and efforts to decrease indwelling device exposure.

Background

- Colonization and infection with antibiotic-resistant organisms are common in the long-term care, aging population.
- Infections due to fluoroquinolone-resistant *Escherichia coli* (FQREC) lead to significant morbidity and mortality.
- An improved understanding of FQREC acquisition is needed in long-term care.

Objective

- To assess risk factors for the development of new FQREC gastrointestinal tract colonization in residents of long-term care facilities (LTCFs), including the impact of antibiotic exposure during LTCF residence.

Methods

- Study design:** Prospective cohort study
- Setting:** Three LTCFs w/in an academic network from 2006 to 2008
- Subjects:** Residents initially colonized with FQ-susceptible *E. coli* were followed with serial fecal sampling for new FQREC colonization for up to 12 months, or until discharge or death.
- Data collection:** Demographics, comorbidities, antibiotic and indwelling device use
- Statistical analysis:** A Cox proportional hazards regression model was developed to identify risk factors for new FQREC colonization, with antibiotic and indwelling device exposures modeled as time-varying covariates.

Results

- Study population
 - The median age of patients was 76 years (IQR, 64-83.5).
 - The majority of patients (69.8%) had been transferred to the LTCF of residence from an acute care hospital.
- There was a high prevalence of certain major comorbidities present at the time of enrollment;
 - diabetes mellitus (37%)
 - severe respiratory disease (23.5%)
 - malignancy (40.3%).
- There were high rates of antibiotic use during LTCF stay, with 48(40.0%) patients received at least one antibiotic.

Results

- Fifty-seven (47.5%) of a total of 120 residents became newly colonized with FQREC,
- The median time to new FQREC colonization was 57 days (interquartile range, 28-155).
- On MV analysis, fecal incontinence (hazard ratio [HR] 1.78, 95% confidence interval [CI] 1.04-3.06, $P = 0.04$) was significantly associated with FQREC acquisition.
- Receipt of amoxicillin-clavulanate (HR 6.48, 95% CI 1.43-29.4, $P = 0.02$) and the presence of a urinary catheter (HR 3.81, 95% CI 1.06-13.8, $P = 0.04$) during LTCF stay were risk factors for development of new FQREC colonization.

Conclusions

- Acquisition of FQREC was common, with nearly half of residents developing new FQREC colonization.
- Long-term care facilities have become increasingly important sites of healthcare delivery, and are characterized by high rates of colonization with antibiotic-resistant organisms.
- Further studies are needed on optimal interventions to limit the emergence of FQREC in the long-term care setting, including antibiotic stewardship programs and efforts to decrease indwelling device exposure.

Multivariable Cox Proportional Hazards Regression Model of Risk Factors Associated with Fluoroquinolone-Resistant *E. coli* Colonization in LTCF Residents

Variable	Hazard Ratio (95% CI)	P value
Age	1.02 (0.99-1.04)	0.22
Fecal incontinence	1.78 (1.04-3.06)	0.04
Receipt of a fluoroquinolone in prior 30 days	2.04 (0.27-15.6)	0.49
Receipt of a amoxicillin-clavulanate after enrollment	6.48 (1.43-29.4)	0.02
Urinary catheter	3.81 (1.06-13.8)	0.04
Age	1.02 (0.99-1.04)	0.22
Fecal incontinence	1.78 (1.04-3.06)	0.04

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