Implementation of strategies to impact fluoroquinolone use: Results from an 8 year evaluation from an inner city hospital

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Introduction

The CDC estimates that 30 to 50% of antibiotic usage in hospitals is unnecessary or inappropriate. Increased antibiotic use, particularly inappropriate use, has been linked to rising rates of antimicrobial resistance and hospital-onset *Clostridium difficile* infection due to selective pressure.(1,2) One of the core elements of an antibiotic stewardship program is incorporating data on local antimicrobial susceptibilities and local antimicrobial flora into clinician education in an effort to improve antimicrobial use and limit or reverse worsening susceptibility trends.(3)

Background

- The inpatient antibiogram data at Bronx Lebanon Hospital Center (BLHC) had shown rising rates of resistance to fluoroquinolones (FQ) in Gram negative pathogens.
- FQ were one of the top three most used antibiotics at BLHC.
- A study conducted at BLHC using antibiogram data from 2011 showed that ciprofloxacin was adding very little in terms of coverage to combination therapy for non-duplicate respiratory and blood isolates.(4)
- These data prompted a multifaceted intervention implemented over time to reduce the use of FQ at BLHC.

Objective

- To evaluate the impact of a multifaceted strategy to reduce FQ use on overall broad-spectrum antimicrobial use over an 8 year period.

Methods

- FQ, 3rd/4th generation cephalosporin (3/4 Ceph), piperacillin/tazobactam (P-T), and carbapenem (CB) use, measured as days of therapy (DOT) per 1000 days at risk (DAR) was obtained from MedMined Surveillance Advisor (CareFusion-BD, San Diego, CA) yearly from July 2007 through June 2015.
- The institution implemented the following FQ control strategies:
  - Intravenous (IV) to oral (PO) transition with Computerized Physician Order Entry (CPOE) hard stop was implemented during 2010-2011. The physicians were allowed 3 days of ciprofloxacin use. At re-order a hard stop would occur asking if the patient needed to continue FQ and if so, prompting a switch to oral.
  - Pneumonia guidelines were implemented during 2011-2012 that deemphasized the use of FQ in favor of an aminoglycoside. This was based on an analysis showing that FQ in combination therapy against Gram negative isolates contributed little to the overall effectiveness of the regimen (Table 1).(4)
  - UTI Guidelines implemented during 2011-2012 emphasizing the use of an alternate empiric first line agent for UTI based on antibiogram data showing that *E. coli* susceptibilities were less than the 80% threshold considered for utility by IDSA guidelines.
  - Education of the medical staff.

Results

- Over the 8 year period, FQ use decreased significantly from 111.5 (July-Dec 2007) to 43.6 (Jan-June 2015) DOT/1000 DAR (-0.96, $p < 0.0001$). During that time there was a significant increase in use of 3/4 Ceph (69 to 90.5 [0.83, $p < 0.0001$]), P-T (76.1 to 102.9 [0.88, $p < 0.0001$]), and CB (18.4 to 28.4 [0.84, $p = 0.0005$]). However, combined FQ, 3/4 Ceph, P-T, and CB use was significantly lower at the end of the study period (274.9 to 265.4 [-0.78, $p = 0.0049$]).

	PSA Isolates	PSA Susc	E coli isolates	E coli Susc	K pneumo isolates	K pneumo Susc
P/T + Cipro	169	78.1%	101	92.1%	105	49.5%
P/T + Gent	147	84.4%	101	94.1%	100	81.0%
P/T Tobra	172	90.7%	98	93.9%	100	55.0%
Cefepime + Cipro	145	71.7%	104	76.9%	104	48.1%
Cefepime + Gent	123	83.7%	104	90.4%	104	78.9%
Cefepime + Tobra	148	89.2%	101	83.2%	102	52.0%
Imipenem + Cipro	162	69.1%	104	98.1%	107	60.8%
Imipenem + Gent	139	79.9%	104	98.1%	105	84.8%
Imipenem + Tobra	177	89.8%	101	98.0%	105	62.9%

Table 1: Combination antibiogram of Non-duplicate blood and respiratory isolates for calendar year 2011.

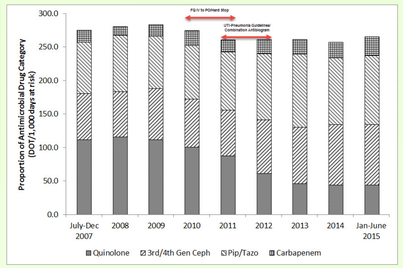

Figure 1: Antimicrobial use from July 2007 to June 2015 (DOT/1,000 days at risk).

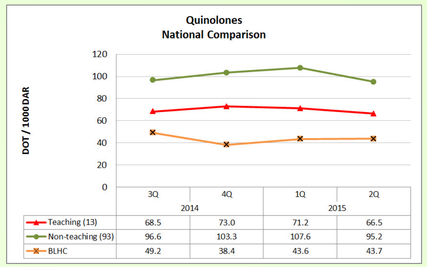

Figure 2: National comparison of Quinolone use (DOT/1,000 days at risk) across teaching and non-teaching acute care hospitals.*

Discussion

- FQ use has been associated with a number of collateral issues including detection of methicillin-resistant *Staphylococcus aureus*, carbapenem-resistant *Enterobacteriacae* and *Clostridium difficile* infections.(5) Using a multifaceted intervention, FQ use was significantly reduced by about 61% from 2007 to 2013. The resulting lower usage of FQ, well below the benchmark from other comparable teaching institutions (Figure 2), has persisted through June 2015. Other studies have noted increase in use of other broad spectrum antibiotics when restrictions were applied to one group of antibiotics.(6) In our study there was an increase in use of 3/4 Ceph and CB over time; nevertheless, overall usage of broad-spectrum antibiotics decreased over the study period (Figure 1).
- Most effective antibiotic stewardship policies appear to center around restriction policies and prior approval.(7) In our study a series of interventions including development of disease specific guidelines using local susceptibility data, computer algorithms and education over time were found to be very effective in curbing quinolone use. Each initiative, IV to PO and UTI and pneumonia guidelines, contributed to the reduction of FQ use.

Conclusion

- Multifaceted strategies to impact FQ use at an inner city hospital resulted in a significant decrease in FQ use and an associated decrease in broad-spectrum antimicrobial use over time. Such strategies can impact related antimicrobial resistance.

References

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