Bundled Antimicrobial Stewardship Intervention Reduces Inpatient Third Generation Cephalosporin Use without Restriction

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Background

- Third generation cephalosporins (3GC) are associated with significant collateral damage:
  - *C. difficile*[1-3]
  - ESBL-producing organisms[4-5]
  - VRE[6-9]
  - MRSA[10-11]
- Reduction of 3GC use has been shown to reduce prevalence of these infections, particularly *C. difficile* and ESBLs[12-15]
- An increase in 3GC use was observed at South Texas Veterans Health Care System in 2019 and 2020, likely due to targeted fluoroquinolone reduction initiatives in 2019 and COVID-19 surges in 2020, leading to implementation of a bundled antimicrobial stewardship intervention targeting 3GC use

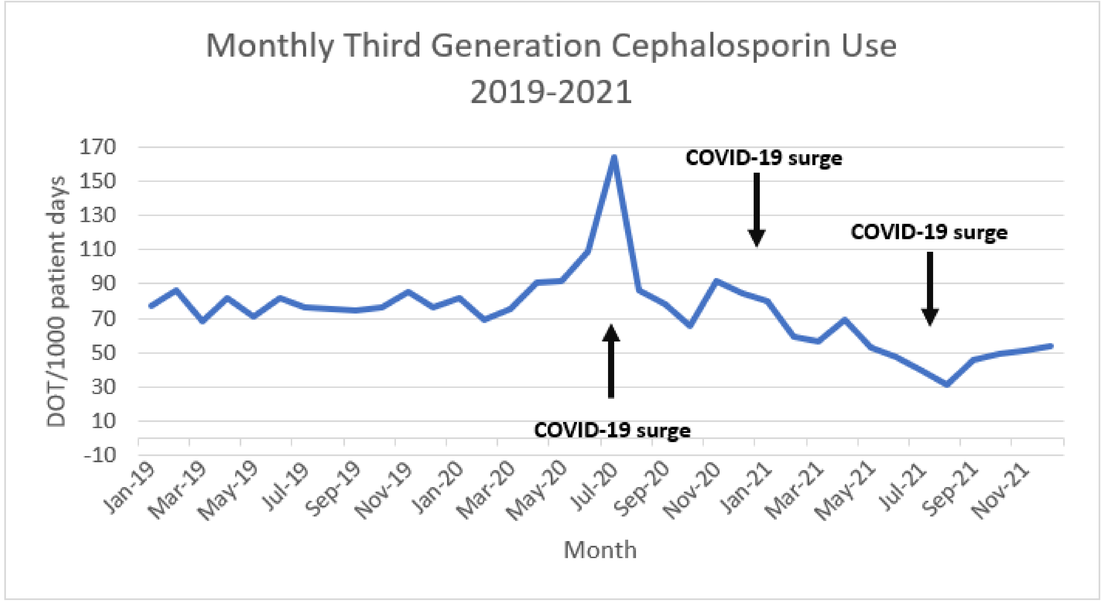
Methods

- Retrospective quasi-experimental study
- Comparing days of therapy (DOT) per 1000 patient days monthly and yearly for ceftriaxone, ceftazidime, cefpodoxime and cefdinir
  - Pre-intervention: January to December 2019 and January to December 2020
  - Post-intervention: January 2021 to December 2021

Table 1: Bundled interventions to reduce 3GC use

Intervention	Implementation
CAP guideline update -Ampicillin/sulbactam over ceftriaxone - first line -Amoxicillin/clavulanate for oral stepdown	December 2020
Education to hospitalist group on 3GC reduction	December 2020
Daily antibiotic stewardship pharmacist review of 3GC	January 2021
UTI guideline update -Cefazolin over ceftriaxone for empiric treatment -Cephalexin for oral stepdown	February 2021
Education to hospitalist group on UTI guideline	April 2021

Results



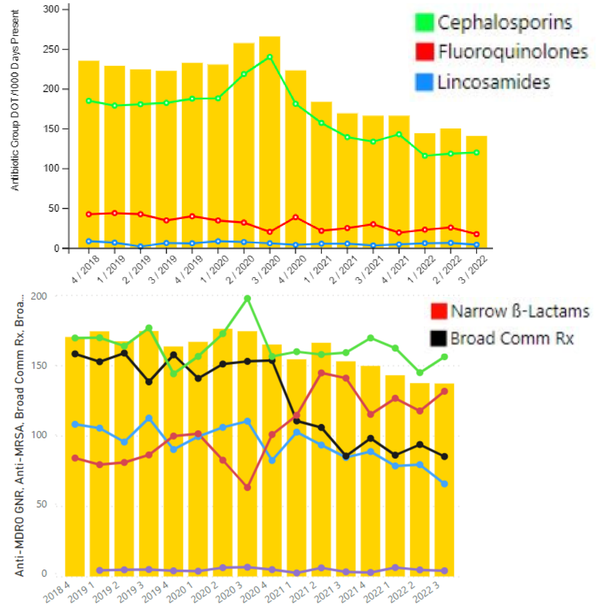
3GC use decreased by **40.73%** in 2021, compared to 2020. A **31.40%** decrease was seen in 2021 compared to 2019 (accounting for confounding due to COVID-19 surges in 2020).

Year	DOT/1000 patient days
2019	77.35
2020	89.52
2021	53.06

Conclusion

A combination of interventions without restriction of 3GC was successful in reducing inpatient use of this class of antibiotics, including through two COVID-19 surges in 2021. Further study is required to determine impact on clinical outcomes, such as *C. difficile* and antimicrobial resistance rates

Concomitant Antibiotic Trends



References

1.Nelson DE, Auerbach SB, Baltch AL, et al. Epidemic Clostridium difficile--associated diarrhea: role of second- and third-generation cephalosporins. Infect Control Hosp Epidemiol 1994; 15:88–94
2. de Lalla F, Privitera G, Ortisi G, et al. Third generation cephalosporins as a risk factor for Clostridium difficile–associated disease: a four-year survey in a general hospital. J Antimicrob Chemother 1989; 23:623–31.
3. Golledge CL, McKenzie T, Riley TV. Extended spectrum cephalosporins and Clostridium difficile. J Antimicrob Chemother 1989; 23:929–31.
4. Asensio A, Oliver A, Gonzalez-Diego P, et al. Outbreak of a multi resistant Klebsiella pneumoniae strain in an intensive care unit: antibiotic use as risk factor for colonization and infection. Clin Infect Dis 2000;30: 55–60
5. Paterson DL, Ko WC, Von Gottberg A, et al. International prospective study of Klebsiella pneumoniae bacteremia: implications of extended spectrum beta-lactamase production in nosocomial infections. Ann Intern Med 2004; 140:26–32
6. Dahms RA, Johnson EM, Statz CL, Lee JT, Dunn DL, Beilman GJ. Third-generation cephalosporins and vancomycin as risk factors for postoperative vancomycin-resistant enterococcus infection. Arch Surg 1998; 133:1343–6. 9.
7. Ostrowsky BE, Venkataraman L, D'Agata EM, Gold HS, DeGirolami PC, Samore MH. Vancomycin-resistant enterococci in intensive care units: high frequency of stool carriage during a non-outbreak period. Arch Intern Med 1999; 159:1467–72. 10.
8. Loeb M, Salama S, Armstrong-Evans M, Capretta G, Olde J. A case control study to detect modifiable risk factors for colonization with vancomycin-resistant enterococci. Infect Control Hosp Epidemiol 1999; 20:760–3. 11.
9. Fridkin SK, Edwards JR, Courval JM, et al. The effect of vancomycin and third-generation cephalosporins on prevalence of vancomycin-resistant enterococci in 126 US adult intensive care units. Ann Intern Med 2001; 135:175–83. 1
10. Washio M, Mizoue T, Kajioka T, et al. Risk factors for methicillin resistant Staphylococcus aureus (MRSA) infection in a Japanese geriatric hospital. Public Health 1997; 111:187–90. 16.
11. Landman D, Chockalingam M, Quale JM. Reduction in the incidence of methicillin-resistant Staphylococcus aureus and ceftazidime-resistant Klebsiella pneumoniae following changes in a hospital antibiotic formulary. Clin Infect Dis 1999; 28:1062–6
12. Patterson JE, Hardin TC, Kelly CA, Garcia RC, Jorgensen JH. Association of antibiotic utilization measures and control of multiple-drug resistance in Klebsiella pneumoniae. Infect Control Hosp Epidemiol 2000; 21:455–8. 28.
13. Rice LB, Eckstein EC, DeVente J, Shlaes DM. Ceftazidime-resistant Klebsiella pneumoniae isolates recovered at the Cleveland Department of Veterans Affairs Medical Center. Clin Infect Dis 1996; 23:118–14. Rahal JJ, Urban C, Horn D, et al. Class restriction of cephalosporin use to control total cephalosporin resistance in nosocomial Klebsiella. JAMA 1998; 280:1233–7
15. Ludlam H, Brown N, Sule O, Redpath C, Coni N, Owen G. An antibiotic policy associated with reduced risk of Clostridium difficile–associated diarrhoea. Age Ageing 1999; 28:578–80

Disclosures: The authors have no conflicts of interest

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