Reducing the use of empiric antibiotic therapy in patients on admission to the hospital with COVID-19

Natasha N. Pettit (natasha.pettit@uchospitals.edu)
University of Chicago Medicine
Cynthia T. Nguyen
University of Chicago Medicine
Alison Lew
University of Chicago Medicine
Palak Bhagat
University of Chicago Medicine
Allison Nelson
University of Chicago Medicine
Gregory Olson
University of Chicago Medicine
Jessica Ridgway
University of Chicago Medicine
Mai T. Pho
University of Chicago Medicine
Jade Pagkas-Bather
University of Chicago Medicine

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Abstract

Background: Empiric antibiotics for community acquired bacterial pneumonia (CABP) are often prescribed to patients with COVID-19, despite a low reported incidence of co-infections. Stewardship interventions targeted at facilitating appropriate antibiotic prescribing for CABP among COVID-19 patients are needed. We developed a guideline for antibiotic initiation and discontinuation for CABP in COVID-19 patients. The purpose of this study was to assess the impact of this intervention on the duration of empiric CABP antibiotic therapy among patients with COVID-19.

Methods: This was a single-center, retrospective, quasi-experimental study of adult patients admitted between 3/1/2020 to 4/25/2020 with COVID-19 pneumonia, who were initiated on empiric CABP antibiotics. Patients were excluded if they were initiated on antibiotics >48hours following admission or if another infection was identified. The primary outcome was the duration of antibiotic therapy (DOT) prior to the guideline (March 1 to March27, 2020) and after guideline implementation (March 28 to April 25, 2020). We also evaluated the clinical outcomes (mortality, readmissions, length of stay) among those initiated on empiric CABP antibiotics.

Results: A total of 506 patients with COVID-19 were evaluated, 102 pre-intervention and 404 post-intervention. Prior to the intervention, 74.5% (n=76) of patients with COVID-19 received empiric antibiotics compared to only 42% of patients post-intervention (n=170), p<0.001. The median DOT in the post-intervention group was 1.3 days shorter (p<0.001) than the pre-intervention group, and atypical antibiotic DOT was reduced by 2.8 days (p<0.001). More patients in the post-intervention group were initiated on antibiotics based on criteria consistent with our guideline (68% versus 87%, p=0.001). There were no differences between groups in terms of clinical outcomes.

Conclusion: Following the implementation of a guideline outlining recommendations for initiating and discontinuing antibiotics for CABP among COVID-19 inpatients, we observed a reduction in antibiotic prescribing and DOT. The guideline also resulted in a significant increase in the rate of guideline-congruent empiric antibiotic initiation.

Introduction

Reagents

Equipment

Procedure

Design:

Single-center, quasi-experimental, retrospective cohort study

Setting:

811-bed academic medical center in Chicago, IL, USA.

Inclusion:

Adult patients admitted with COVID-19, confirmed by SARS-CoV-2 testing (nasopharyngeal swab), between March 1, 2020 and April 25, 2020 who received at least one dose of empiric antibiotics for CABP initiated within 48 hours of admission were included.

Exclusion:

Another source of infection identified that was not pneumonia for which antibiotics were indicated and initiated.

Approval:

This project received a formal Determination of Quality Improvement status according to University of Chicago Medicine institutional policy. As such, this initiative was not considered human subjects research and was therefore not reviewed by the Institutional Review Board.

Intervention:

(1) Guideline Development:

In March 27, 2020, the Antimicrobial Stewardship Program (ASP) in conjunction with ID providers outlined recommendations regarding when to initiate antibiotics for possible bacterial pneumonia and when to discontinue empiric antibiotics among patients with COVID-19. These recommendations were incorporated into the institution’s inpatient COVID-19 management guideline. Indications to initiate

empiric antibiotics for CABP included the presence of leukocytosis, fever, or chest imaging suggestive of a bacterial process. The guideline also included recommendations for ordering a respiratory bacterial

and viral panel (RBVP; Biofire Diagnostics FilmArray® respiratory Panel, Biomerieux, Salt Lake City, UT), a *Legionella* urinary antigen, and a *Streptococcus pneumoniae* urinary antigen. Discontinuation of atypical coverage (e.g. azithromycin, doxycycline, or levofloxacin) was recommended in patients with a negative *Legionella* urinary antigen and a RBVP negative for atypical bacterial pathogens. Additionally, discontinuation of antibiotics prescribed for CABP (e.g. ceftriaxone or cefdinir) was recommended in patients with negative RBVPs for non-atypical bacterial pathogens and a negative *Streptococcus pneumoniae* urinary antigen.

(2) Guideline Implementation:

Throughout the study period, recommendations and education regarding antibiotic use among COVID-19 inpatients were given to COVID unit providers during daily virtual rounds with the ID COVID-19 Consult Service. Education was also provided to emergency department (ED) staff. All admitted patients with confirmed COVID-19 received an automatic ID consult for evaluation of antibiotic therapy in addition to COVID-specific management. Each ID consult team included an ID/ASP pharmacist who, along with the ID providers, evaluated each patient case. After updating the institution's guideline to include recommendations for CABP, this evaluation also included a standardized and targeted stewardship intervention to recommend obtaining an RVBP, *Streptococcus pneumoniae* urinary antigen and/or *Legionella* urinary antigen (if not performed on admission), along with recommendations to discontinue or de-escalate antibiotics for CABP, in accordance with the institutional guideline.

Primary Endpoint:

Median duration of antibiotic therapy for CABP (March 1 to March 27 (pre-intervention) and March 28 to April 25 (post-intervention)).

Secondary Endpoints:

Hospital length of stay (LOS)

30-day readmissions (for suspected bacterial pneumonia, based on documentation of antibiotic indication)

Inpatient mortality (all-cause)

Re-initiation of antibiotics following discontinuation during the same admission (for any indication or specifically for suspected pneumonia based on documentation of antibiotic indication)

Rates of *Clostridioides difficile* infections. *C. difficile* infection was defined as a positive *C. difficile* test in conjunction with symptoms of diarrhea requiring treatment.

Statistical analysis:

Categorical data were analyzed with a Fisher's exact test or a Chi-Square test. Continuous data were analyzed by the Shapiro-Wilk test to determine if the data were normally distributed. Continuous data were analyzed with Student's t-test for parametric data or a Mann-Whitney U Test for non-parametric data. The significance level for all tests were set at alpha = 0.05. All statistical analyses were performed with STATA®, version 16, College Station, TX.

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