



Major Article

Antimicrobial stewardship for hospitalized patients with viral respiratory tract infections



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Key Words:

Influenza

Oseltamivir

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Real-time multiplex PCR

Background: The purpose of this study was to implement a targeted antimicrobial stewardship intervention for patients with a viral respiratory tract infection.

Methods: This was a quasi-experimental before and after audit and feedback intervention of adult inpatients with a positive polymerase chain reaction for a respiratory virus in 2 acute care hospitals in Vancouver, Canada. Audit and feedback was implemented based on 2 criteria: microbiology (no positive bacterial cultures) and chest imaging (absence of pneumonia or consolidation on radiology dictation). A chart review was conducted to assess for days of antibiotics postviral diagnosis. Outcomes including length of stay, intensive care unit admission within 14 days, mechanical ventilation within 14 days, antibiotics prescribed within 14 days, *Clostridium difficile* infection diagnosed within 30 days, and readmission within 30 days were also reviewed in comparison with the previous year.

Results: Antimicrobial stewardship recommendations for hospitalized patients with viral respiratory tract infections were accepted for 77% of cases. This targeted approach based on easily assessed parameters translated into a 1.3-day (95% confidence interval, 0.3-2.3; $P < .01$) decrease in mean days of antibiotics postviral diagnosis compared with the previous year without systematic interventions. Compared with the previous year, no differences were identified for adverse outcomes associated with the intervention.

Conclusions: A targeted antimicrobial stewardship intervention integrating virology testing with the treating physician facilitated a reduction in duration of antibiotic treatment for viral respiratory tract infections.

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Antimicrobial stewardship programs (ASPs) are essential in improving utilization of antibiotics and confronting the growing public health crisis of antimicrobial resistance.¹ For viral respiratory tract infections, concurrent treatment for presumed community-acquired pneumonia (CAP) is frequently prescribed²; however, bacterial coinfection occurs in a minority of cases.^{3,4}

Rapid testing for respiratory viruses using real-time multiplex polymerase chain reaction (PCR) improves sensitivity, specificity and

turnaround time. With increasing adoption of such technologies, there is a potential for rapid diagnostics to help decrease antimicrobial usage. However, the introduction of a new diagnostic test alone may not contribute to changes in prescriber practices.⁵

At our facility, we initiated a collaboration between the virology laboratory and the ASP team to integrate reporting of respiratory virus PCR with an ASP audit and feedback intervention to optimize antiviral and antimicrobial use for admitted patients.

METHODS

A quasi-experimental before and after study was conducted to assess the impact of a targeted antimicrobial stewardship intervention for viral respiratory tract infections. From December 1, 2015-April 30,

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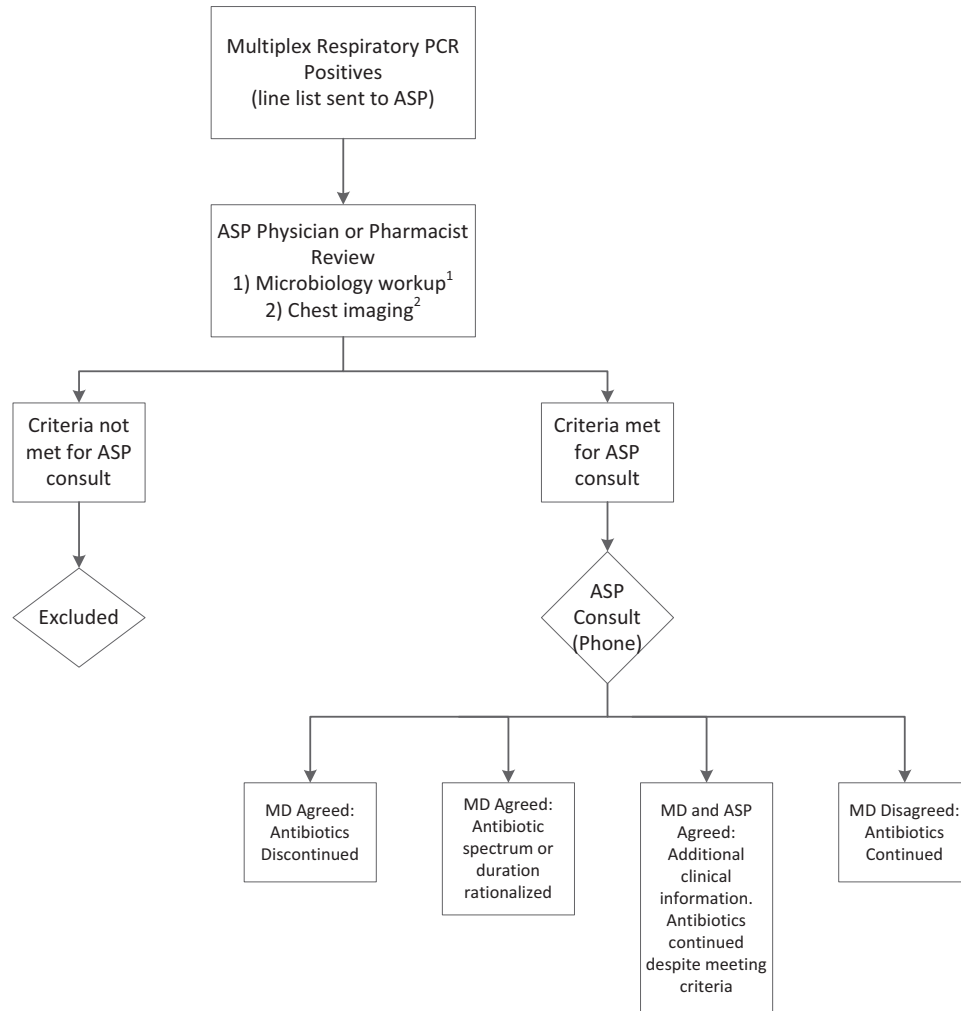


Fig 1. Targeted audit and feedback algorithm for assessment of patients with a positive respiratory virus. ¹Microbiology workup included a review of any positive bacterial cultures during the current admission. ²Chest imaging was reviewed for evidence of new lobar consolidation or pneumonia dictated by radiology. ASP, antimicrobial stewardship program; MD, medical doctor; PCR, polymerase chain reaction.

2016, we conducted a prospective audit and feedback intervention for all adult inpatients with a positive respiratory virus PCR from upper (nasopharyngeal swab) or lower (endotracheal aspirate or bronchoalveolar lavage) respiratory samples admitted in 2 acute tertiary care hospitals in Vancouver, Canada. Pediatric (≤ 18 years old) and cystic fibrosis patients were excluded. Inclusion of patients for an ASP consult was based on 2 criteria (Fig 1): microbiology (no positive bacterial cultures on current admission) and radiology (absence of new lobar consolidation or pneumonia reported on chest imaging, either by chest radiograph or computed tomography scan). Other findings on chest imaging were not specific for bacterial pneumonia in discussion with local radiology colleagues; therefore, we felt an ASP consult would also be applicable to these patients. For patients meeting the inclusion criteria, the ASP team reviewed the case with the treating physician to determine if antibiotics for CAP were required, and assessed the need for oseltamivir. Baseline patient admission information, including age, white blood cell count, CURB-65 score (clinical tool for assessment of community-acquired pneumonia severity), and HIV status, was collected (Table 1). Duration of antimicrobial therapy after viral diagnosis was the primary outcome of interest. Secondary outcomes were intensive care unit (ICU) admission, mechanical ventilation, and represcription of antibiotics within 14 days of diagnosis; and readmission, mortality, and

Clostridium difficile infection within 30 days (Table 2). A retrospective chart review was also conducted for admitted patients with a positive respiratory virus PCR between December 1, 2014, and April 30, 2015, prior to the institution of the ASP intervention for positive respiratory virus PCR testing, and data were extracted for comparative purposes.

We used an in-house developed, multiplex real-time respiratory virus PCR targeting influenza A, influenza B, respiratory syncytial virus, parainfluenza 1, 2 and 3, adenovirus, and human metapneumovirus.⁶⁻¹⁰ PCR was performed daily, and results were reported directly to the ASP team, in addition to the standard reporting in electronic medical records. Research ethics board approval was obtained for this study.

The χ^2 or Fisher exact test with cells ≤ 5 , with a 2-tailed P value, and the Student t test were used for categorical or continuous variables, respectively. $P < .05$ was considered statistically significant. Statistics were performed using Stata Statistical Software release 14 (StataCorp, College Station, TX).

RESULTS

Ninety-two patients were included in the prospective cohort and 118 in the retrospective cohort. A similar percentage of the prospective (76%, 70/92) and retrospective (83%, 98/118) cohorts were

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