Examining the Use of Rapid Polymerase Chain Reaction Assay in Optimizing Antimicrobial Usage in Respiratory Viral Infections

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Examining the use of rapid polymerase chain reaction assay in optimizing antimicrobial usage in respiratory viral infections.
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Background

- Respiratory infections account for over 5 million deaths worldwide.
- Historically, respiratory pathogen testing has included the use of cultures and antigen-testing.
- Rapid polymerase chain reaction (PCR) assay:
  - Fast, effective identification of 17 viral pathogens
  - 95% sensitive and 99% specific
  - Turnaround time ~ 1 hour

<table>
<thead>
<tr>
<th>Pathogen Detected</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adenovirus</td>
<td>95%</td>
<td>99%</td>
</tr>
<tr>
<td>Coronavirus HKU1</td>
<td>95%</td>
<td>99%</td>
</tr>
<tr>
<td>Coronavirus NL63</td>
<td>95%</td>
<td>99%</td>
</tr>
<tr>
<td>Coronavirus 229E</td>
<td>95%</td>
<td>99%</td>
</tr>
<tr>
<td>Coronavirus OC43</td>
<td>95%</td>
<td>99%</td>
</tr>
<tr>
<td>Human Metapneumovirus</td>
<td>95%</td>
<td>99%</td>
</tr>
<tr>
<td>Human Rhinovirus/ Enterovirus</td>
<td>95%</td>
<td>99%</td>
</tr>
<tr>
<td>Influenza A</td>
<td>95%</td>
<td>99%</td>
</tr>
<tr>
<td>Respiratory Syncytial Virus</td>
<td>95%</td>
<td>99%</td>
</tr>
</tbody>
</table>

- Targeted therapies exist only for influenza infections.
- Agents are most effective in reducing patient’s symptoms and duration of illness if used within 48 hours of symptom onset.
- Other practices have included the use of procalcitonin levels to aid in the identification of bacterial infections.
- Higher levels are associated with bacterial infections
- Studies:
  - FilmArray® respiratory panel resulted in decreased admission rates, duration of antimicrobial use, length of stay, and amount of chest imaging performed.
  - PCR assay resulted in a decrease in antibiotic usage only in patients who tested positive for influenza virus.
  - Procalcitonin levels and respiratory panel results, alone or in combination, are seldom associated with the discontinuation of antibiotic therapy upon diagnosis of viral infection.
- All studies highlight the effectiveness of PCR technology in identifying viral infections.
- Different findings suggest the need to further evaluate the usefulness of rapid PCR technology in optimizing antimicrobial therapy in respiratory infections.

Objective

- The objective is to examine the use of viral PCR assays in the management of respiratory viral infections in a community hospital.
- The study will describe viral PCR use in identifying viral pathogens, evaluating appropriate treatment, and de-escalating of antimicrobial therapy when indicated.

Methods

- An exploratory analysis using medical chart reviews will be conducted using daily molecular result reports provided to the pharmacy.
- Inclusion criteria: Adults 18 years of age who received viral PCR microbiology testing for respiratory infections between July 1, 2017 and March 31, 2018.
- Exclusion: Patients with a documented viral respiratory infection 2 weeks prior to the time of admission.
- Patients will be randomly selected (every 6th patient) for a total population size of 150 patients.
- Data collection:
  1. Viral PCR results (time of results & pathogen identification)
  2. Diagnostic labs
     1. Procalcitonin level (Y-high, Y-low, N)
     2. Influenza A & B antigen testing (Y-positive, Y-negative, N)
  3. Initial therapy
     1. Antimicrobial and/or antiviral therapy
     2. Time of initial therapy
  4. If applicable, antibiotic prescribed and documented indication
  5. Therapy modification upon respiratory results
     1. Y/N (e.g., discontinuation of antibiotic or start of antiviral therapy)
     2. Time of therapy modification

- Preliminary Results

  - Preliminary data demonstrates 26.7% (16/60) of patients who had PCR assay testing were determined to be positive for a respiratory viral infection.
  - Most reported virus: rhinovirus/enterovirus (10/16, 62.5%).
  - In addition to PCR testing, 1 in every 3 patients had an influenza A & B antigen test (18/60, 30%) and 61.7% had a procalcitonin level.
  - Patients who were positive for respiratory viral infections were managed appropriately taking into account any co-infection.
  - When antimicrobial therapy was not indicated, the antimicrobial de-escalation time was approximately 4 hrs.

Conclusion

Research in progress.

Implications for Practice

- Optimize treatment using PCR assay as a diagnostic tool.
- Reduce unnecessary diagnostic tests.
- Decrease the inappropriate use of antimicrobials in viral respiratory infections.

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Disclosure

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References