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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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MAGNET RECOGNIZED AMERICAN NURSES CREDENTIALING CENTER

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

Pathogens Detected	
• Adenovirus	• Influenza A/H1
• Coronavirus HKU1	• Influenza A/H3
• Coronavirus NL63	• Influenza A/H1-2009
• Coronavirus 229E	• Influenza B
• Coronavirus OC43	• Parainfluenza Virus 1
• Human Metapneumovirus	• Parainfluenza Virus 2
• Human Rhinovirus/ Enterovirus	• Parainfluenza Virus 3
	• Parainfluenza Virus 4
• Influenza A	• Respiratory Syncytial Virus

Figure 1. Pathogens detected in the FilmArray® Panel

- 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

Patients with a Positive PCR Result	
Number of Patients	16
Virus	Rhinovirus/Enterovirus: 10
	Influenza B: 2
	RSV: 2
	Coronavirus: 1
	Metapneumovirus: 1
Influenza A & B Antigen testing	Yes-positive: 0
	Yes-negative: 5
	No test: 11
Procalcitonin Level	Yes-high: 4
	Yes-low: 4
	No level: 8
Initial Therapy	ABX: 12
	Antiviral: 1
	None: 3
Documented ABX indication	11
Average De-escalation Time	~ 4 hrs

Figure 2. Positive PCR result data

Influenza A & B Antigen Testing

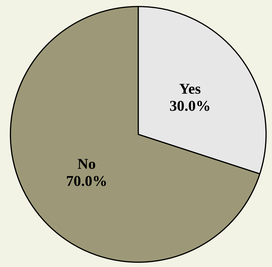

Figure 3. Antigen testing in sample size (n=60)

Procalcitonin Level

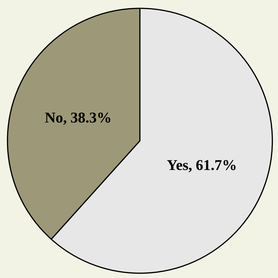

Figure 4. Procalcitonin level ordered in total sample size (n=60)

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

Authors of this presentation have nothing to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation.

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