A Comparison of Multiplex Respiratory Panels: A Workflow Analysis

Lisa Tingley, Lori Daigneault, and Kimberle C. Chapin

Department of Pathology and Laboratory Medicine, Dept of Medicine Rhode Island Hospital and Alpert Medical School Brown University Providence, RI

Abstract

Background: The Lifespan microbiology laboratory currently performs approximately 8000 respiratory viral multiplex panel assays per year at Rhode Island Hospital (RIH) for a multi-hospital system. More than 80% of the time the multiplex assay is used for in-patient diagnosis of respiratory infections. While the current assay system provides excellent results and allows high capacity testing; high technical complexity, lengthy reporting time to result, large equipment footprint, and lack of key URI bacterial pathogens limit its overall efficiency in the lab and usefulness clinically for patient treatment, patient flow from the ER, and appropriate infection control. The objective of this study was a workflow study and a cost assessment of the GenMark Diagnostics ePlex® Respiratory Pathogen Panel® (Research Use Only) compared to our current protocol which includes a combination of the random access Cepheid Xpert Flu/RSV XC Assay at three separate hospitals with subsequent request on in-patients with negative Xpert for the Luminex xTAG Respiratory Viral Panel (RVP) performed at RIH.

Methods: A time-motion operational workflow study (prior to influenza season) was done for a two day period in November 2016 evaluating all analytical steps from the time of specimen order to report in the electronic medical record for 39 specimens tested on a single day and then annualized for 8000 tests per year. RVP was performed four days per week. Overall metrics included the following: Operator hands-on-time, laboratory turnaround time, total time to result from physician order to posting, laboratory throughput and capacity, instrument footprint, and points of risk for operator error.

Conclusion: The current protocol of Cepheid Xpert Flu/RSV XC with reflex testing option to xTAG RVP for inpatients showed batch testing with a high complexity RPV limited both laboratory and clinical utility of the assay. While the implementation of the test is not laboratory cost-neutral, use of the ePlex RP allows for a single PCR test for respiratory pathogens, decreased in sample error, and appropriate infection control. The objective of this study was a workflow study and a cost assessment of the GenMark Diagnostics ePlex® Respiratory Pathogen Panel® (Research Use Only) compared to our current protocol which includes a combination of the random access Cepheid Xpert Flu/RSV XC Assay at three separate hospitals with subsequent request on in-patients with negative Xpert for the Luminex xTAG Respiratory Viral Panel (RVP) performed at RIH.

Results

Comparison of Multiplex Respiratory Assay Systems

<table>
<thead>
<tr>
<th>Test System</th>
<th>Daily Hands-on Time</th>
<th>Hands-on/Output Efficiency</th>
<th>Benefits with ePlex RP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luminex xTAG RVP</td>
<td>88%</td>
<td>50%</td>
<td>80% reduction in hands-on time</td>
</tr>
<tr>
<td>Xpert Flu/RSV XC</td>
<td>83%</td>
<td>50%</td>
<td>Increased accuracy and flexibility of workflow</td>
</tr>
</tbody>
</table>

RHI RVP Turnaround Time Comparison

- Rapid Flu and xTag RVP
- ePlex RP

Instrument Footprint Comparison

- ePlex RP
- xTag RVP

How valuable is your lab space?

Conclusions

- Batch testing with a high complexity xTAG RVP limits both laboratory and clinical utility of the assay
- Cost of ePlex RP is not cost neutral
- Use of ePlex RP allows decentralization of testing in a multisite hospital with 24/7 random access
- Additional targets including bacteria on the ePlex RP critical to deescalating antibiotic use
- ePlex RP allows for highly efficient use of laboratory space and technical labor