Evaluation of the Implementation of Rapid Cerebral Spinal Fluid Diagnostic Test for Meningitis and Encephalitis at a Large Academic Institution

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Evaluation of the Implementation of Rapid Cerebral Spinal Fluid Diagnostic Test for Meningitis and Encephalitis at a Large Academic Institution
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Background
- Meningitis and encephalitis are central nervous system (CNS) infectious diseases associated with significant morbidity and mortality in adult populations.
- Traditional approaches of culture and pathogen-specific polymerase chain reaction (PCR) tests are limited by slow turnaround time and low diagnostic yield.
- The FilmArray Meningitis and Encephalitis (M/E) panel is a multiplex PCR test targeting a combination of 14 viruses, bacteria, and yeasts.
- The M/E panel was first introduced at LVHN in February, 2016.

Objectives
This study aims to determine how the M/E panel affects clinical outcomes including: time to diagnosis, appropriate antibiotic deescalation, days of therapy, and mortality.

Methods
Retrospective analysis of patients with CSF culture from 2/23/2015 to 2/22/2016 (Pre-Intervention) and M/E panel and CSF culture from 2/23/2016 to 2/22/2017 (Post-Intervention).

- Review EMR for: demographics, length of stay, type of CSF studies, CSF collection date and time, CSF result date and time, antibiotics administered, antibiotic initiation and discontinuation date and time.
- Perform descriptive statistics to compare the pre and post-intervention groups regarding: time to diagnosis, time to antibiotic deescalation, days of therapy, mortality.

Results

<table>
<thead>
<tr>
<th>Table 1. Negative CSF Test Results</th>
<th>Table 2. Positive CSF Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-group (N=57)</td>
</tr>
<tr>
<td>Mean Time to Antibiotic Deescalation (SD)</td>
<td>81.7 (85.6)</td>
</tr>
<tr>
<td>Mean Days of Therapy (SD)</td>
<td>3.4 (3.6)</td>
</tr>
<tr>
<td>Mean # CSF Tests Ordered (Range)</td>
<td>4.7 (1-13)</td>
</tr>
<tr>
<td>Mean Length of Stay Days (Range)</td>
<td>7.9 (1-33)</td>
</tr>
</tbody>
</table>

Key: ICU, Intensive Care Unit; CSF, cerebrospinal fluid.

Results/Discussion
- Time to diagnosis decreased in the post-intervention group for all pathogens included on the M/E panel.
- The post-intervention group had a reduced time from antibiotic initiation to discontinuation (70.0 h vs 81.7 h) and reduced antibiotic days of therapy (2.9 d vs 3.4 d) for negative CSF results.
- The post-intervention group had an overall decreased mean time to targeted therapy (27.7 h vs. 32.9 h) and reduced mean time to diagnosis (21.2 h vs. 39.1 h) for positive CSF results.
- The post-intervention group had a reduced average number of CSF tests (3.6 vs. 4.7).
- Notably, this translated into an increase in the average patient charge: $1,339.79 vs. $1,458.45, but a decrease in the average supply cost ($434.26 vs $314.29) in the post-intervention group.

Conclusions/Recommendations
- The implementation of the M/E panel has resulted in improved time to diagnosis, time to antibiotic deescalation for negative CSF tests and time to targeted antibiotic therapy for positive CSF test results.
- Future research using a larger sample size is needed to determine if there is a change in outcomes data including: length of stay, ICU stay, and mortality.

References/Acknowledgments

Special thanks to Health Network Laboratories (HNL) for their assistance with data and cost/charge information.