ABSTRACT

Background: NorthShore University HealthSystem is a four-hospital and associated outpatient network that serves the northern Chicago suburban area. All microbiology testing is done at a central laboratory located in Evanston Hospital. The Microbiology Laboratory processes approximately 29,200 unique specimens per year for antimicrobial susceptibility testing using disk diffusion. We compare the cost of semiautomated BIOMIC disk diffusion to an automated MIC test system.

Methods: Disk diffusion is performed using the BIOMIC semi-automated reader (Giles Scientific) with a two-way LIS interface. The automated MIC System with automated processing is the BD Phoenix™ AP Automated Microbiology System (BD Diagnostic Systems). The cost comparison includes materials (all consumables) and technician time. Timed measurements of technical procedures, published time measurements, manufacturers processing time data, and contracted prices for consumable materials were used to determine costs. Average technician cost (including benefits) for a midrange technologist in our setting is $32/hour. Instrument purchase and preventive maintenance costs were not included in the calculations.

Results: Cost of materials for performing antimicrobial susceptibility testing using BIOMIC disk diffusion is $1.49/test. In our hospital system, this equates to $43,508 per year. Each specimen takes approximately 224 seconds to setup and interpret (1,817 technician hours or $58,144/year for all tests). Cost of materials using the BD Phoenix™ AP system is $5.68/test or $165,856.00/year. Setup and interpretation time is 102 seconds/specimen (827 technician hours or $26,464/year for all tests).

Conclusion: The BD Phoenix™ AP Automated Microbiology System costs $6.59 and the BIOMIC Disk Diffusion $3.48 per test. In our setting, the BD Phoenix System saves approximately 0.5 FTE but would cost $90,668 more per year because of greater materials costs.

BACKGROUND

• According to the College of American Pathologists 2009 and 2010 Bacteriology Survey Participant Summaries, only 6-9% of laboratories perform Gram-negative or Gram-positive antimicrobial susceptibility testing using disk diffusion
• Disk diffusion is a standardized, accurate and inexpensive methodology for testing antimicrobial susceptibility.
• Although the BIOMIC Microbiology System provides semi-automated reading of disk plates, disk diffusion remains relatively labor intensive.
• Multiple automated platforms for antimicrobial susceptibility testing are available. All have the advantage of requiring less technical time for set-up and interpretation, but have higher reagent costs.
• We determined whether cost savings from decreased technical time would offset increased reagent costs by comparing disk diffusion performed using the BIOMIC Microbiology System to automated testing using the BD Phoenix™ AP Microbiology System.

METHODS

• In our laboratory
  • The automated Phoenix AP System
    • Costs $6.59 / test
    • Costs $192,320 / year for our test volume
  • Disk diffusion using the BIOMIC System
    • Costs $3.48 / test
    • Costs $101,652 / year for our test volume
  • In our laboratory
    • The BD Phoenix System saves approximately 0.5 FTE but would cost $90,668 more per year because of greater materials costs.

RESULTS

COST OF REAGENTS – per specimen

<table>
<thead>
<tr>
<th></th>
<th>Automated (Phoenix)</th>
<th>Disk Diffusion (BIOMIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AST Panel</td>
<td>4.23</td>
<td>150 mm Agar Plate 0.57</td>
</tr>
<tr>
<td>ID Broth</td>
<td>0.45</td>
<td>Antimicrobial Disks (12) 0.6</td>
</tr>
<tr>
<td>AST Broth</td>
<td>0.45</td>
<td>Sterile Swab 0.02</td>
</tr>
<tr>
<td>AP ID Solution</td>
<td>0.08</td>
<td>Snap-Cap Tube 0.16</td>
</tr>
<tr>
<td>AP Tip Waste Liner</td>
<td>0.02</td>
<td>Saline 0.01</td>
</tr>
<tr>
<td>AP Waste Bottle</td>
<td>0.03</td>
<td>Purity Plate 0.1</td>
</tr>
<tr>
<td>AP Pump Tubing</td>
<td>0.02</td>
<td>Labels 0.03</td>
</tr>
<tr>
<td>AP PH Indicator</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>AP Pipette Tips</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>$5.68</td>
<td>Total $1.49</td>
</tr>
</tbody>
</table>

COST OF TECHNICAL TIME (LABOR) – per year

• At a volume of 29,200 tests/year
  • Disk diffusion using BIOMIC
    • 1,817 technical hours/year
  • Automated testing using Phoenix AP
    • 827 technical hours/year
• For a midrange technical salary of $32/hour
  • Disk diffusion using BIOMIC total labor cost
    • $58,144 per year
  • Automated testing using Phoenix AP
    • $26,464 per year

CONCLUSIONS

• Analysis of the BD Phoenix™ AP Workflow: J. T. Page, A. L. Gibson, K. D. King, T. Daniel, P. Campognone; BD Diagnostics, Sparks, MD; As presented at the 108th General Meeting of the American Society for Microbiology. June, 2008, Boston, MA
• Cost of BD Phoenix™ AP reagents and disposables obtained from a price quote from BD Diagnostics, based on a volume of approximately 28,000 tests per year.

REFERENCES

G. P. Turner1,2, I. Dusich3, R. B. Thomson, Jr1,2
1. Evanston Hospital and NorthShore University HealthSystem, Evanston, IL; 2. The University of Chicago Pritzker School of Medicine, Chicago, IL