New Employee TB Screening: Analysis of Two Methods

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The author has no financial or other conflicts of interest to report.

Needs Assessment

• 3200 HCWs requiring annual TB screens
• 2 staff members available to screen employees (1 RN, 1 NP)
• Multiple other clinical demands
• High “failure to return rate” between 17% and 20% for TST (Tuberculosis Skin Test)
• 64% of staff between ages of 45 and 64; High rate of positive TSTs (18-20%)
• High rate of prior BCG vaccination

Preliminary Steps

• Business plan development
• IRB review: deemed Quality Improvement
• National VA Innovation Grant
• Local funding
• Coalition building with hospital laboratory
• Selection of test
• Contract negotiations with vendor

Interpretation of ImmunoSpot® (TSPOT) Results

Europe:
> 6 spots – positive

US:
> 8 spots – positive
> 5,6,7 spots – borderline
< 5 spots – negative

Donabedian Model (1980)
Structure, Process, Outcomes

Selected enzyme-linked ImmunoSpot® (T-SPOT) because:
• Logistical ease (3 tube, storage at room temperature, stability of sample)
• Potential for reduced load on the lab (Occupational Health could draw samples)
• Business plan analysis suggested cost-effectiveness as a “send out” test
• Formal complaint regarding number of tubes drawn for pre-placement evaluation

Evaluated 100 new hires screened in 2011 & 2012
• Compliance rate
• Time to clearance
• Cost

Switched to TSPOT for TB screening 3/12/2013, then Evaluated:
• Compliance rate
• Time to clearance
• Cost

Test Characteristics: Interferon Gamma Release Assays

ELISA, Whole Blood (QuantIFERON®-TB Gold In-Tube)
• More specific
• Not affected by BCG
• Threshold for conversions?
• Conversions/increases
• Boosted by recent TST? (van Zyl-Smit et al, 2012)
• Good negative predictive value
• Positive predictive value weak, but better than TST (Bett et al, 2012)
• Preventive treatment reduces risk of active disease (no evidence base yet)
• Easier to bring test in-house
• In-use longer, more specific research available

Enzyme-linked ImmunoSpot® (T-SPOT®,TB)
• More sensitive
• Not affected by BCG
• Threshold for conversion?
• Conversions/increases
• Boosted by recent TST (same as ELISA)
• Good negative predictive value
• Positive predictive value weak, but better than TST (Same as ELISA)
• Preventive treatment reduces risk of active disease (no evidence base yet)
• More stable with changes in CD4 counts/immunocompromised (Santin et al, 2012)
• Operationally simpler – one standard green-top tube
Definitions

• **Compliance rate**: % of newly hired employees completing pre-placement physical, blood draw, and TB screening within 14 days (no evidence of active TB)

• **Clearance**: all above is complete, provider signs clearance sheet, sheet arrives in Human Resources

• **Time-to-clearance**: number of days from date of pre-placement physical to clearance

• **Cost**:
  - pre-implementation based on average cost for TB screening according to Palo Alto VA cost model (Thanassi, 2010)
  - Post-implementation tracked per employee screened

Outcomes: Compliance and Time-to-Clearance

<table>
<thead>
<tr>
<th>Objective</th>
<th>Compliance</th>
<th>Time-to-Clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective 1</strong>: Compliance By Year Comparison</td>
<td>Compliance Rates</td>
<td>Time to Clearance</td>
</tr>
<tr>
<td>2011/2012</td>
<td>77%/81% 0.482</td>
<td>&gt;0.001 95% No</td>
</tr>
<tr>
<td>2011/2013</td>
<td>77%/97% 15.959</td>
<td>&gt;0.001 95% Yes</td>
</tr>
<tr>
<td>2012/2013</td>
<td>81%/97% 11.491</td>
<td>&gt;0.001 95% Yes</td>
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<table>
<thead>
<tr>
<th>Sample Size</th>
<th>Time-to-Clearance (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 (total)</td>
<td>N/A 10.881 2 &gt;0.001 95% Yes</td>
</tr>
</tbody>
</table>

Comparative Cost Outcomes*

**Pre-implementation**
- **TST alone:**
  - 2011: $7852.70
- **TST (+6 QFTs):**
  - 2012: $7656.74

**Post-implementation**
- **T-SPOT alone:**
  - 2013: $4701.94
  - 40% reduction

Note: Pre-implementation costs based on average cost of a TB screen per employee at the Philadelphia VA Medical Center

*No costs were assumed in any year when new employees arrived with adequate, up-to-date TB screen records

Philadelphia VAMC Outcomes HR Performance Measure 2013

Timely recruiting and hiring within 60 days (Goal = > 80%)

Hospital-wide Results

<table>
<thead>
<tr>
<th>IGRA Testing Results, Occupational Health</th>
<th>3-12-2013 to 9-25-2013</th>
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<tbody>
<tr>
<td>Negative</td>
<td>727</td>
</tr>
<tr>
<td>Positive</td>
<td>32</td>
</tr>
<tr>
<td>Borderline</td>
<td>14</td>
</tr>
<tr>
<td>Invalid</td>
<td>4</td>
</tr>
<tr>
<td>Canceled</td>
<td>5</td>
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<tr>
<td>Comment</td>
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<tr>
<td>Total</td>
<td>783</td>
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</tbody>
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Barriers, Facilitators, and Acknowledgments

Barriers
- Resistance to phlebotomy
- Schedule conflicts
- Funding (resolved)
- Administrative issues
- Changes in personnel, staffing levels/mix
- Different practice patterns
- Equipment needs (7 mL green-top tubes)

Facilitators
- Business plan
- National and local support
- Strong coalition with lab
- Knowledgeable OH staff
- "One-click" order entry
- PPD shortage
- Web portal
- Results available in 36–48 hours

Limitations of Project
- Reviewed; deemed QA by IRR – not research
- Not focused exclusively on IGRA vs TST
- Time-to-clearance assumed a "proxy" for duration of TB screening process (not an ideal measure)
- Confounded by workflow/staff and patient issues
- No blinding, random assignment or matched controls
- Changes in office procedures/policies
- Increase in lab workload not measured
- Time too short to evaluate intra-subject variation

Recommendations/Next Steps
- Continue and expand use of an IGRA
- Electronic transmission of clearances
- Cross-training of staff to decrease delays due to vacations/holidays
- Chart completion timelines monitoring
- Development of evidence-based guidelines for IGRA use
- IGRA screening rolled out for veterans 7/13

References


