Unencumbered by conflicts of interest

Ziad Peerwani, MD

- Independent practicing pathologist, group receives medical director payments from BHCS

- No financial interest in the equipment or product manufacturers mentioned in this presentation

Ernest Franklin, MD

- Wholly employed by BHCS

- No financial interest in the equipment or product manufacturers mentioned in this presentation
Agenda for today’s discussion

1. Share our market context, performance awareness, and recognition of the problem

2. Discuss how lean improved our service levels, cost position, and workplace culture in the hematology laboratory

3. Share how pulling the clinical utilization lever reduced laboratory demand in the hematology laboratory
Baylor Health Care System originated with the formation in 1903 of the Texas Baptist Memorial Sanitarium.

Baylor Health Care System and Baylor University Medical Center were incorporated, and the System was formally established in 1981.

Founded as a Christian ministry of healing, Baylor Health Care System exists to serve all people through exemplary health care, education, research and community service.
With 350 access points, BHCS has the geographic concentration to provide longitudinal care in a population health era

**Utilization**
- 409,375 ED visits
- 122,007 admissions
- 625,000 CBCs per year

**Facilities**
- 31 Owned/Operated/Ventured/Affiliated Hospitals
- 28 Ambulatory Surgery Centers
- 83 Satellite Outpatient Clinics (Imaging/Pain/Rehabilitation)
- 193 HealthTexas locations with over 600 physicians
- 1 free-standing Emergency Medical Center
Sequentially address levers to improve hematology turnaround times and demand management for the next 40 minutes

How can we improve our service levels?

How can we improve our accuracy of results?

Can we reduce our turnaround times?

Can we improve pre-analytic processes?

Can we improve our analytic processes?

Can we reduce processing errors?

Can we shift to a culture of speed and accuracy?

Can we decrease the cost of reagents?

Can we decrease our depreciation?

Can we lower our labor costs?

Can we change instrument platform?

Should we change the LIS reports?

Can we improve our service levels?

Can we reduce our turnaround times?

...at the same demand volume?

...at a lower demand volume?

Can we change our automated flagging?

Can we standardize tech-driven diffs?

Can we decrease the cost from $15.66M per year?
Agenda for today’s discussion

1. Share our market context, performance awareness, and recognition of the problem

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3. Share how pulling the clinical utilization lever reduced laboratory demand in the hematology laboratory
Baylor University Medical Center’s hematology lab has simultaneously improved service levels while reducing labor cost

Reduce turnaround time (TAT) by one hour (45%)

Median TAT, received to verify minutes

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>170</td>
<td>97</td>
<td>93</td>
</tr>
</tbody>
</table>

-45%

Source: Soft LIS

Nearly eliminated calls from impatient nurses and physicians

Complaint calls per day

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4-5</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Drs. Krause and Gill

Reduced labor expense in Hematology lab $490K through attrition

SWB expense $, annualized

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.34M</td>
<td>1.04M</td>
<td>0.85M</td>
</tr>
</tbody>
</table>

-46%

1. Reduced one manager and four medical technologists

Source: BUMC
After showing no performance improvement after our $200K investment in a new analyzer, we decided things had to change in our largest hematology lab in the system

Installed $200K automated hematology analyzer

- Automated production line
- Two automated analyzers
- Automated slide producer

BUMC did not capture the productivity gains that other labs with similar equipment did

Comparison of CBC turnaround times, 2011
Minutes from received in lab to verify, comparator facilities include MDACC, Mayo Clinic, Cleveland Clinic, and Johns Hopkins

<table>
<thead>
<tr>
<th>Lab</th>
<th>CBCs</th>
<th>Lab A</th>
<th>Lab B</th>
<th>Lab C</th>
<th>Lab D</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUMC all</td>
<td>401</td>
<td>1700</td>
<td>805</td>
<td>1358</td>
<td>1488</td>
</tr>
</tbody>
</table>

Source: Sysmex
Must focus on all three components of the change management framework to drive lasting and self-renewing change.

Change organizations by...

- Installing processes to manage operating system
  - Create performance metrics
  - Assign accountability for metrics and performance
  - Set clear expectations for performance
  - Align with goals

- Optimizing processes and resources
  - Eliminate waste
  - Design workflow from end-to-end
  - Focus on value levers
  - Reduce process variability

- Surface and address the mindsets that drive behaviors
  - Diagnose the deeply held beliefs and mindsets driving counterproductive behavior
  - Address core beliefs with demonstrable action

Source: McKinsey and Company
### Change Element: Operating System (OS)

<table>
<thead>
<tr>
<th>Manifestation/root cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Bottlenecked automated lines of specimens caused by <strong>running two instruments manually</strong></td>
<td>1. Change to <strong>parallel processing</strong>, 5S workspace, process and role redesign</td>
</tr>
<tr>
<td>2. <strong>Supply/demand mismatch</strong> for labor and work, within a shift and between shifts (e.g., deep nights and days)</td>
<td>2. Implement <strong>nearly continuous flow</strong> with reduced batch delivery size and increase delivery frequency</td>
</tr>
<tr>
<td>3. 6% bar code reading error and 3% stainer tube clamp failure rate due to <strong>poor quality specimen labeling upstream at patient draw</strong></td>
<td>3. <strong>Upstream process control</strong> by fixing phlebotomy label printing and label placement errors</td>
</tr>
<tr>
<td>4. Label film breakage causing 20 minute delays</td>
<td>4. Adjust tension on label film spool</td>
</tr>
<tr>
<td>5. Overwork waste in specimen sorting area</td>
<td>5. Eliminate “priority floors”; <strong>FIFO only</strong></td>
</tr>
</tbody>
</table>

### Change Element: Management Infrastructure (MI)

<table>
<thead>
<tr>
<th>Manifestation/root cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Operational changes driven by loudest complainer and <strong>not a fact base</strong></td>
<td>1. Measured hemogram, CBC, CBC with manual differential <strong>TAT, daily</strong></td>
</tr>
<tr>
<td>2. <strong>Unaware of performance trends</strong></td>
<td>2. Posted TAT results, <strong>daily</strong></td>
</tr>
<tr>
<td>3. <strong>Lack of objective data</strong> to remove anecdote-based discussions</td>
<td>3. Huddled TAT results, <strong>daily</strong> to discuss performance; meet <strong>weekly with senior system leadership to review performance</strong></td>
</tr>
<tr>
<td>4. Collectively owned and ignored performance goals</td>
<td>4. Vested <strong>accountability with supervisors</strong></td>
</tr>
</tbody>
</table>

### Change Element: Mindsets, behaviors, and capabilities (MB/C)

<table>
<thead>
<tr>
<th>Manifestation/root cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Mindset of fear and deference</strong> to hierarchy</td>
<td>1. Empowered frontline decision making, changed leadership</td>
</tr>
<tr>
<td>2. Disbelief in other systems’ performance metrics</td>
<td>2. Continued discussion and then celebration of small wins</td>
</tr>
<tr>
<td>3. Long downtimes due to skill gaps in computer or machine troubleshooting and correction</td>
<td>3. Invested in increased training for shift supervisors and managers</td>
</tr>
</tbody>
</table>
Operating system: Looked upstream to find and address root causes of hematology automation failure

Root causes of 6% barcode reader error and 3% tube clamp error:

- Soft ID phlebotomy handheld devices were not printing labels distinctly enough for the bar code reader to log the specimen
- Phlebotomists were not seating the label exactly longitudinally and snug with the cap on the tube, leaving adhesive label exposed that would stick to the tube clamp and cause a failure to release the tube

Solutions:

- Saved all rejected tubes to examine the label for common problems
- Traced this back to a few phlebotomists, but phlebotomists with problem specimens changed each day
- Problem labels came from the same printer but not the same phlebotomist
- Cleaned printer head and increased darkness of label printed
- Problem ceased

- Noticed tube clamp errors occurred on tubes with overhanging label
- Did not occur when Soft label was longitudinal to the tube and seated right below the cap
- Recognized that immutable Soft label had a 1-2mm tolerance before error
- Brought phlebotomists to hematology lab to witness the impact one misplace label had on production
- Retrained phlebotomists; problem ceased
Operating system: Eliminate “overwork” waste at the front of the process that also reinforces the mindset of “we’re slow”

- When TAT was 170 minutes, it was important for special floors to receive results quickly

- Created “overwork” waste each morning rush as one med tech would sort the tubes in the pre-automation table

- Removing this paper to your left from the machine acknowledged:
  - **We are fast enough** to not need this compensating mechanism in the queue
  - **Staff should work at the top of their capabilities**
  - **Cause for celebration** when none of the previous “priority floors” complained when we moved to a FIFO model
Management infrastructure: Standardized performance metric definitions and post performance daily for frontline huddles

Daily metrics drive frontline problem solving
• Democratizes change and pushes empowerment thinking to the frontline
• Four part process:
  • “How we did yesterday”
  • “What worked, what did not?”
  • Pause for answers and discussion
  • Unite on the one change to make today

Weekly metrics allow for trending and goal assignment
• Senior lab leaders review metrics with staff every two weeks
• Manager receives annual goal for this metric
• Proves to other labs that sustainable change is possible
Mindsets, behaviors, and capabilities: Locking in self-renewing change required surfacing the mindsets that prevented staff from believing that they could change their work environment.

**Definitions**

**Behavior** is, like the tip of the iceberg, what we see and is the manifestation of the underlying **mindset**.

**Thinking and feeling**

The **mindset** is the set of accumulated beliefs that intertwine to form the belief patterns through which our experiences are filtered and judged.

**2011 observations**

- Resistance, blank looks
- Comments of disbelief
- Saying “yes” but doing “no”
- Fear displeasing manager
- Broken will from workplace intimidation
- “Nothing has ever changed here, look at the ceiling tiles and chairs”
- Enjoyment of being the “neglected child of the hospital”

Source: McKinsey and Company Organizational Practice
Mindsets, behaviors, and capabilities: Used the four part influence model to change mindsets and beliefs in the hematology lab

Role model beliefs and behaviors

- System lab leadership problem solving with team weekly
- Create space for emerging leaders to lead
- Be there at odd hours

Tell the compelling story to “touch” all attitudinal segments

- Segment workforce by assumed belief
- Tell, don’t explain
- Tell the story for why we are doing this four or five ways
- Probe for emotional understanding of what you said

Reward and goal based on clear performance

- Assign goals
- Hold members accountable
- Praise lavishly people who make the shift
- Counsel and exit those who do not

Tell, don’t explain

Role model beliefs and leadership

“… I see my leaders behaving differently”

Understanding and commitment

“… I know what I need to change and I want to do it “

Capability building

“… I have the skills to behave in the new way”

Aligned systems and structure

“… the systems reinforce the desired change “

Source: McKinsey and Company Organizational Practice
Transitioning from acute phase of performance improvement to steady state refinements in process and value capture

Median weekly TAT, CBC with manual differential, received to verify
Minutes, BUMC Hematology lab, Jan 2012 to September 1, 2013

- EHR-LIS go-live
- Stainer automation
- FIFO implemented
- Mature process with lower variation
- Frequent EHR down times

-44%
### Next steps for the BUMC laboratories

| Shift demand complexity down to reduce “overworking” waste | • Implement new hematology flagging parameters in January 2013 to reduce the manual differential rate down from 41%  
  • Complete prospective testing on December 12  
  • Calculate false negative, sensitivity, and specificity rates  
  • Implement facility-specific flagging parameters across BHCS |
| --- | --- |
| Continue cross-training chemistry staff to increase labor flexibility during deep nights | • Allows lab to share staff to match differing peak and trough demand patterns  
  • Started automation cross training in September to advance “core lab” concept with new skill sets |
| Continue monitoring throughput, quality, and staff satisfaction | • Follow data:  
  • Objective data – TAT, error rates in tube clamp and stainers  
  • Subjective data – end user complaints, staff satisfaction |
| Capture performance improvement value through lean in other areas of the lab | • Proliferate lean to the specimen accessioning areas  
  • Continue to improve core chemistry lean processes  
  • Implement Total QC to reduce inefficiencies in non-patient facing work demands |
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Concerning when Baylor’s scan and differential count rate is higher than 75% of the 263 studied institutions

**Rates of manual blood scan in participating institutions**
Rate; n=263 institutions, 95,141 CBCs

BHCS’s average

**Rates of manual differential count in participating institutions**
Rate; n=263 institutions, 95,141 CBCs

BHCS’s average

Literature was less instructive due to wide variety of recommended flagging parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Field</th>
<th>Hur</th>
<th>Hyun</th>
<th>Lantis</th>
<th>Lin</th>
<th>Sachser</th>
<th>Stamminger</th>
<th>Int'l Cons. Group</th>
<th>Sysmex 100 average</th>
<th>Cleveland Clinic</th>
<th>BUMC</th>
<th>More sensitive</th>
<th>Less sensitive</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neut #&lt;</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>1</td>
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<td>1.5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>At Sysmex recommended setting</td>
</tr>
<tr>
<td>Neut %&lt;</td>
<td>–</td>
<td>30</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>20</td>
<td>10</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>Average of all data points; BUMC’s current setting</td>
</tr>
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<td>7.5</td>
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<td>20</td>
<td>15</td>
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<td>20</td>
<td>20</td>
<td>Range between average and Sysmex recommended</td>
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<td>80</td>
<td>–</td>
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<td>80</td>
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<td>–</td>
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<td>–</td>
<td>85</td>
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<td>85</td>
<td>Wide variation, keep BUMC setting</td>
</tr>
<tr>
<td>Lymp#&lt;</td>
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<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0</td>
<td>1</td>
<td>–</td>
<td>0.8</td>
<td>–</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>BUMC is at average, keep BUMC setting</td>
</tr>
<tr>
<td>Lymp%&lt;</td>
<td>–</td>
<td>10</td>
<td>–</td>
<td>–</td>
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<td>7</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>10</td>
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<td>7</td>
<td>This is a strong lever of flags, recommend a wide range</td>
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<td>–</td>
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<td>At Sysmex recommended setting</td>
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<td>15</td>
<td>15</td>
<td>10</td>
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<td>1.99</td>
<td>1.6</td>
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<td>–</td>
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<td>20</td>
<td>Most sources use this value</td>
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<td>Baso#&lt;</td>
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<td>0.2</td>
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<td>4</td>
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<td>–</td>
<td>–</td>
<td>100</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>This setting is a very weak lever, no change between this range</td>
</tr>
<tr>
<td>WBC#&lt;</td>
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<td>4</td>
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<td>–</td>
<td>–</td>
<td>–</td>
<td>2.5</td>
<td>2.01</td>
<td>2.5</td>
<td>2.5</td>
<td>Wide variation &amp; weak lever, use average</td>
</tr>
<tr>
<td>WBC#&gt;</td>
<td>–</td>
<td>–</td>
<td>50</td>
<td>50</td>
<td>25</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>20</td>
<td>19.99</td>
<td>18</td>
<td>20</td>
<td>20</td>
<td>Wide variation &amp; weak lever, use average</td>
</tr>
<tr>
<td>NRBC%&gt;</td>
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<td>3</td>
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<td>–</td>
<td>1</td>
<td>–</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Weak lever, keep BUMC setting</td>
</tr>
<tr>
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<tr>
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<td>2</td>
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<td>2</td>
<td>2</td>
<td>2</td>
<td>Most sources use this value</td>
</tr>
</tbody>
</table>

1 Sysmex advises clients to follow the recommendations of the International Consensus Group
Applied the definitions and settings of the International Consensus Group for Hematology to our patient population to test for safe lowering of scan and differential rates

The International Consensus Group for Hematology Review: Suggested Criteria for Action Following Automated CBC and WBC Differential Analysis

P. W. Barnes,¹ S. L. McFadden,² S. J. Machin,³ E. Simpson⁴

TABLE 2. Truth Table Summary

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>True positive</td>
<td>1483</td>
<td>11.20</td>
</tr>
<tr>
<td>False positive</td>
<td>2476</td>
<td>18.60</td>
</tr>
<tr>
<td>True negative</td>
<td>8953</td>
<td>67.30</td>
</tr>
<tr>
<td>False negative</td>
<td>386</td>
<td>2.90</td>
</tr>
<tr>
<td>Total number of samples</td>
<td>13298</td>
<td></td>
</tr>
</tbody>
</table>

15 Institutions
13,298 Patient Samples
Varied Patient Populations:
- Tertiary care hospitals
- Community hospitals
- Oncology hospitals
- Pediatric hospitals
- Doctors’ offices
Harmonized our criteria for a positive smear with that of the ICG

**International Consensus Group for Hematology Review: Suggested Criteria for Action Following Automated CBC and WBC differential analysis**

<table>
<thead>
<tr>
<th>TABLE 1. Criteria for a Positive Smear</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Morphology</td>
</tr>
<tr>
<td>a. RBC morphology at either 2+/moderate or greater. The only exception is malaria, where any finding will be considered a positive finding.</td>
</tr>
<tr>
<td>b. PLT morphology (giant platelets) at either 2+/moderate or greater.</td>
</tr>
<tr>
<td>c. Platelet clumps at &gt; rare/occasional.</td>
</tr>
<tr>
<td>d. Dohle bodies at either 2+/moderate or greater.</td>
</tr>
<tr>
<td>e. Toxic granulation at either 2+/moderate or greater.</td>
</tr>
<tr>
<td>f. Vacuoles at either 2+/moderate or greater.</td>
</tr>
<tr>
<td>2. Abnormal cell types</td>
</tr>
<tr>
<td>a. Blast ≥1</td>
</tr>
<tr>
<td>b. Meta &gt;2</td>
</tr>
<tr>
<td>c. Myelo/promyelocyte ≥1</td>
</tr>
<tr>
<td>d. Atypical lymphs &gt;5</td>
</tr>
<tr>
<td>e. NRBC ≥1</td>
</tr>
<tr>
<td>f. Plasma cells ≥1</td>
</tr>
</tbody>
</table>
Flagging study accumulated specimens from each type of facility in BHCS to ensure applicability to our portfolio of hospitals’ types of patients

Specimens collected from 6 facilities
Number of samples per facility, n=3,243

Study design

Sample and data collection
- Randomly collected, three times per day
- Automated CBC with diff
- 100 cell manual diff counts

Analysis
- Collected and analyzed in Excel
- Consensus amongst 4 hematopathologists
- Validation of excel model with comparison to Sysmex’s analysis
Adopting the ICG’s criteria is expected to reduce our manual review rate by one-third while preserving the false negative rate under 5%

<table>
<thead>
<tr>
<th>Outcome statistics: baseline vs. ICG criteria application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent; n=3,243 samples</td>
</tr>
</tbody>
</table>

- **Manual review rate**: 72.2% (base) vs. 45.9% (ICG), **-36.4%**
- **Sensitivity rate**: 92.3% (base) vs. 81.6% (ICG)
- **Specificity rate**: 66.4% (base) vs. 34.7% (ICG)
- **False positive rate**: 48.5% (base) vs. 24.9% (ICG)
- **False negative rate**: 2.0% (base) vs. 4.7% (ICG)
- **Clinical positive rate**: 25.7% (base) vs. 25.7% (ICG)
- **PPV**: 32.9% (base) vs. 45.7% (ICG)
- **NPV**: 92.9% (base) vs. 91.2% (ICG)
Validation study accumulated specimens from each type of facility in BHCS but was purposefully agnostic to rates of abnormalities

**Study design**

**Sample and data collection**
- 10 participating sites
- 100 to 200 samples per site, 1,614 total samples
- Half normal and half with specific abnormalities delineated by CLSI
- 200-cell manual differentials by two different individuals

**Analysis**
- Collected and analyzed in Excel
- Consensus amongst 4 hematopathologists
- Validation of excel model with comparison to Sysmex’s analysis

**Specimens collected from 10 facilities**
Number of samples per facility, n=1,614

<table>
<thead>
<tr>
<th>Facility</th>
<th>Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUMC</td>
<td>236</td>
</tr>
<tr>
<td>MCK</td>
<td>228</td>
</tr>
<tr>
<td>BAS</td>
<td>202</td>
</tr>
<tr>
<td>IRV</td>
<td>202</td>
</tr>
<tr>
<td>GAR</td>
<td>185</td>
</tr>
<tr>
<td>GRPL</td>
<td>150</td>
</tr>
<tr>
<td>PLANOCAR</td>
<td>135</td>
</tr>
<tr>
<td>THH</td>
<td>127</td>
</tr>
<tr>
<td>WAX</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>
Adopting the ICG’s criteria was expected to reduce our manual review rate by one-third while preserving the false negative rate under 5%, but did not.

### Outcomes statistics: ICG flagging vs. validation study

Percent; n=1,614 samples

<table>
<thead>
<tr>
<th></th>
<th>ICG</th>
<th>Validation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity rate</td>
<td>81.6</td>
<td>78.2</td>
</tr>
<tr>
<td>Specificity rate</td>
<td>66.4</td>
<td>62.3</td>
</tr>
<tr>
<td>False positive rate</td>
<td>24.9</td>
<td>28.4</td>
</tr>
<tr>
<td>False negative rate</td>
<td>4.7</td>
<td>5.3</td>
</tr>
<tr>
<td>PPV</td>
<td>91.2</td>
<td>89.8</td>
</tr>
<tr>
<td>NPV</td>
<td>45.7</td>
<td>40.2</td>
</tr>
</tbody>
</table>

**Why did our false negative rate increase so much?**
One hospital was the statistical outlier pulling the mean up, and this hospital potentially will require different flagging parameters.

Overall false negative rates with and without The Heart Hospital Baylor Plano (THHBP) included
Percent, n=1,614

Heart hospital with high rate of clinically less significant giant platelets

<table>
<thead>
<tr>
<th>Hospital</th>
<th>With THHBP</th>
<th>Without THHBP</th>
</tr>
</thead>
<tbody>
<tr>
<td>BHCS</td>
<td>5.3</td>
<td>1.3</td>
</tr>
<tr>
<td>THHBP</td>
<td>36.4</td>
<td>0.0</td>
</tr>
<tr>
<td>MCK</td>
<td>5.3</td>
<td>0.0</td>
</tr>
<tr>
<td>BUMC</td>
<td>5.1</td>
<td>1.3</td>
</tr>
<tr>
<td>WAX</td>
<td>4.0</td>
<td>3.1</td>
</tr>
<tr>
<td>IRV</td>
<td>3.5</td>
<td>3.0</td>
</tr>
<tr>
<td>CAR</td>
<td>3.0</td>
<td>2.7</td>
</tr>
<tr>
<td>BAS</td>
<td>2.7</td>
<td>1.3</td>
</tr>
<tr>
<td>GAR</td>
<td>1.3</td>
<td>0.0</td>
</tr>
<tr>
<td>GRP</td>
<td>0.0</td>
<td>3.3</td>
</tr>
<tr>
<td>Plano</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>BHCS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>with THHBP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>without THHBP</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Immediate and sustained decrease in percentage of manual scans at Baylor All Saints Medical Center

Manual review rates per week
Percent of total CBCs, starting on April 21, 2013, n=39,760 CBCs

- Pre-change mean
- Post-change mean

Flagging criteria implemented
P <0.05 by T test
Initial implementation has reduced slide review rates by 27-42% per hospital and may be a significant savings lever.

**Hematology slide review rates**

- **Percent**
  - **Pre**: 45.1
  - **Post**: 32.7
  - **-27%**
  - **Pre**: 36.7
  - **Post**: 21.2
  - **-42%**

**BHCS potential savings model from full implementation of ICG flagging criteria**

- **Total CBCs**: 625,000
- **Man review rate, baseline**: 53%
- **Scan rate, baseline**: 24%
- **Manual diff rate, baseline**: 29%
- **Scan volume, baseline**: 152,375
- **Man diff volume, baseline**: 178,875
- **Man review rate, ICG**: 34.5%
- **Scan volume, ICG**: 99,188
- **Man diff volume, ICG**: 116,438
- **Cost per scan**: $7.79
- **Cost per man diff**: $15.58
- **Potential savings**: $1,387,107
- **Savings if 50% capture rate**: $693,553
Questions