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

3



Share how pulling the clinical utilization lever reduced laboratory demand in the hematology laboratory



Focus of immediate

At 110 years old, Baylor Health Care System retains its mission as a Christian ministry of healing

- 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



...a lower demand

volume?

per year?

Can we lower our labor costs?

Can we change our automated flagging?

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Can we standardize tech-driven diffs?

Agenda for today's discussion





Focus of immediate discussion

Baylor University Medical Center's hematology lab has simultaneously improved service levels while reducing labor cost



7 **BAYLOR**

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



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



... installing processes to manage operating system

- Create performance metrics
- Assign accountability for metrics and performance
- Set clear expectations for performance
- Align with goals

... surface and address the mindsets that drive behaviors

- Diagnose the deeply held beliefs and mindsets driving counterproductive behavior
- Address core beliefs with demonstrable action

Each component of the change model has many causes and solutions

Change element Manifestation /root cause

Solution



Operating system: Looked upstream to find and address root causes of hematology automation failure

Solutions:

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

- 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 preautomation 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

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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	2011 observations					
Behavior is, like the tip of the iceberg, what we see and is the manifestation of the underlying mindset	 Resistance, blank looks Comments of disbelief Saying "yes" but doing "no" 					
Thinking and feeling	Fear displeasing manager					
The mindset is the set of accumulated beliefs that intertwine to form the belief patterns through which our experiences are filtered	 Broken will from workplace intimidation "Nothing has ever changed here, look at the ceiling tiles and chairs" Enjoyment of being the "poglected shild of the 					

hospital"



MB &C

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 Segment workforce by problem solving with team assumed belief • Tell, don't explain weekly "... I know what "... I see my leaders Create space for Tell the story for why we I need to behaving differently" emerging leaders to lead are doing this four or five change and Be there at odd hours ways I want to do it Probe for emotional understanding of what vou said **Reward and goal** Teach and train for based on clear the new role Capability building performance Teach new computer and Assign goals "... I have the stainer ... the systems Hold members skills to behave reinforce the Train on slide maker accountable in the new way" desired change Praise lavishly people operations who make the shift Counsel and exit those who do not



Tell the compelling story to "touch" all

attitudinal segments

Transitioning from acute phase of performance improvement to steady state refinements in process and value capture



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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



Agenda for today's discussion





Focus of immediate discussion

Concerning when Baylor's scan and differential count rate is higher than 75% of the 263 studied institutions¹





1. Arch Pathol Lab Med – Vol. 130, May 2006



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

Our recommended settings

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Parameter	Field	Hur	Hyun	Lantis	Lin	Sachse	Stam- minger	Int' I Cons. Group¹	Sysmex 100 average	Cleve- land Clinic	BUMC	More sen- sitive	Less sen- sitive	Rationale
Neut #<	_	-	_	_	1	1.5	_	1	1.5	-	1	1	1	At Sysmex recommended setting
Neut %<	-	30	-	-	20	10	-	-	-	-	20	20	20	Average of all data points; BUMC's current setting
Neut#>	-	-	7.5	_	18	9	-	20	15	-	12	15	20	Range between average and Sysmex recommended
Neut%>	-	85.5	80	-	95	80	80	-	-	_	85	85	85	Wide variation, keep BUMC setting
Lymp#<	-	-	-	-	0	1	-	-	0.8	-	0.8	0.8	0.8	BUMC is at average, keep BUMC setting
Lymph%<	-	10	-	-	0	7	-	-	-	-	10	10	7	This is a strong lever of flags, recommend a wide range
Lymp#>	-	-	6	8	4	3.5	-	5	5	4.99	4.8	5	5	At Sysmex recommended setting
Lymph%>	-	70	60	-	60	50	-	-	-	100	60	60	60	Most sources use this value
Mono#>	-	-	1	2	1	0.8	-	1.5	1.5	1.69	1.2	1.5	1.5	At Sysmex recommended setting
Mono%>	-	15.5	15	-	15	10	-	-	-	100	15	15	15	Most sources use this value
Eos#>	-	-	1	1.5	0.7	0.5	-	2	2	1.99	1.6	2	2	At Sysmex recommended setting
Eos%>	-	20	15	-	20	7	-	-	-	100	20	20	20	Most sources use this value
Baso#>	-	-	0.3	-	0.2	-	-	0.5	0.5	0.2	0.2	0.5	0.5	At Sysmex recommended setting
Baso%>	-	2	4	-	5	-	-	-	-	100	3	3	5	This setting is a very weak lever, no change between this range
WBC#<	-	-	4	1	2	-	-	-	2.5	2.01	3	2.5	2.5	Wide variation & weak lever, use average
WBC#>	-	-	50	50	25	-	-	-	20	19.99	18	20	25	Wide variation & weak lever, use average
NRBC%>	-	2	3	-	2	2	-	-	1	-	1	1	1	Weak lever, keep BUMC setting
IG#>	0.5	-	_	_	_	0.1	_	_	_	0.1	0.5	0.5	0.5	Limited sources, keep BUMC setting
IG%>	5	_	_	_	_	2	2	_	2	100	1	2	2	Most sources use this value

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. Simson⁴

	IABLE 2. Truth Table Summary		
15 Institutions13,298 Patient Samples		Number	%
 Varied Patient 	True positive	1483	11.20
Populations:	False positive	2476	18.60
 Tertiary care hospitals 	True negative	8953	67.30
 Community hospitals 	False negative	386	2.90
 Oncology hospitals Pediatric hospitals Doctors' offices 	Total number of samples	13298	



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 1. Criteria for a Positive Smear

- I. Morphology
 - a. RBC morphology at either 2+/moderate or greater. The only exception is malaria, where any finding will be considered a positive finding.
 - b. PLT morphology (giant platelets) at either 2+/moderate or greater.
 - c. Platelet clumps at > rare/occasional.
 - d. Dohle bodies at either 2+/moderate or greater.
 - e. Toxic granulation at either 2+/moderate or greater.
 - f. Vacuoles at either 2+/moderate or greater.
- 2. Abnormal cell types
 - a. Blast ≥1
 - b. Meta >2
 - c. Myelo/promyelocyte ≥1
 - d. Atypical lymphs >5
 - e.NRBC ≥I
 - f. Plasma cells ≥I

Flagging study accumulated specimens from each type of facility in BHCS to ensure applicability to our portfolio of hospitals' types of patients





Adopting the ICG's criteria is expected to reduce our manual review rate by one-third while preserving the false negative rate under 5%





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





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



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One hospitals was the statistical outlier pulling the mean up, and this hospital potentially will require different flagging parameters





Immediate and sustained decrease in percentage of manual scans at Baylor All Saints Medical Center





Initial implementation has reduced slide review rates by 27-42% per hospital and may be a significant savings lever





Questions

