Lab Quality Confab 2017

Laboratory Value Pyramid as the Essential Blueprint for Volume-to-Value Journey

Denise Uettwiller-Geiger Ph.D., DLM(ASCP)
Clinical Chemist and Director of Clinical Trials
John T. Mather Memorial Hospital
Port Jefferson, New York 11777
October 24, 2017

Presentation Objectives

- Examine the value of laboratory information
- Describe how the Laboratory Value Pyramid (LVP) provides an essential and strategic roadmap for making the transition from volume to value
- Discuss how leveraging technology can improve quality and enhance clinical effectiveness for high value patient outcomes
- Measure the direct impact of laboratory test results on organizational performance
- Describe how the Laboratory can contribute to performance driven healthcare

John T Mather Hospital

Our Mission is to be the Best Community Hospital in New York State

- 248 Bed Community Hospital established in 1929
- Located North Shore on Long Island in Suffolk County
- Continually changing to meet the needs of the community
- Magnet Status
- U.S. News & World Report's Best Hospital 2016 Rankings

  Ranked #19 in New York State
- Patient Safety Score "A" from Leapfrog Group, 9 consecutive quarters
- Four Stars from CMS, Aug 2016, the highest on Long Island

John T Mather Laboratory

Who Are We?

- JCAHO Accredited
- JCAHO Gold Seal
- 2.4 million tests/year
- Automated Lab since 2001
- 1800 sq. feet of space
- 72 FTEs
- HR Cost- 33%
- Average TAT- <30 minutes

The Value of Laboratory Information

Laboratory Diagnostics Information…

The Case for Investment

- Medical risk and quality management
- Improves medical decision-making
- Changes the course of disease
- Reduces the burden of disease

Total Healthcare Spending:

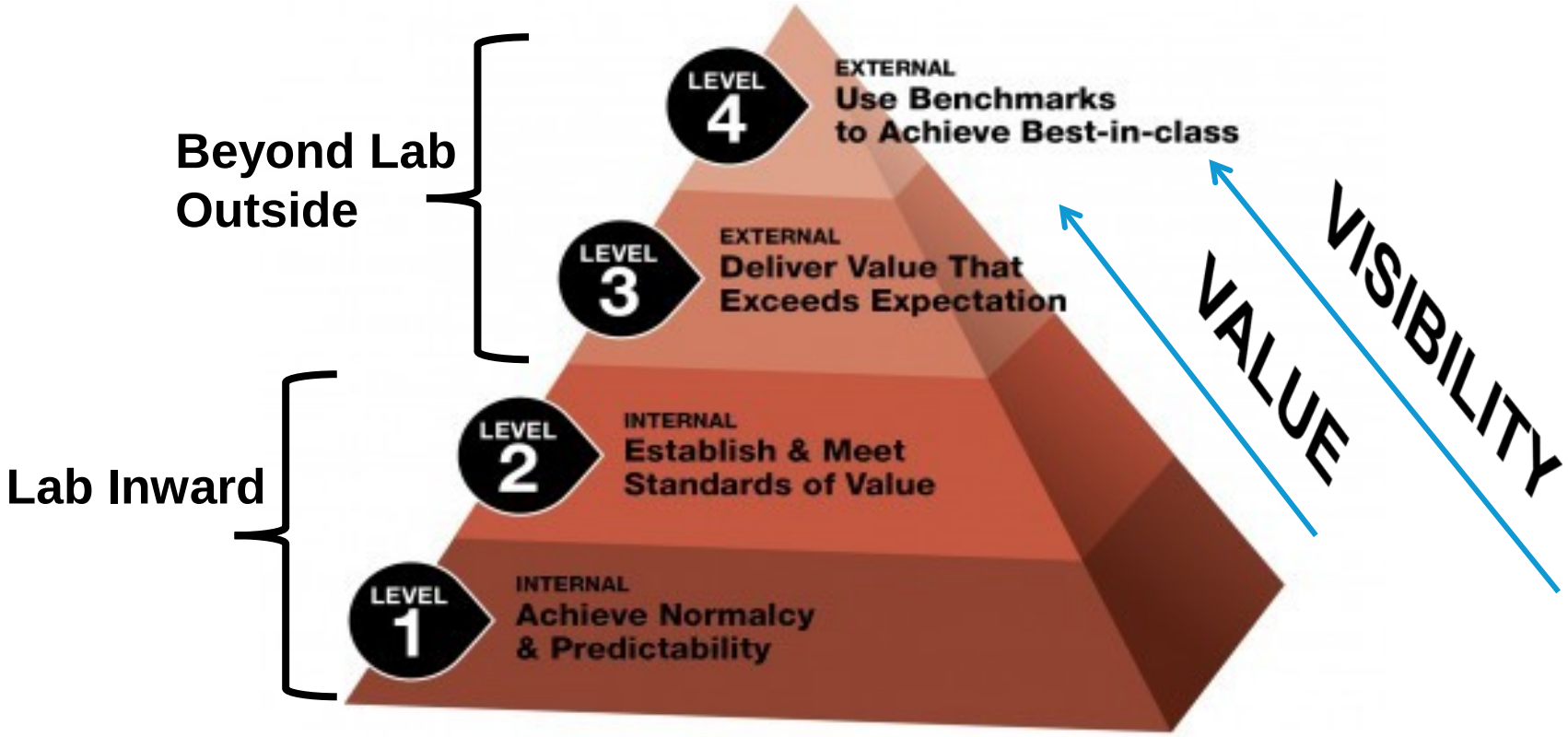
$3.40 trillion in 2016 or $10,345 per person
$3.20 trillion in 2015 or $ 9,990 per person
$2.60 trillion in 2010 or $ 8,686 per person
$2.00 trillion in 2005 or $ 6,697 per person

Source: CMS.gov

The Case for Investment

Labs are only 3% of

Laboratory Value Pyramid



Source: Ellis J, Michel RL. The Laboratory Value Pyramid. Published as a 4-part series in *The Dark Report*: Sept. 22, 2014; Nov. 24, 2014; Feb. 17, 2015; March 30, 2015.

Laboratory Value Pyramid

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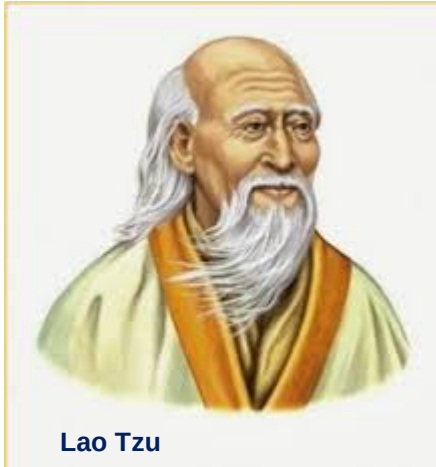
A thousand mile journey begins with a single step



Lao Tzu

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Provides the organization with direction for the future and brings the promise of a better future.

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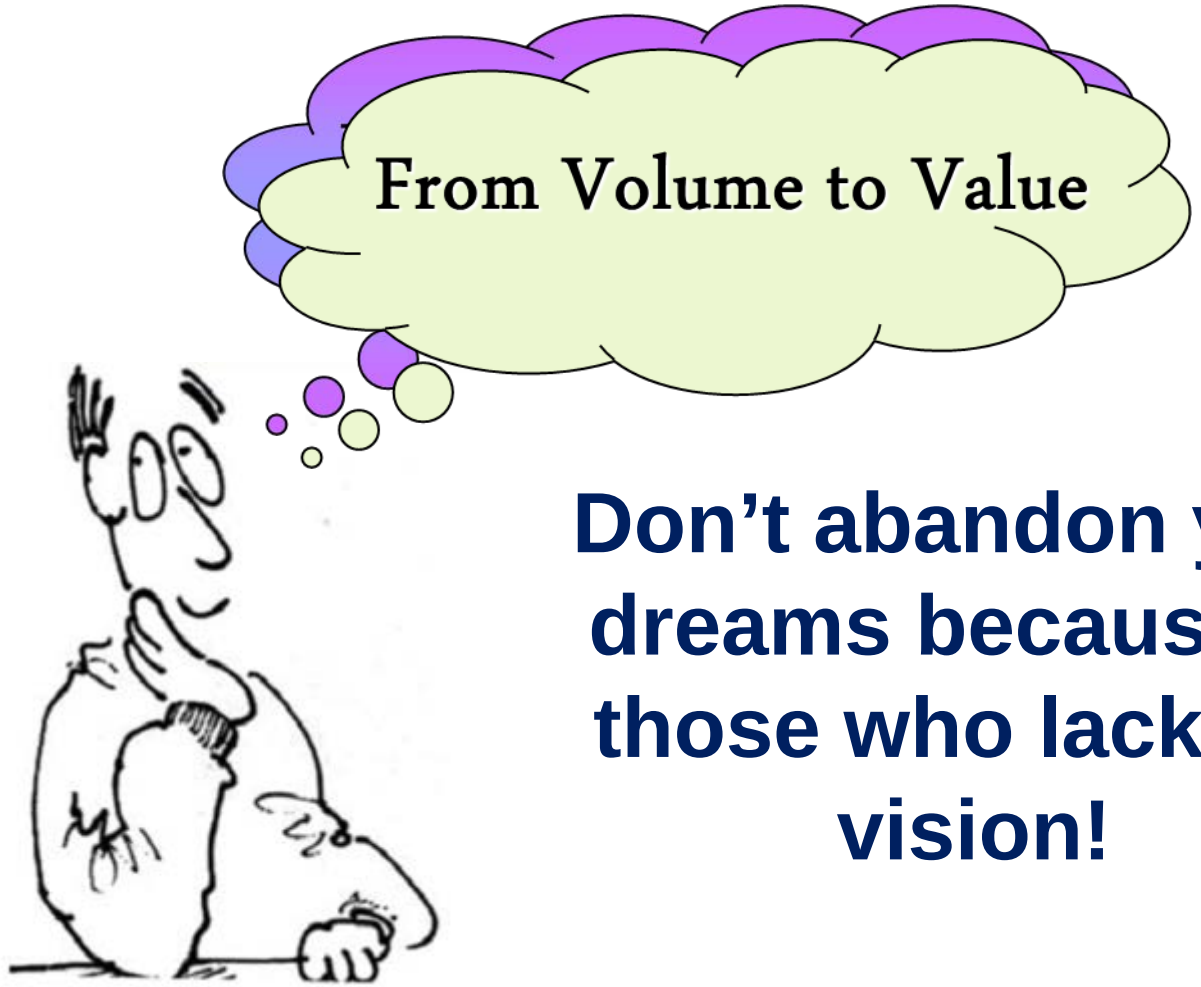
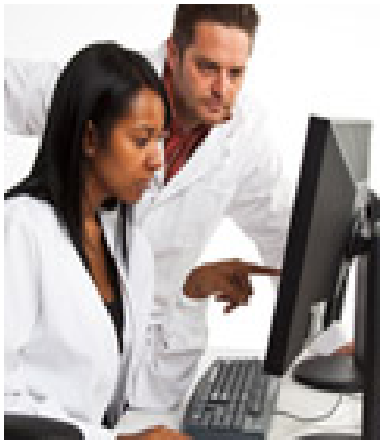


Don’t abandon your dreams because of those who lack the vision!

Key Questions to Consider When Ordering a Test



Is the test meaningful?

Does the test enhance decision making?

Is this an appropriate order or not?

Is the test highly useful or not?

Will the test change patient management ?

Patient outcomes are improved when the correct test is ordered

Adding Value with Lab Tests

- **Goal is to improve patient outcomes while reducing the cost per episode of care**
- **Lab can spend a bit more money, but contribute to millions in cost savings**

Process Modification

Define	Measure	Analyze	Improve	Control
Project	Map process	Sources of variation	Map future	Quality control
Business case	Measure waste	Sources of waste	Plan improvements	Speed control
Objective	Measure variation	Sources of Overburden	Apply Improvements	Sharing of Knowledge
Team	Measure performance	Root causes	Evaluate impact	Standarize
Process	Measurement system	Bottlenecks	Document changes	

Does Your Process Leave Your Staff Tired?

Let’s Take a Look at

Mather’s Journey……..

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Laboratory Value Pyramid
Level 1 and 2
Laboratory Based Initiatives

Strategic Plan for Laboratory

- Maintain or Improve Quality Levels
- Free Up Valuable Time and Resources
  - Identify biggest productivity barriers
  - Streamline process
  - Eliminate duplicate efforts
  - Create a proactive vs. reactive culture
- Leverage Critical Intelligence to Drive Decisions
  - Rapid TAT
- Create Real Time Knowledge for better patient outcomes
- Assure patient safety with patient centric approaches

What Level of Automation/Technology Do We Need?

Key Questions

- How can Laboratory resources, skills, core competency, and automation/technology support the organization's strategic plan, vision, and priorities?
- How will automation/technology fulfill our mission and vision of moving forward?
- How will advantages be created by implementing automation/technology?
- Will automation/technology strengthen the Hospital and the Laboratory’s overall competitive position?

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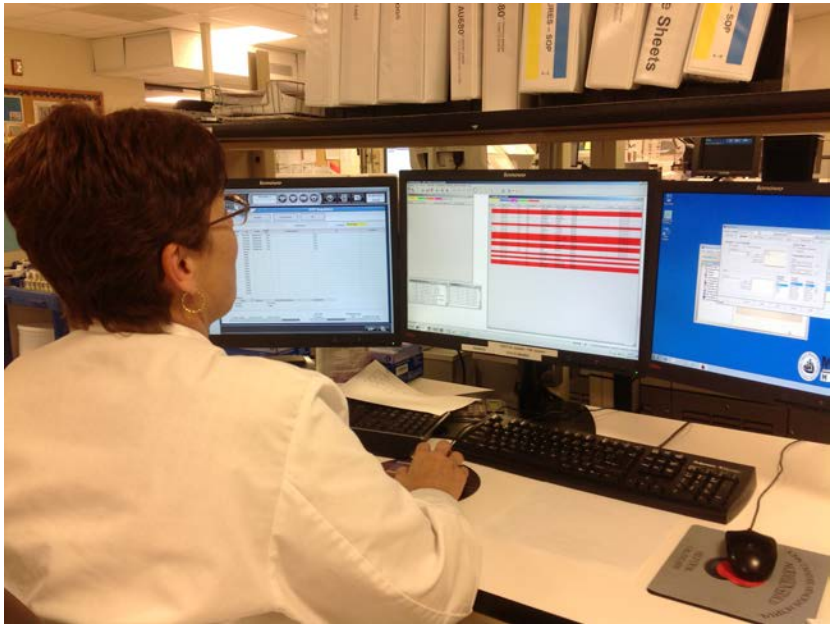
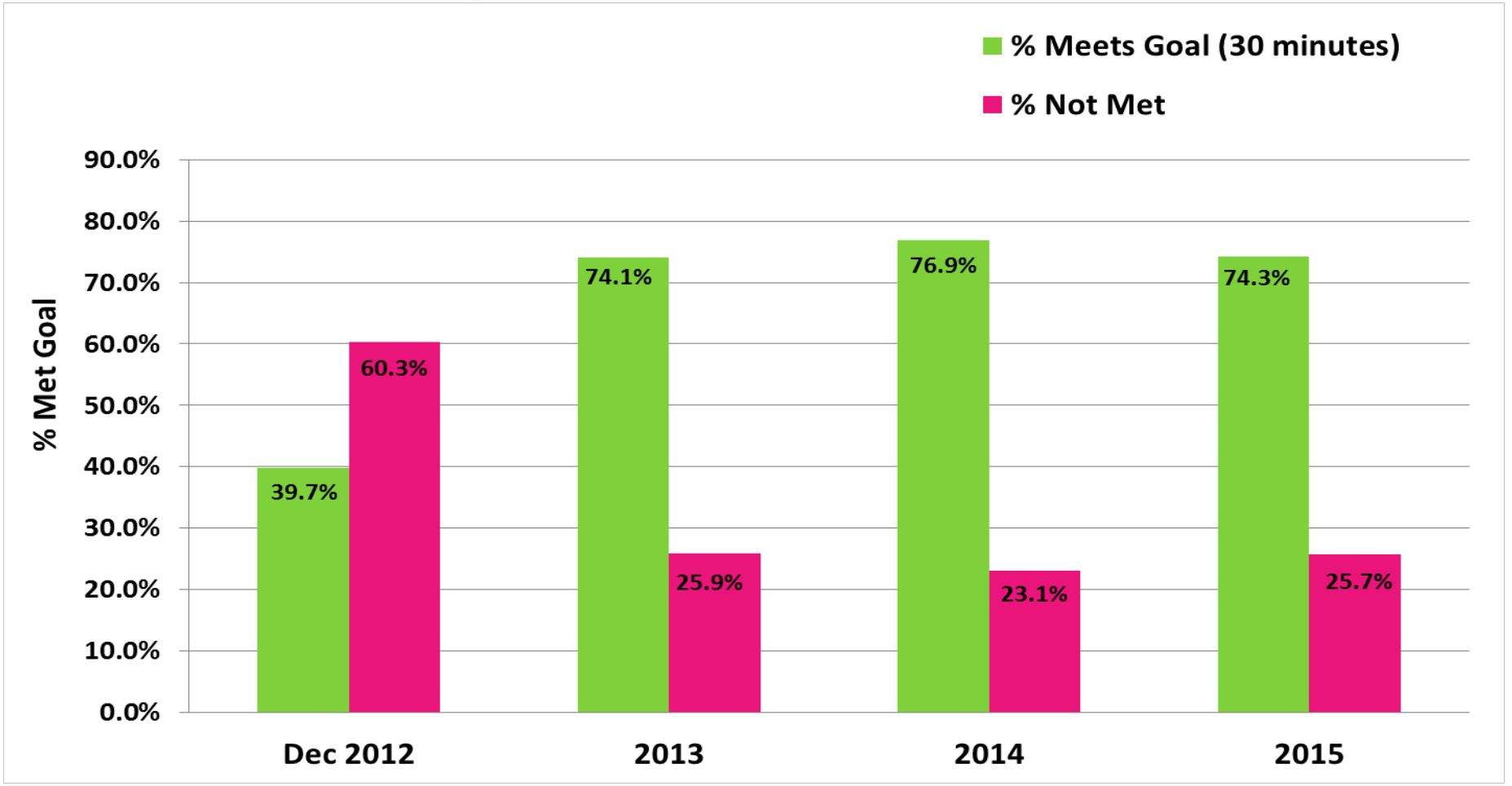
Automation and Auto-validation



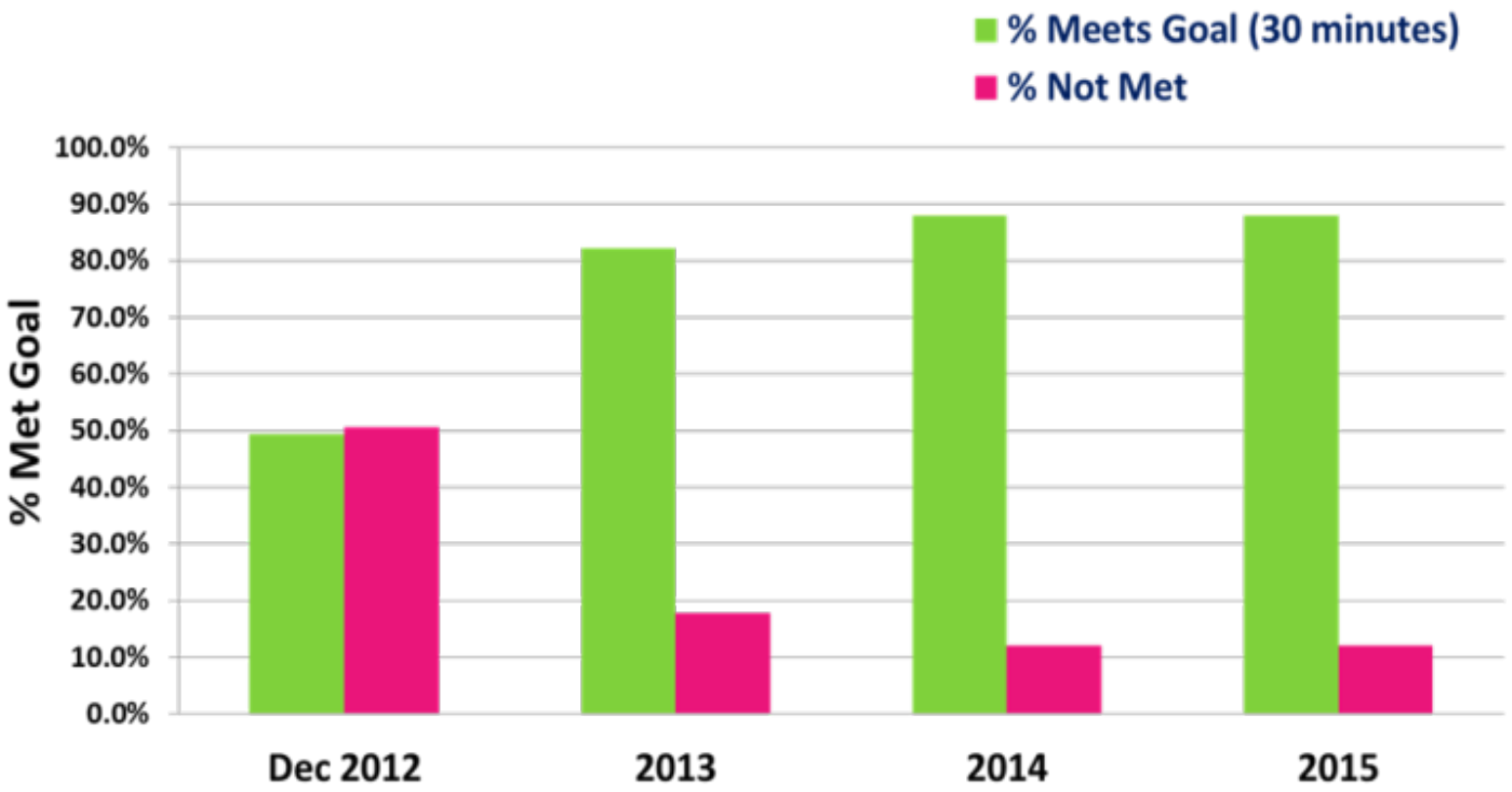
Basic Metabolic Panel

Receipt to Release TAT - ED



ED Lactate

Receipt to Release TAT



Urinalysis

- **Valuable Tool**
- **To diagnosis and monitor renal and urinary tract illnesses**

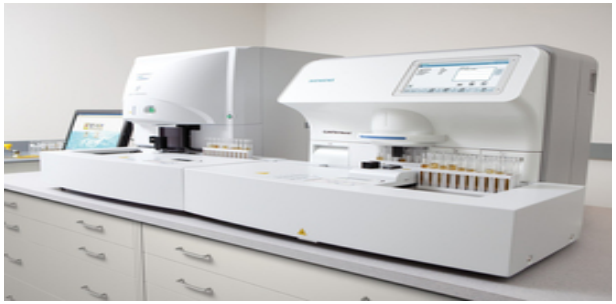
Traditional Urinalysis

- **Macroscopic Physical examination**
  - **Observation of the color, odor, turbidity**
  - **Determination of pH and specific gravity**
- **Chemical tests**
  - **Performed to detect glucose, ketone bodies, protein, bilirubin and nitrate**
- **Microscopic sediment analysis**
  - **RBC, WBC, Crystals, Casts**

Instrument Technology

Innovative Technology

- **Types of technology**
  - **Fluorescent flow cytometry**
  - **Digital flow imaging (Auto-Particle Recognition)**



Process Optimization

Define

- Automate manual process for urinalysis
- Reduce subjectivity and review rates

Measure

- Create workflow map of current process
- Improve current Turnaround time
- Review UTI rates

Analyze

- Identify bottlenecks/barriers
- Reduce errors

Improve

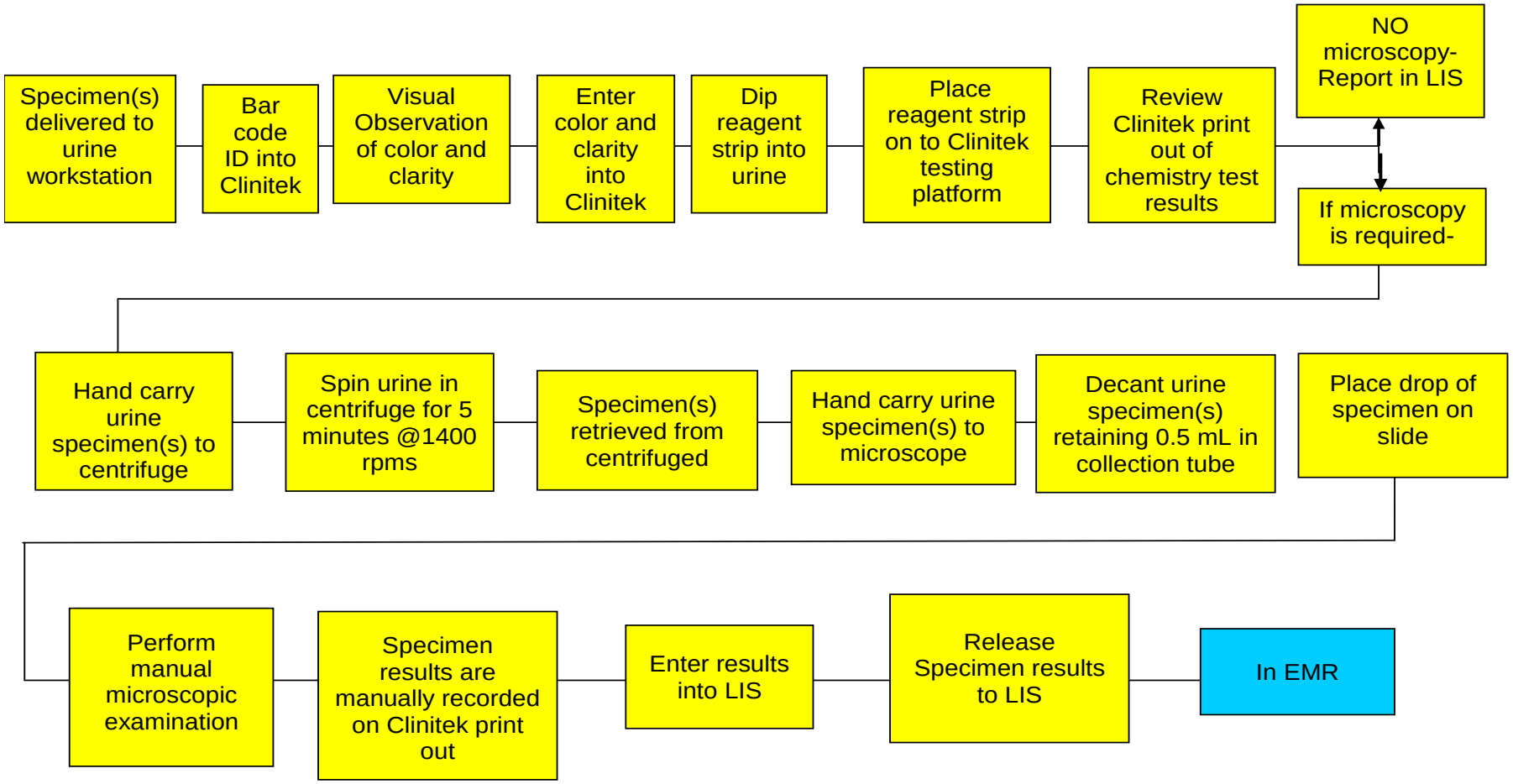
- Quality
- Reduce subjectivity
- Reduce unnecessary testing

Control

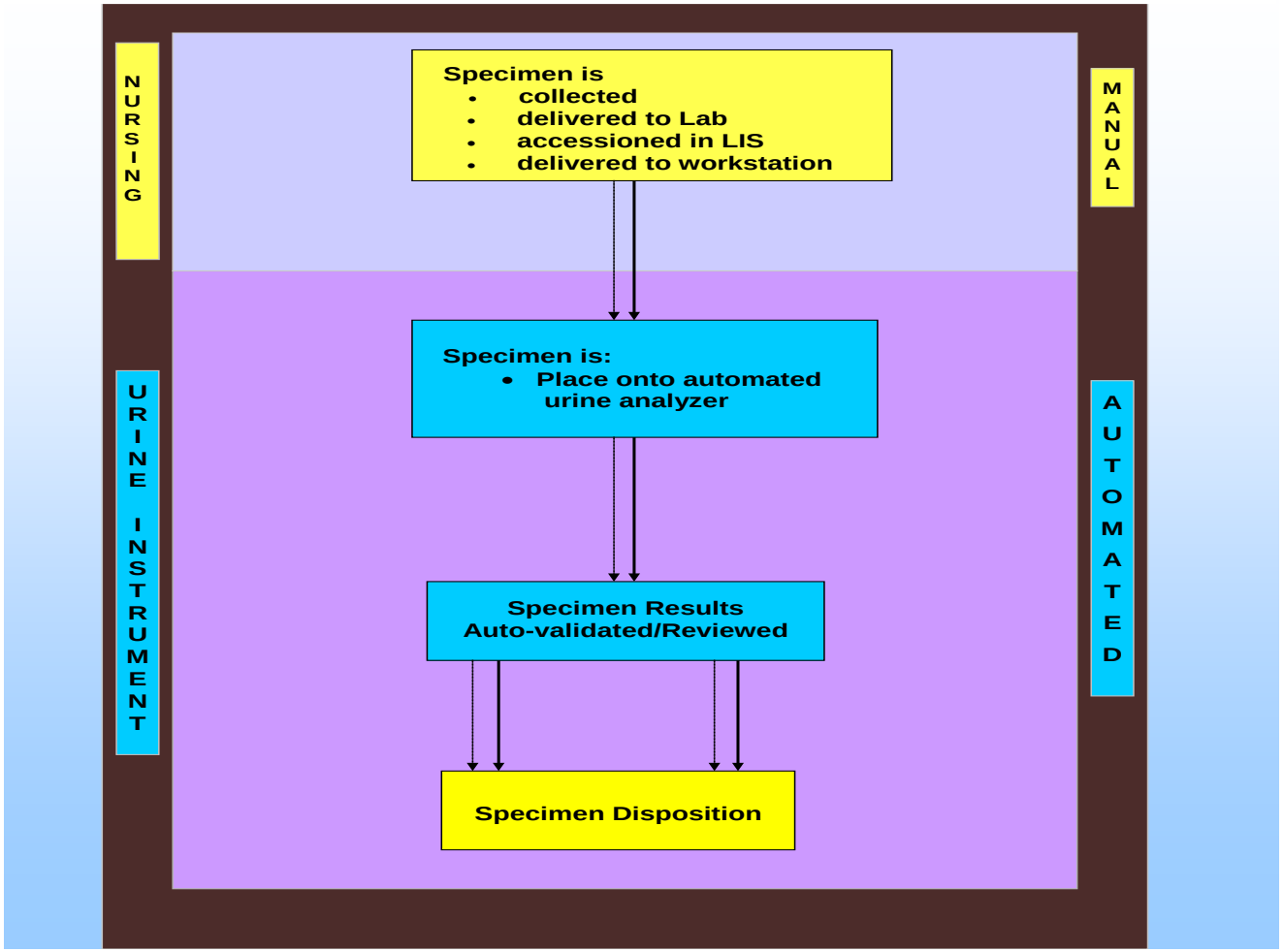
- Costs
- Process

Urine Specimen Processing

Prior to Automated Analyzer



Flow Chart for Automated Urinalysis

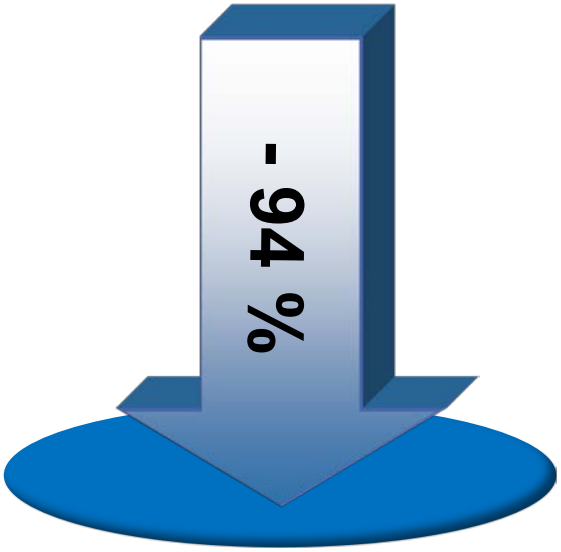


Process Modification Improvement

- **Process modification improvement by leveraging automated technology**

Decrease in Process Steps For Urine Chem Only

Decrease in Process Steps for Both Chem and Micro Urines

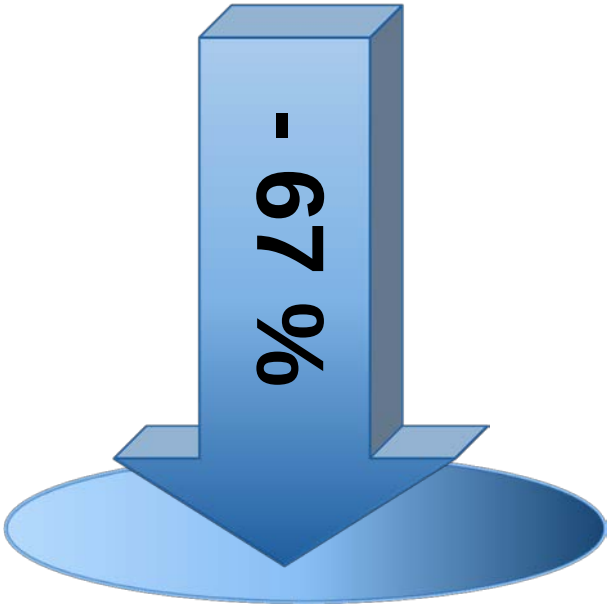


Source: Mather Quality Data

Clinical Impact

- Implementation of Rules Based Middleware
- Rapid Reporting of Actionable Information

Decreased TAT



Automated Urinalysis

Source: Mather Quality Data

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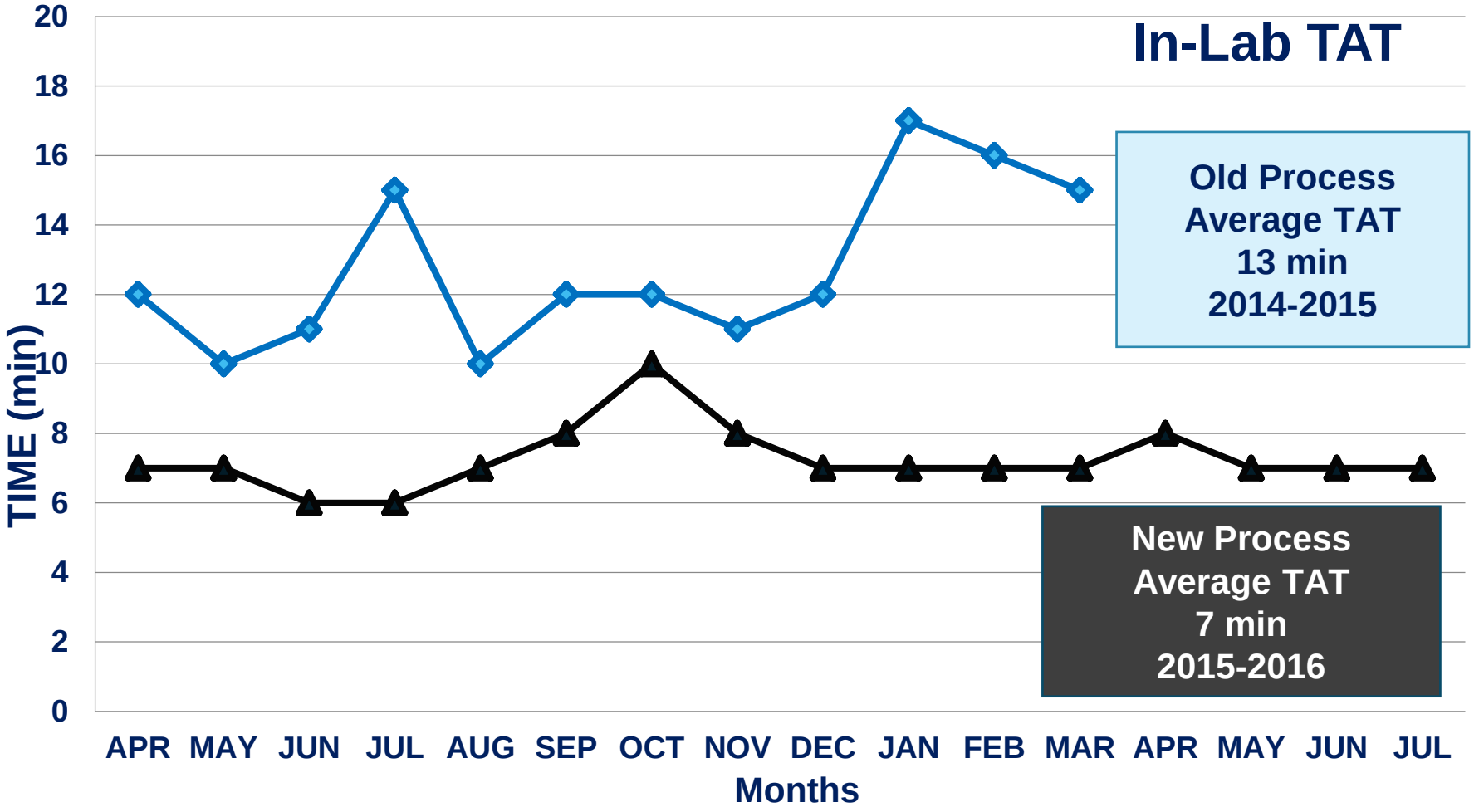
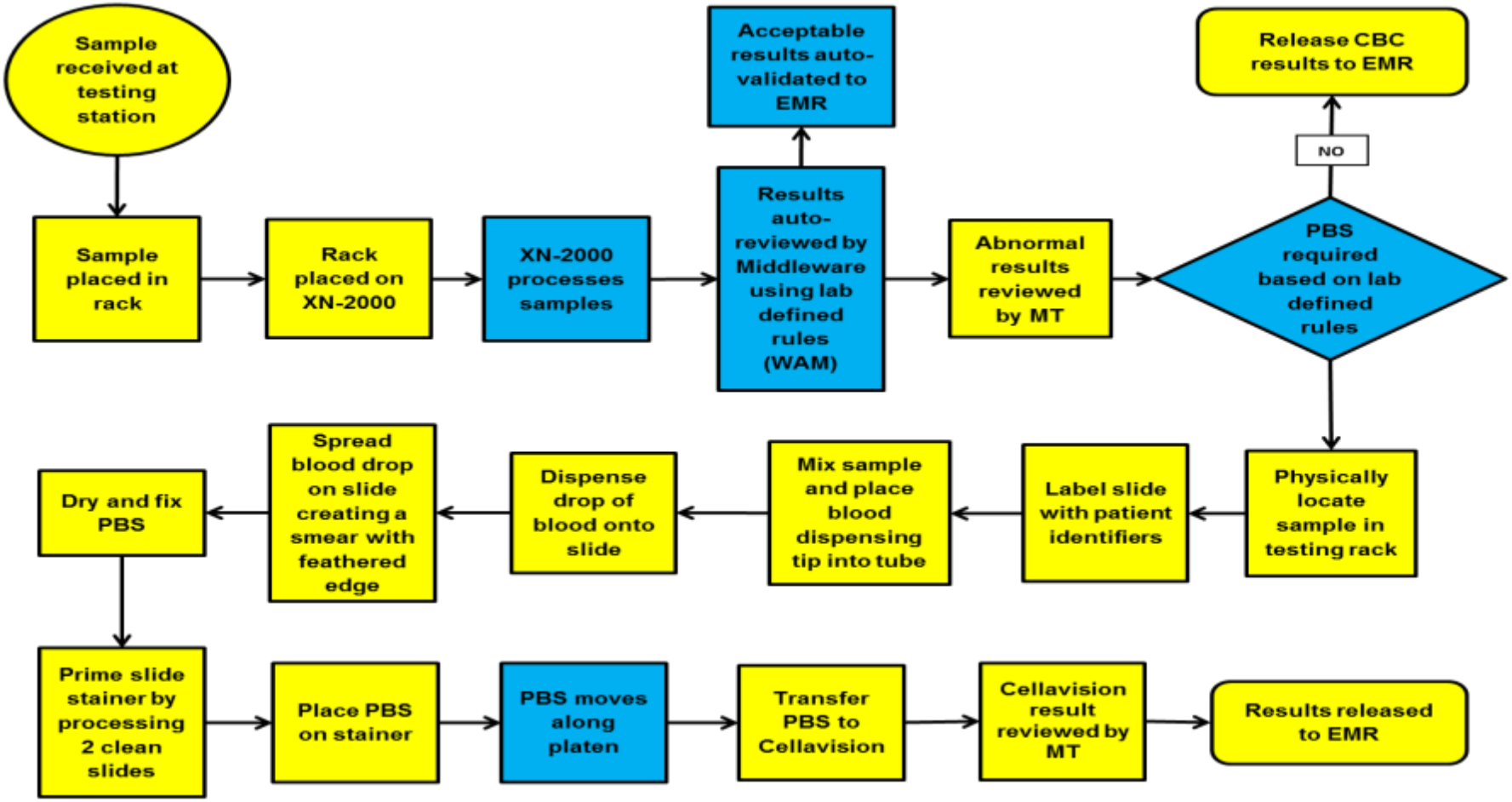
Integration of Slidemaker and Stainer into Hematology Analyzer

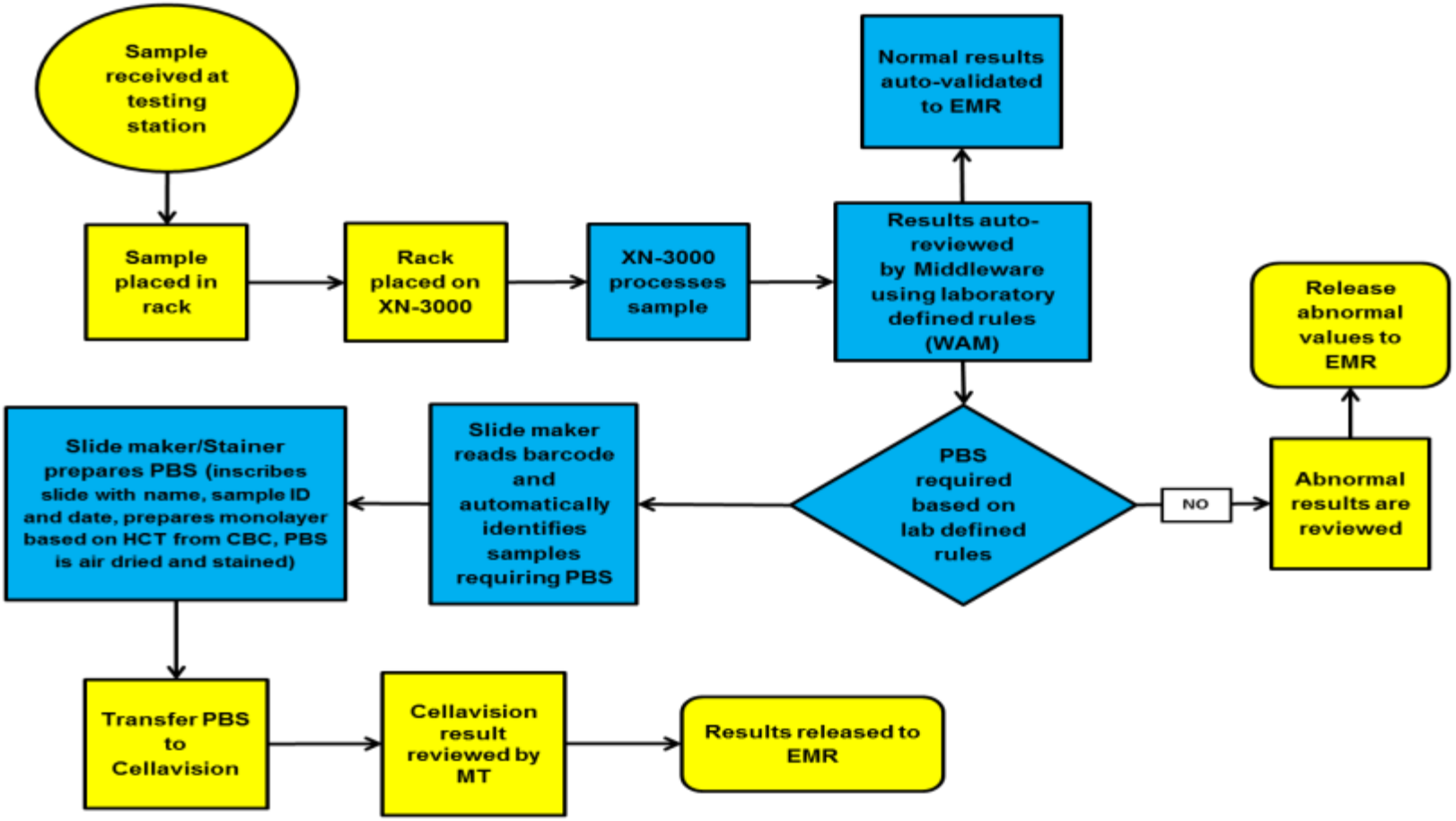
CBC Turnaround Time ED



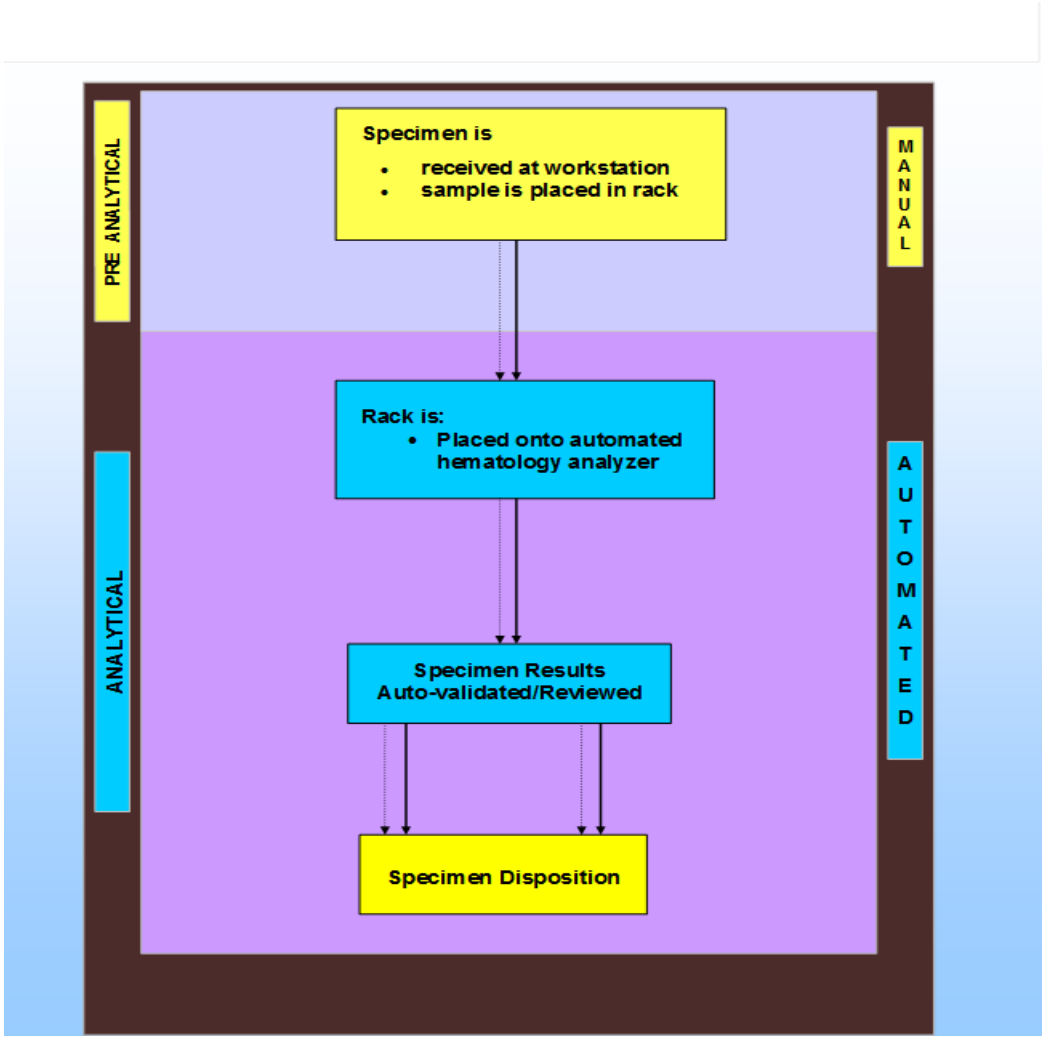
Workflow for Hematology Analyzer Prior to Integration of Slidemaker/Stainer



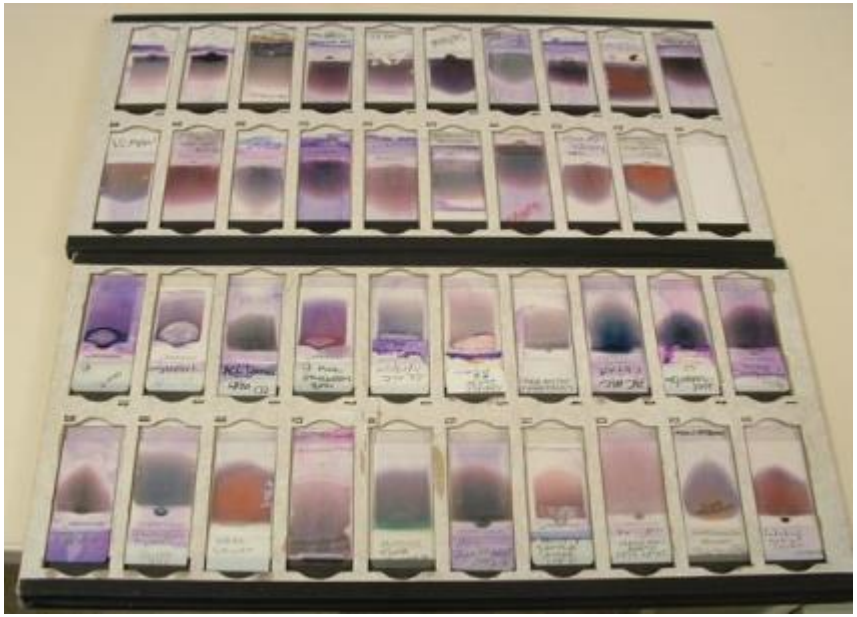
Workflow for Hematology Analyzer with Integrated Slide Maker/Stainer



Flow Chart for Integrated Slidemaker and Stainer



Manual vs. Automated Slide Preparation

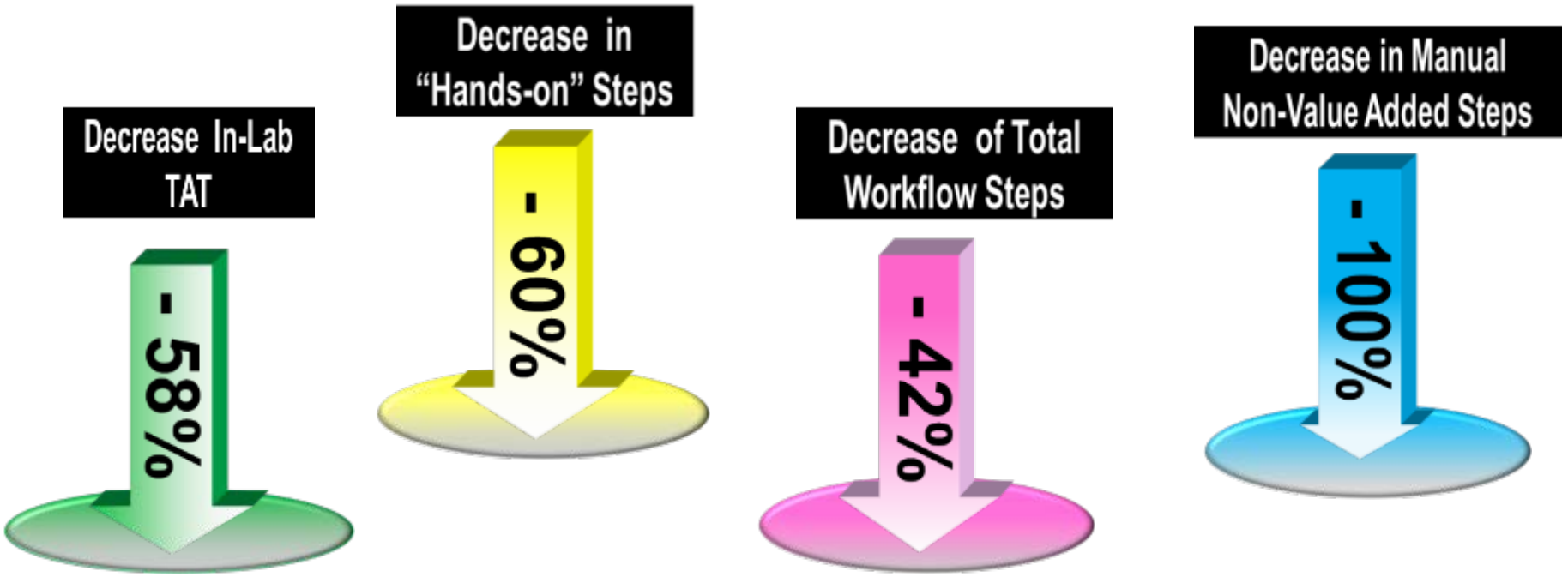


Manual “Hands-On” Slides

Automated Slide Preparation
“Hands-Free” Slides

Process Improvement Metrics

DECREASED	INCREASED
✓ Total In-Lab TAT	✓ Slide Preparation Consistency
✓ Labor Intensive Manual Tasks	✓ Operational Efficiency/ Productivity



Lab Goals for Success from Volume to Value

- Drive out waste to drive out costs
- Refocus on reagent and supply savings
- Use Lean management
- Create automated lean work cells—no more silos
- Manage lab orders and test utilization
- Standardize everything—equipment, policies, processes, job descriptions, etc.
- Leverage technology, connectivity, and data mining

Laboratory Value Pyramid

Level 3

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Urine Culture Screening

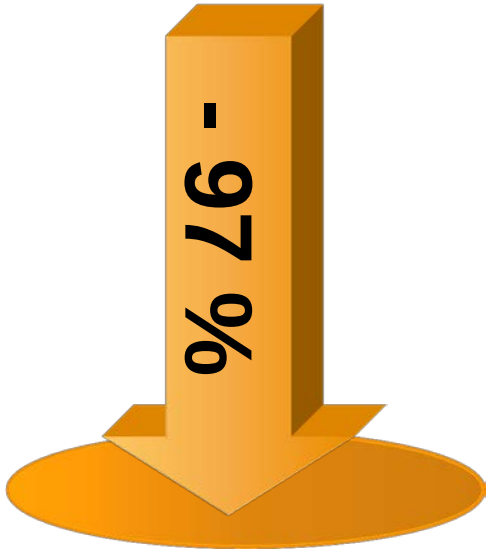
Mather Case Study

- Evaluate the UTI flag as a screen
- Based on WBC and bacteria results
- Orders for both UA and culture
- Collection Methods- minimum sample volume 4mL
  - Clean Catch urines in sterile cups – no additive
  - Clean Catch urines poured off into tube containing preservative
- Analyzed within 1 hour after collection or refrigerated
- Culture performed at reference laboratory

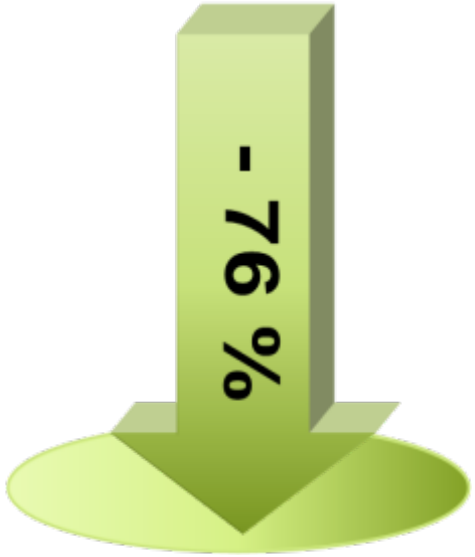
Clinical Impact

- Implementation of Rules Based Middleware
- Rapid Reporting of Actionable Information

Decreased TAT



Decreased Urine Cultures



UTI Screening

NPV= 96%

Source: Mather Quality Data

Making the Financial Case at Mather

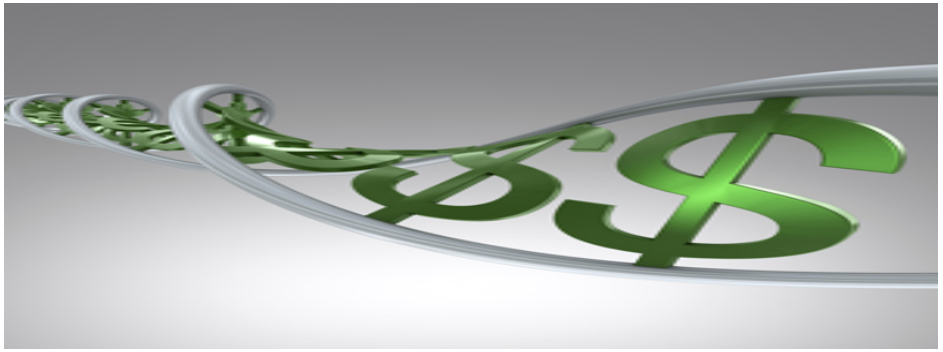
Balancing Healthcare Costs

- Number of Annual Urine Cultures- 17,354
- Number of Positive Urine Cultures- 4,213
- Cost of Urine Negative Culture Screening- $6.70
- Number of Negative Urine Cultures- 13,141

Financial Impact of Culture Reduction

Total Cost Avoidance/Reduction with Urine Culture Screening is

$88,044



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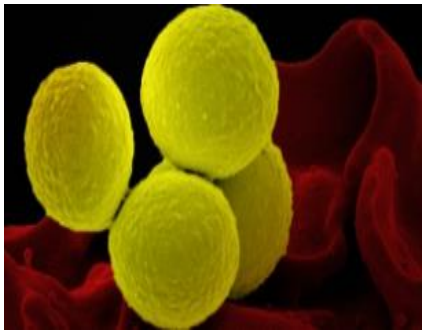
Reducing Hospital Acquired Infections (HAIs)



Leveraging Technology

Culture
The Gold Standard

Molecular Diagnostics

Active Surveillance For MRSA

Cost-Benefit Molecular Testing (PCR)

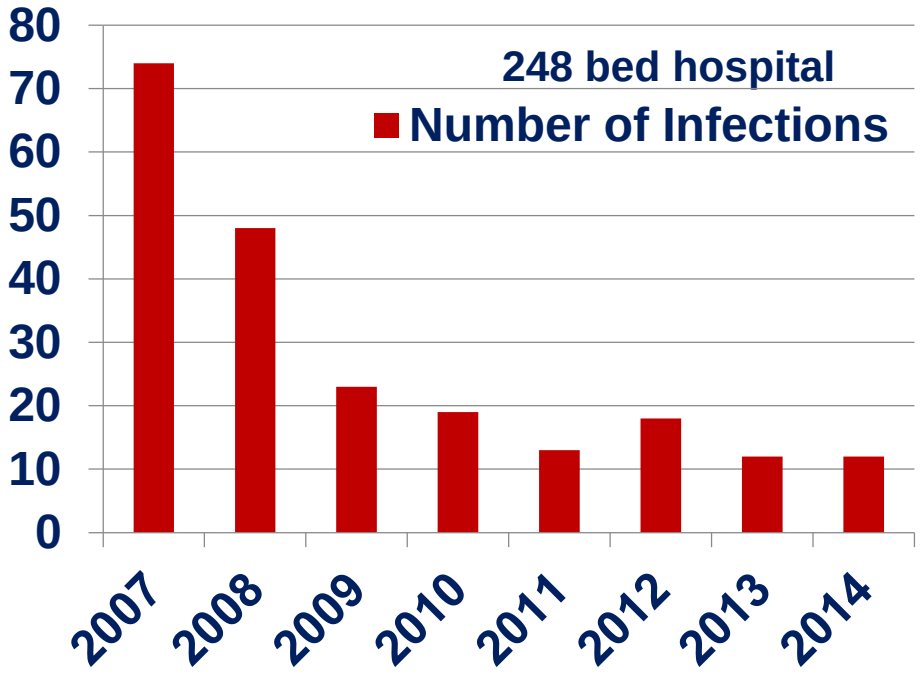
Laboratory Costs

Screened high risk patients
2008 – 2014

12,785 patients (~ 1,825/yr)

- **PCR Assay ~ $51 per test**
- **Total Screening Cost**
  $657,325
- **NO ADDITIONAL FTEs**
- **MRSA testing performed 24/7**

MRSA Infections



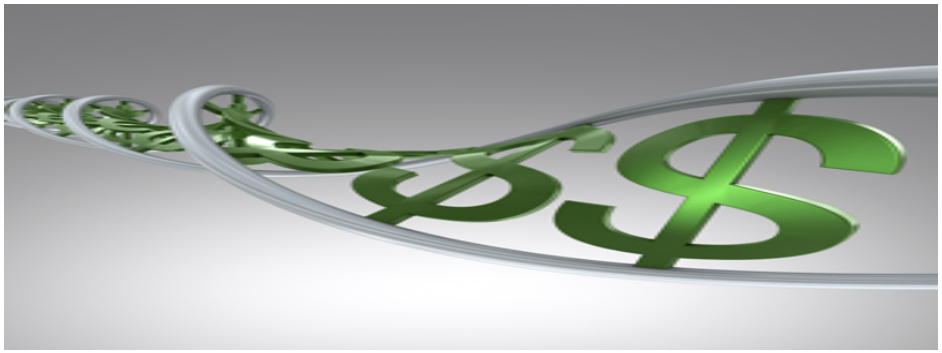
(2007 vs. 2014)
62.0 fewer infections @ $35,000

Financial Impact of Rapid

Screening and Reporting For HAI's

Total Cost Avoidance/Reduction with MRSA Testing/Screening is

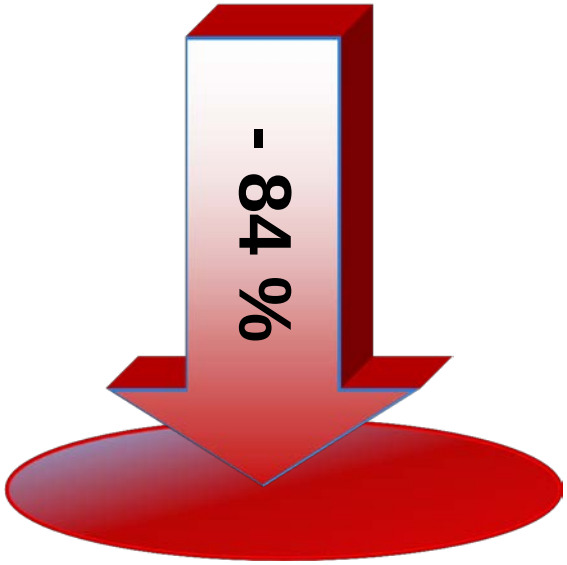
$1,512,675



Clinical Impact and Financial Metrics

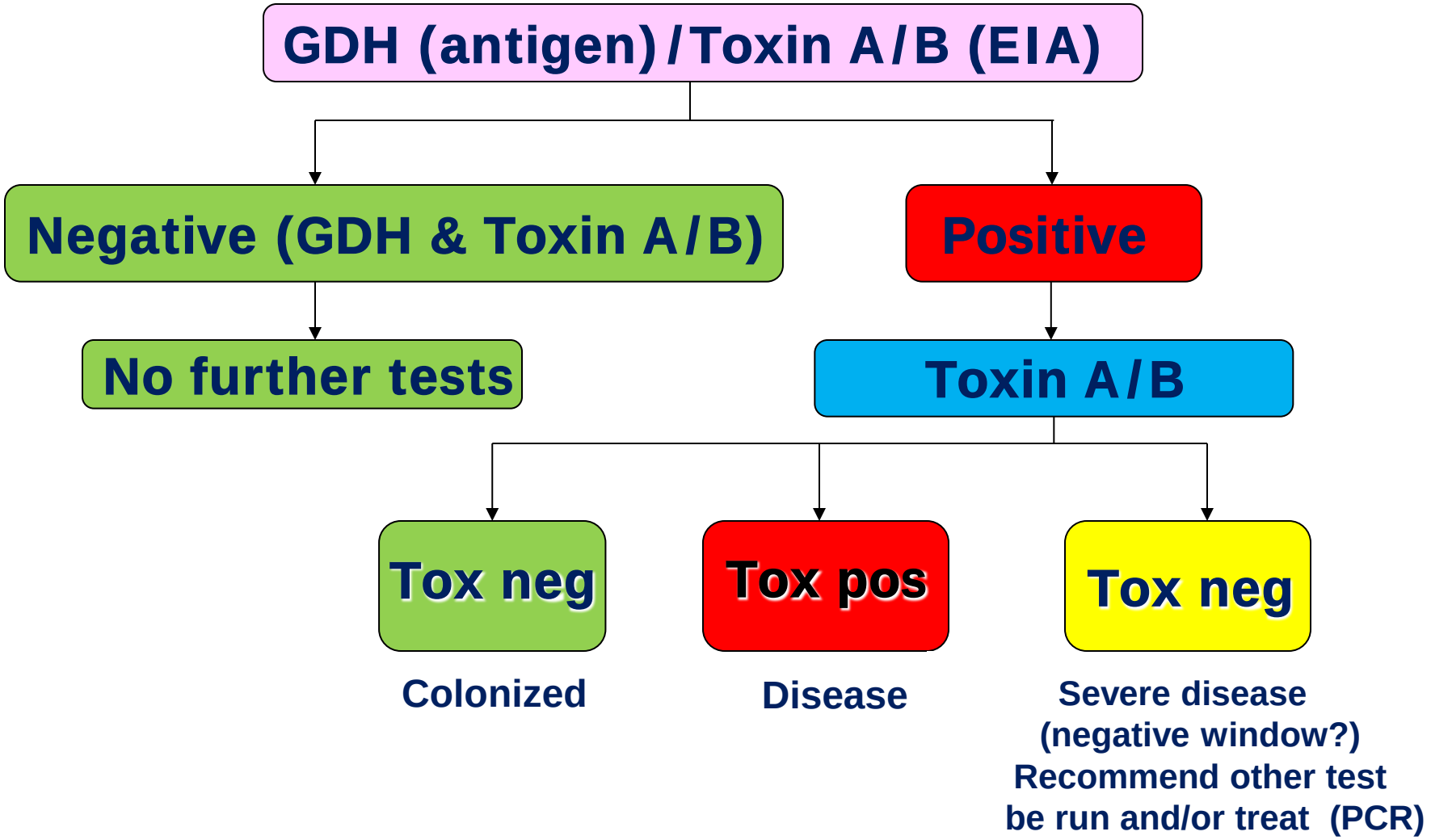
- Implementation of an Active MRSA High Risk Screening Program
- Rapid Reporting of Actionable Information
- Increased Awareness of HAI's

Decreased Infection Rate



Cost Reduction

Algorithm for Rapid Accurate Diagnosis of *C. diff*



C. Diff Cost Savings (2010-2014) Using a Simultaneous Two Test Algorithm

100% of patients tested with PCR

8243 patient samples → **PCR $40 per test** → **$329,720**

Simultaneous Two Test Algorithm

8243 patient samples → **Simultaneous GDH and Toxin A/B $12 per test** → **$98,916**

- **Ag+ Tox– 9%** → **PCR 925 samples $37,000**
- **Ag+ Tox+ 11%** → **REPORT**
- **Ag– Tox– 80%** → **REPORT**

Cost/Savings of Simultaneous GDH/Toxin vs. PCR testing

TOTAL PCR = $329,720

TOTAL TWO TEST ALGORITHM= $135,916

SAVINGS= $193,804

Over 90% of test results reported in <45minutes

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Laboratory Value Pyramid

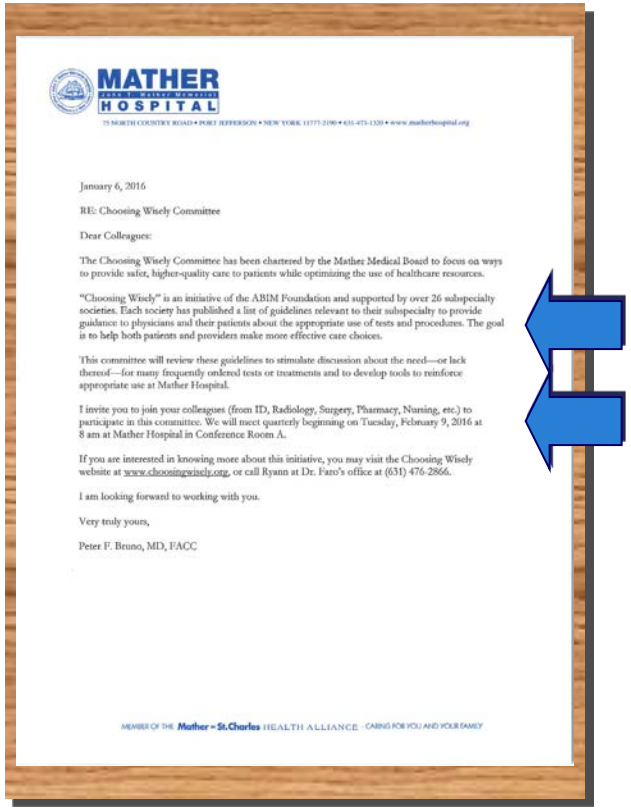
Level 4

Choosing Wisely Initiative

Invitation to Choosing Wisely

January 16, 2016

Invitation Letter sent to Invited Committee Members from Peter Bruno, M.D., FACC Co-Chair, Choosing Wisely



MATHER HOSPITAL

75 NORTH COUNTRY ROAD • PORT JEFFERSON • NEW YORK 11777-2190 • 631-473-1320 • www.matherhospital.org

January 6, 2016

RE: Choosing Wisely Committee

Dear Colleagues:

The Choosing Wisely Committee has been chartered by the Mather Medical Board to focus on ways to provide safer, higher-quality care to patients while optimizing the use of healthcare resources.

"Choosing Wisely" is an initiative of the ABIM Foundation and supported by over 26 subspecialty societies. Each society has published a list of guidelines relevant to their subspecialty to provide guidance to physicians and their patients about the appropriate use of tests and procedures. The goal is to help both patients and providers make more effective care choices.

This committee will review these guidelines to stimulate discussion about the need—or lack thereof—for many frequently ordered tests or treatments and to develop tools to reinforce appropriate use at Mather Hospital.

I invite you to join your colleagues (from ID, Radiology, Surgery, Pharmacy, Nursing, etc.) to participate in this committee. We will meet quarterly beginning on Tuesday, February 9, 2016 at 8 am at Mather Hospital in Conference Room A.

If you are interested in knowing more about this initiative, you may visit the Choosing Wisely website at www.choosingwisely.org, or call Ryann at Dr. Faro's office at (631) 476-2866.

I am looking forward to working with you.

Very truly yours,

Peter F. Bruno, MD, FACC

MEMBER OF THE Mather • St.Charles HEALTH ALLIANCE - CARING FOR YOU AND YOUR FAMILY

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Objectives

- **Better matching of care to needs**
- **High value, population specific**
- **Change Practice to Science — is central to addressing underuse of effective care and overuse of ineffective care**

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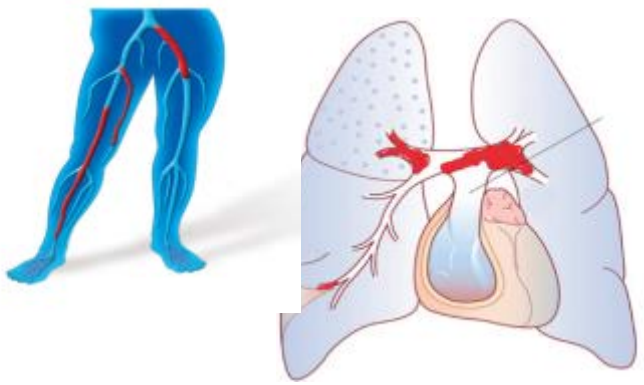
Key Performance Indicators



- Challenge/Opportunity
- Process and Quality
- Patient Benefit
  - Patient safety and satisfaction
  - Outcomes (LOS, mortality, re-admissions)
  - Avoid unnecessary treatment(s)
  - Appropriate level of care
- Cost

Key Questions to Consider

Can patient outcomes and satisfaction levels be improved?	YES
Can we demonstrate measurable outcomes?	YES
What are the savings potential?	YES
Can clinical practice be changed?	YES

Choosing Wisely Initiatives

Clinical Pre-Test Probability and D-dimer

- Wells Score
- D-dimer Test

Chest Pain Accelerated ED Protocol

- Serial Draws
- Single Troponins

HF and BNP

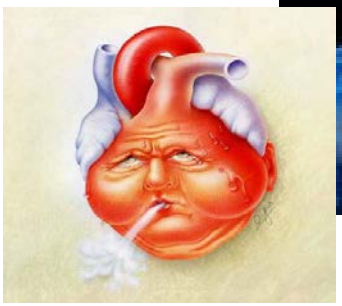
- Pre-discharge BNP
- NYHA Classification
- HF and Iron deficiency and Anemia

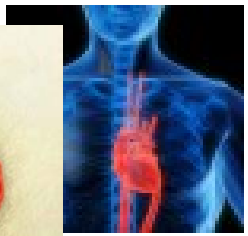
Syncope

- CHESS Score

Echo

- List reason for ECHO





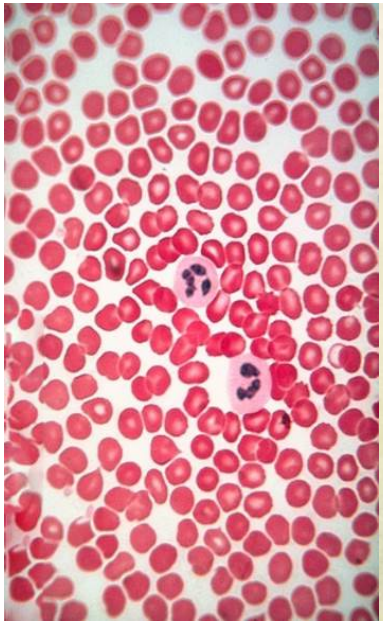
Work in Progress….

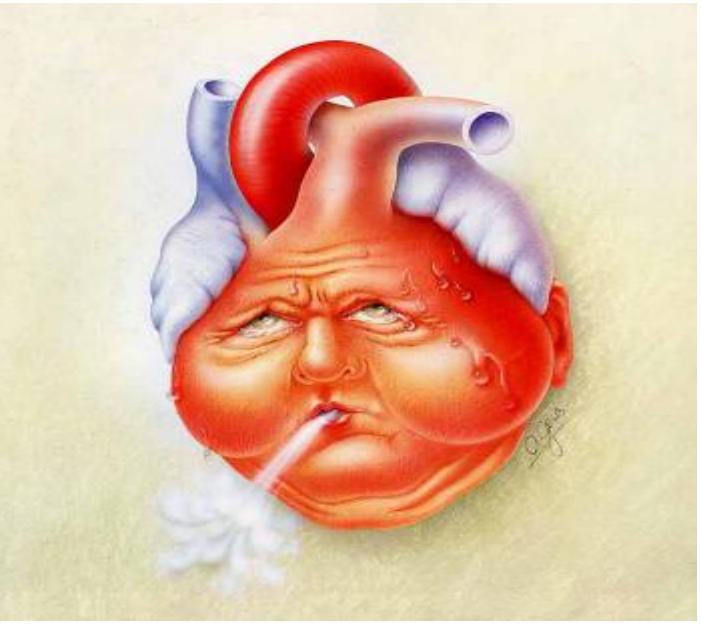
Teamwork

Choosing Wisely Committee should include:

Senior Hospital Leadership
Chief Medical Officer
Chief Information Medical Officer
Hospitalists
Intensivists
Cardiologists
ED Clinicians
Clinical Laboratory
Pharmacists
Nursing Management/Staff
Finance

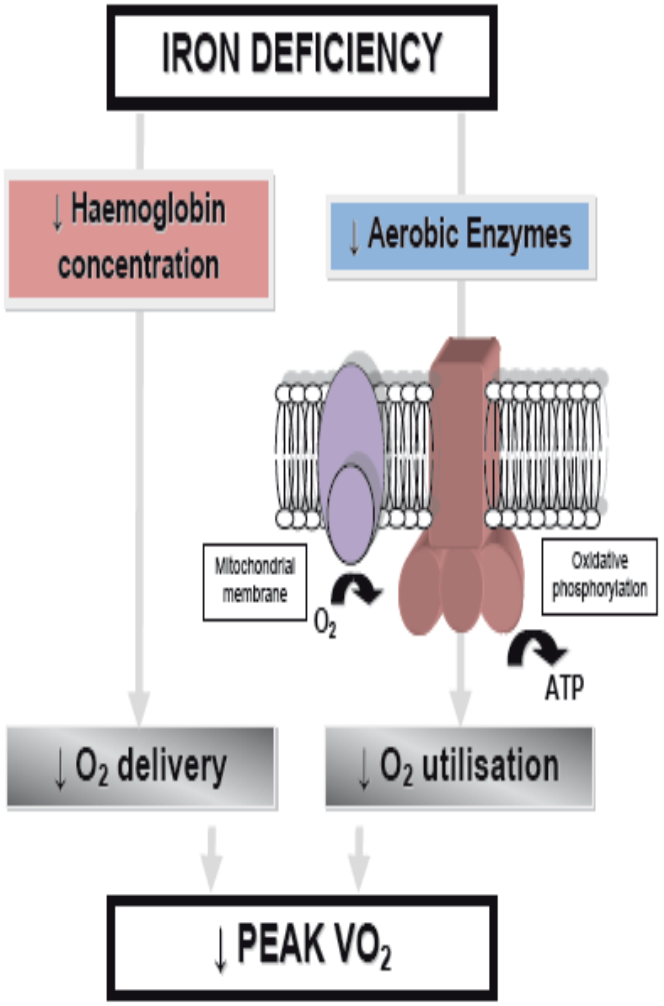
HF and Iron Deficiency





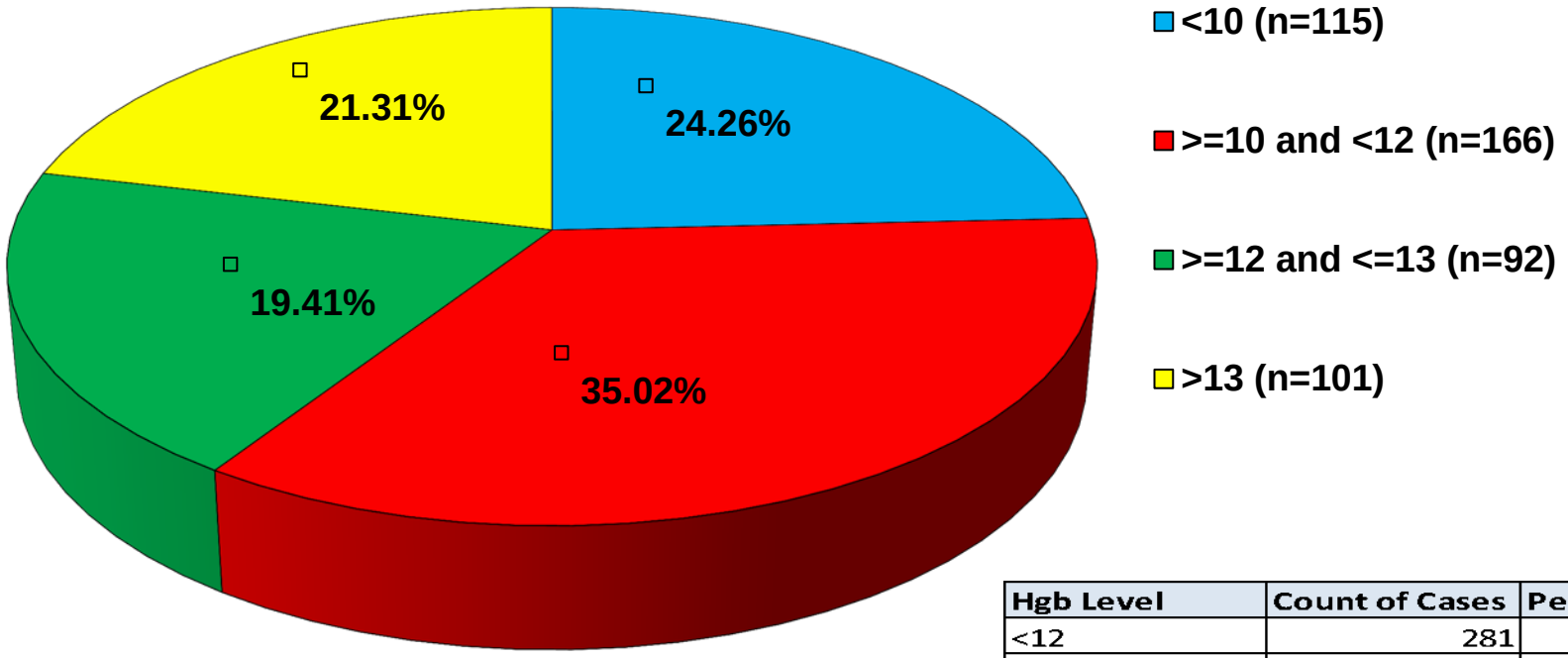
Iron Anemia and HF

- Iron deficiency and anemia are common in HF patients
- Anemia is associated with worsening HF symptoms, increased morbidity & mortality
- Iron deficiency is a major reason for development of anemia
- Iron is essential for oxygen metabolism and energy production



Mather HF and Iron Deficiency Statistics

Hemoglobin Levels for CHF Inpatients
Admissions April 1, 2015 - March 31, 2016



Hgb Level	Count of Cases	Percentage
<12	281	59.28%
>= 12	193	40.72%
Total	**474**	**100.00%**

Population: Inpatients admitted between April 1, 2015 and March 31, 2016 with a primary discharge diagnosis of CHF.
Source: SCM

N = 474 Patients

IDA and HF Patients

Serum Iron & Ferritin Levels for CHF Inpatients
Admissions April 1, 2015 – March 31, 2016

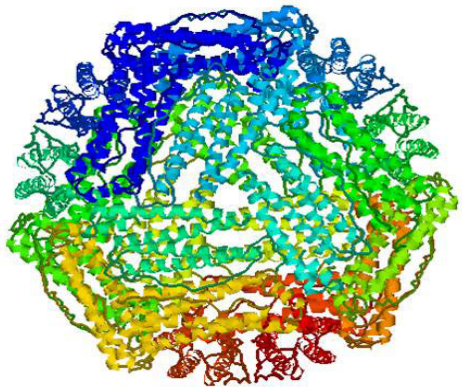
Serum Iron Level	Last Ferritin < 100 ng/mL	Last Ferritin >= 100 ng/mL	No Ferritin Performed
< 40 ug/dL	36	23	3
>= 40 ug/dL	23	12	2
Total	**59**	**35**	**5**

Population: Inpatients admitted between April 1, 2015 and March 31, 2016 with a primary discharge diagnosis of CHF.
Source: SCM

Only 53% (19/36) of patients with Fe <40 and Ferritin <100 left with a prescription for Fe at discharge

Laboratory Anemia Work-up

Diagnosis of Iron Deficiency



- **Biochemical parameters**
  - **Serum iron**
  - **Ferritin**
  - **Transferrin**
  - **Transferrin saturation (TSAT)**

Laboratory Anemia Work-up

Hematology Parameters

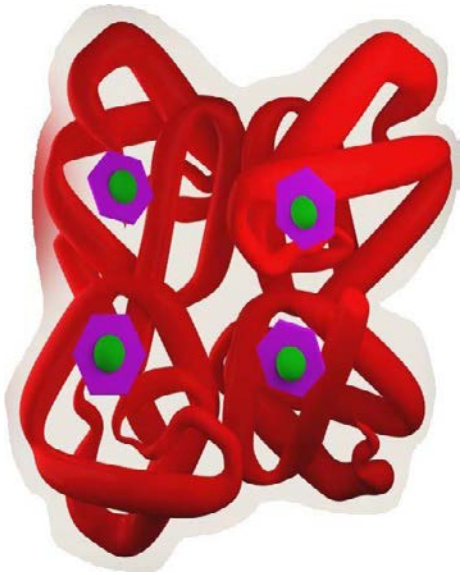
- Based on entire RBC population
  - Hgb
  - HCT
  - MCV
  - RDW
- Based on reticulocyte population
  - Reticulocyte Hemoglobin (RET-He/CHr)

What is Reticulocyte Hemoglobin?

(RET–H*e*/CHr)

- **Measured at cellular level**
- **Early detection of iron deficiency**
- **Monitors acute changes in hemoglobin incorporation into the erythron**
- **More sensitive than indirect chemical measurements**
- **Detects non-responders to ESA (Functional Iron Deficiency)**

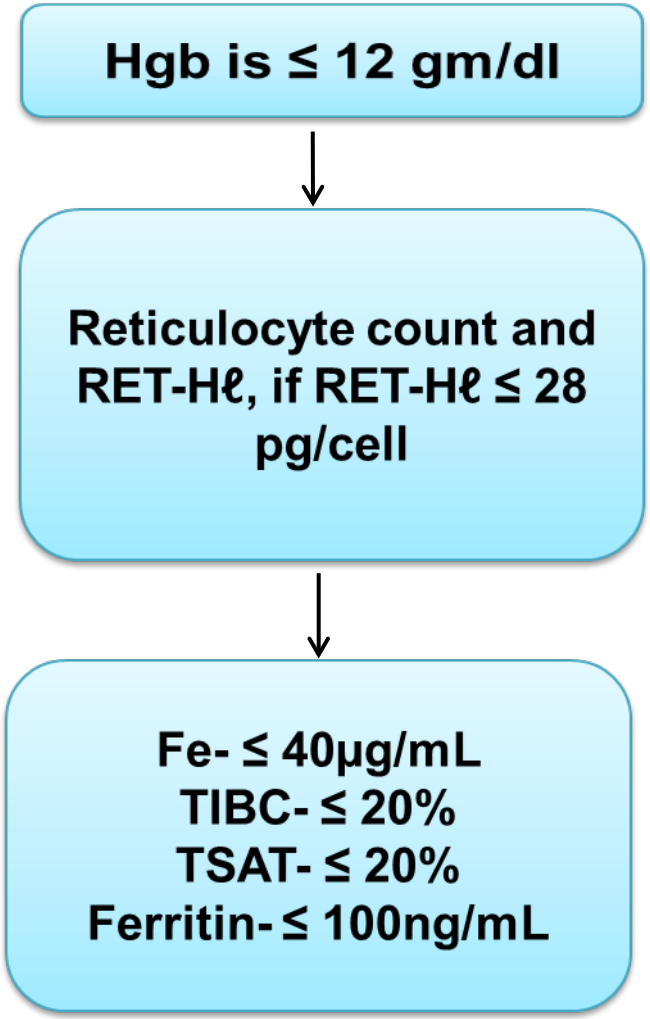
Reference Range for RET-He



- RET-He > 28 pg/cell indicates that sufficient iron is available for incorporation into the red cell
- RET-He < 28 pg/cell indicates that not enough iron is available to produce healthy RBC's
- Reference Range

  Adults: 28.2 –36.6 pg/cell

Screening Assessment for ID/IDA in Heart Failure Patients



ANEMIA ASSESSMENTSCREENING
INTEGRATED PROCESS

PRE-ANALYTICAL

ANALYTICAL

MANUAL

AUTOMATED

Specimen is:
- **Received at workstation**
- **Placed in testing rack**

Rack is:
- **Placed on automated hematology analyzer**

Specimen results auto-validated/reviewed

Specimen disposition

The Value is Unquestionable…

Saves Lives and Dollars

- **RET-He…..Anemia management test**
  - **Cost < $1.00**
  - **Rapid screening**
  - **Prevents progression to Iron deficiency anemia**
  - **Promotes rapid intervention….. reduced blood collection……improves patient outcomes… enhances patient care management**

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Choosing Wisely Initiative

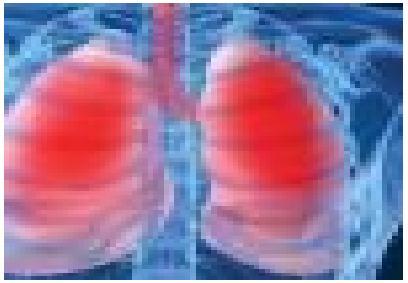
Clinical Pre-Test Probability Assessment and D-dimer as a First Screen for PE and DVT

Statistics

- **99% of ED cases had no documentation of any CPTP assessment**
- **1154- Total Number of D-dimers ordered between May 2015 and April 2016**

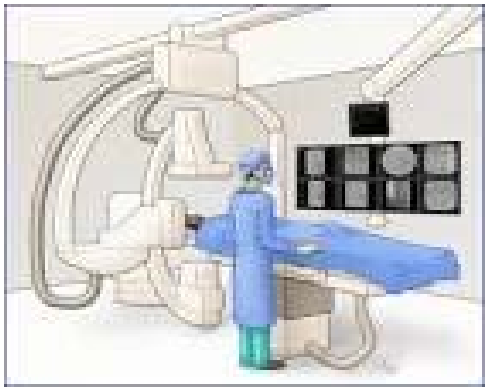
  - 919 (85%) D-dimer and no angiography

  - 157 (15%) D-dimer and angiography



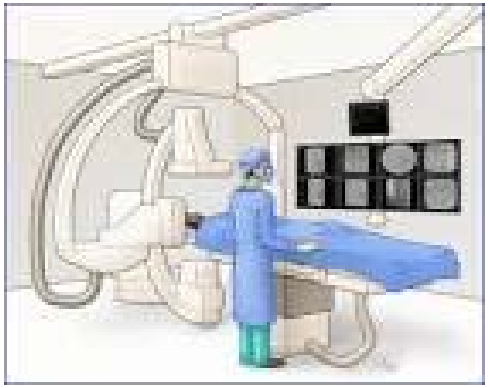
Statistics

- **ED- 107 (68%) Positive D-dimer (>500ng/mL) had Angiography**
- **Angiography Results**
  - **101 Negative**
  - **4 Positive**
  - **2 Equivocal**



Statistics

- ED- 50 patients (32%) with Negative D-dimer (<500 ng/mL) had Angiography
- Angiography Results
  - 50 Negative
    - 32 triple CCTA
    - 2 double
    - 8 single
    - 9 V/Q Scan
- Average Patient Age- 49.5



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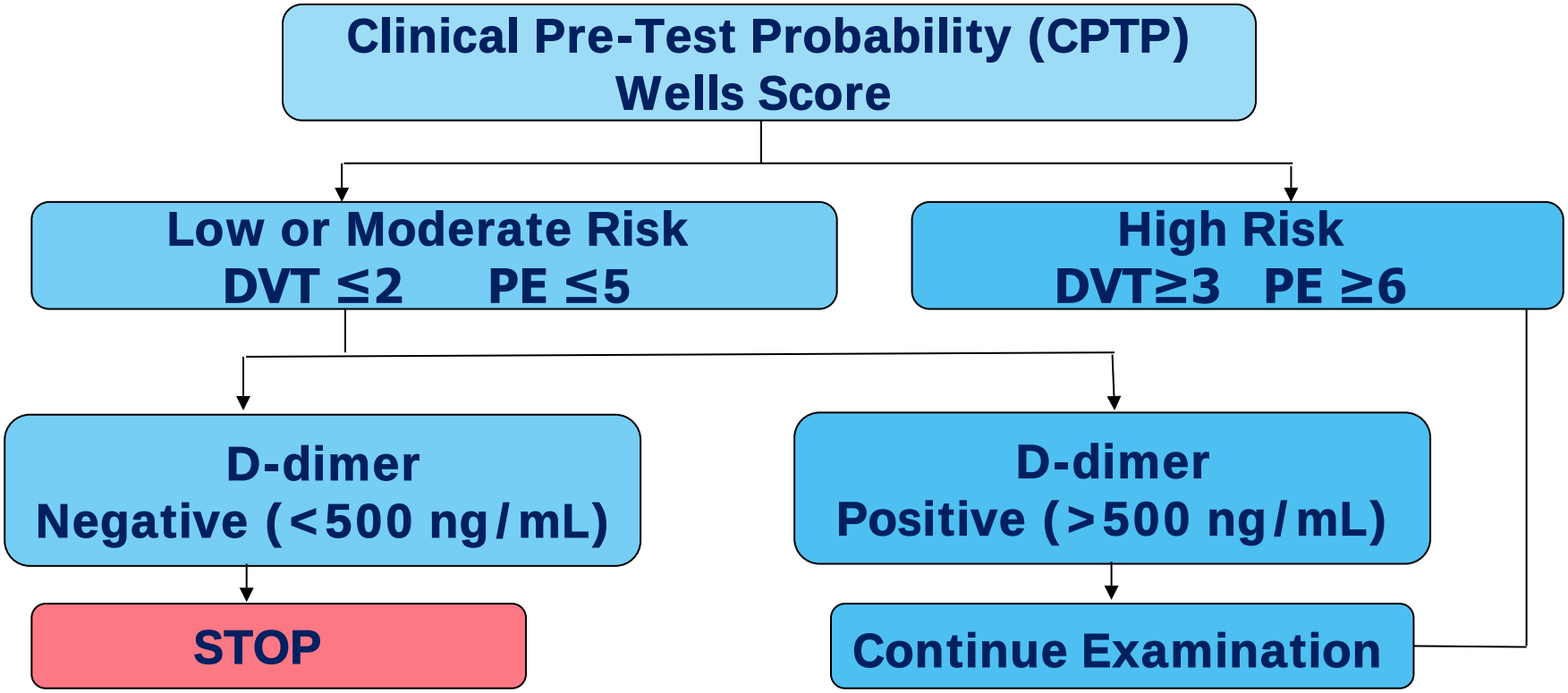
Not all D-dimer Tests are Created Equal

- FDA cleared for Exclusion of PE and DVT in low and moderate risk outpatients
- Not all D-dimer tests support an exclusion strategy
- Negative Predictive Value- (NPV reflects the ability of a test to rule out the disease)
- NPV > 99% at a cut-off of 500ng/mL

DVT/PE Risk Assessment Algorithm



NPV >99% when CPTP and D-dimer are combined for safe exclusion of VTE in suspected outpatients

- No further testing
- No anticoagulant treatment
- Improved patient management
- No radiation exposure
- Cost savings

Follow-up with imaging procedures such as:

- CCTA/Pulmonary angiography
- V/Q Scan
- Compression ultrasonography (CUS)

Other investigations for differential diagnosis

Cost Savings

- **Cost saving for the hospital**
  - **Avoid unnecessary imaging procedures**
    CCTA- $1511
  - **Contrast Media/Meds- $57.82**
    Contrast Media- $46.98
    Meds- $10.84
  - **Human Resources**
    RN and CT Tech- $60.00

Cost Savings

$1628.82/pt x 50= $81,441

The Value is Unquestionable…

Saves Lives and Dollars

D-dimer…..DVT/PE Exclusion strategy when combined with CPTP

- **Cost - $9.00**
- **Rapid screening in less than 1 hour**
- **Promotes accurate (NPV >99%) exclusion of VTE in low to moderate risk <u>outpatients</u>**
- **Improves patient outcomes**
- **Enhances patient care management by closing the case and avoiding unnecessary diagnostic/imaging testing**
- **Frees up beds quicker in ED, thereby eliminating bottlenecks and holds**

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Choosing Wisely can successful shift us from fee for service to High Value Based Patient Outcomes and Improved Patient Satisfaction!

Lessons Learned

- Continuous assessment of the initiatives
- Keep communication open
- Information Technology role is essential
- Change is slower than expected
- Collaboration among all stakeholders is paramount for success
- Demonstrate your knowledge
- Educate and be prepared

We Must Break Out of Our Silos

for High Value Cost Appropriate Care

There has to be something for everyone!

Executive Summary

- **The Laboratory Value Pyramid (LVP) provides an essential and strategic roadmap for making the transition from volume to value**
- **Implementation of the LVP demonstrates how the Laboratory can directly contribute to enhanced patient care and outcomes at each level by implementing advanced technology and data to support evidence based practices**
- **The LVP provides at each level a communication forum that fosters Laboratorian/clinician collaborations and engagement, that enables initiatives that results in reduce costs and infection rates, effective test utilization for improve quality, patient management and reduce costs**
- **The LVP allows the Laboratory to increase their value proposition and visibility, while becoming an integrated member of the healthcare delivery team**

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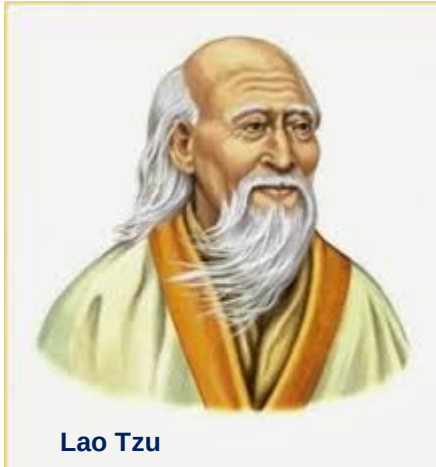
A thousand mile journey begins with a single step



Lao Tzu

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