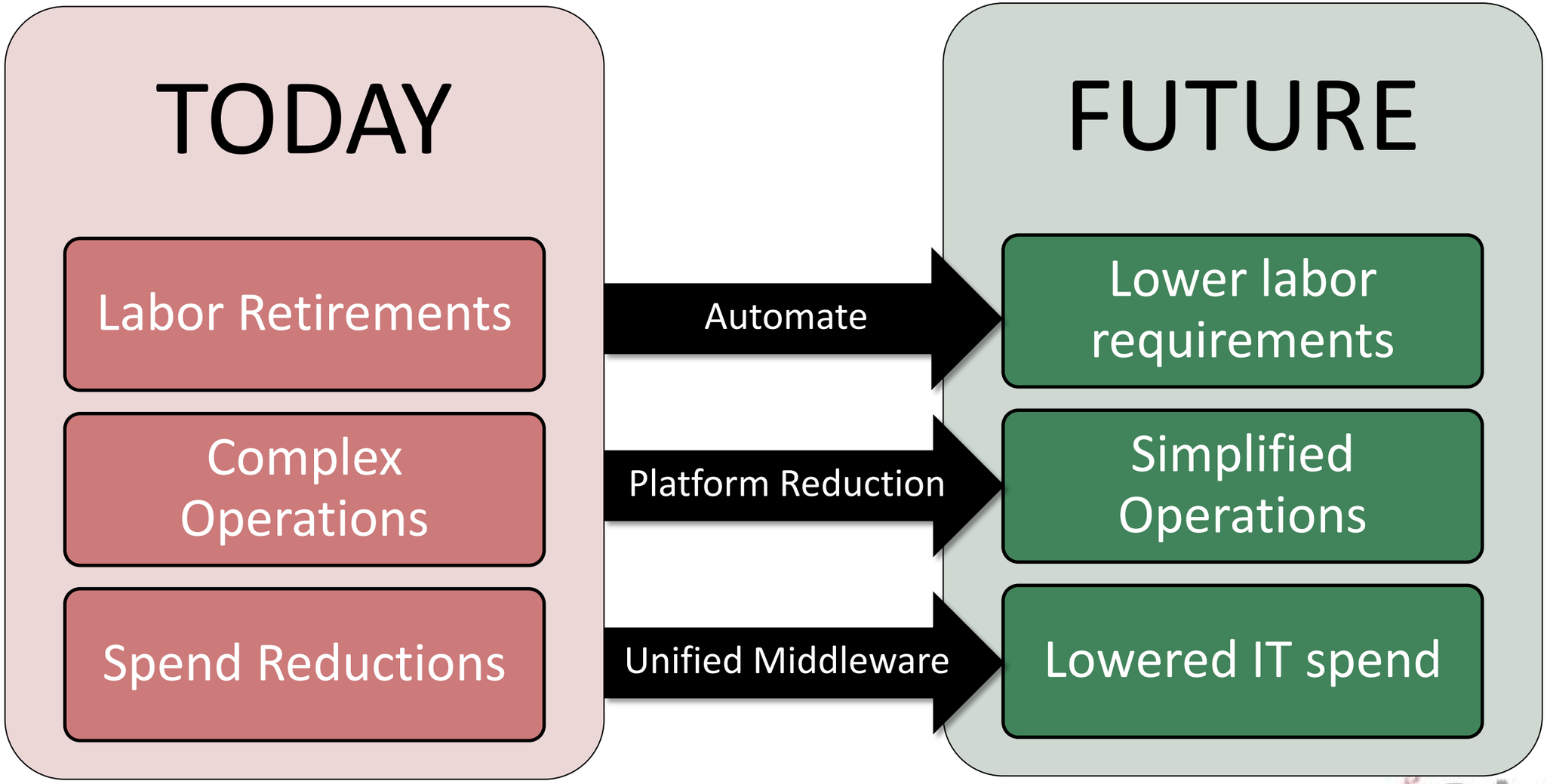
Saint Francis Hospital Laboratory

Rebalancing Our Lab's Use of Lean, Automation, and Analytics in Response to a 25% Staff Vacancy Rate Due to Retiring Baby Boomer MTs

Sharon Cox, MT(ASCP)SC
Core Laboratory Supervisor
Saint Francis Hospital
Tulsa, OK

Saint Francis Health System

Achieving High Performance Growth
Discussion Topics



SaintFrancis Health System

Saint Francis Health System
Accredited Facilities

Saint Francis Health System

Excellence • Dignity • Justice • Integrity • Stewardship

Saint Francis Hospital South

Laureate Psychiatric Clinic and Hospital

Warren Clinic

Saint Francis Hospital

- **SNF**
- **Home Health**
- **Hospice**
- **DME**

Saint Francis Urgent Care at Elm

Saint Francis Heart Hospital

Children's Hospital at Saint Francis

Saint Francis Cancer Center

SaintFrancis Health System

Saint Francis Hospital Laboratory
Department Statistics

Chemistry
1,600 K+/day
Hematology
1,400 CBC/day
Microbiology
140 cans/day
Immunology
6,400 ANA Abs/year
Blood Bank
30,000 transfusions/year
Transplant/Donors
50 cases per year
Pathology
27,000 cases/year
Point-of-Care
1,300 glucoses/day
Genetic
800 cases/month
Outreach
1,600 requisitions/day

Volume		
8.8M	Performed Tests	
99%	In-house Testing	
11%	Stat Testing	
40%	Outreach Testing	
267/76	Total Operations/Lab	Med Tech FTE's
Average Daily Workload		
1,700	Outreach Requisitions	
30,000	Results	
5,000	Specimens	
700	Hospital Blood Draws	
Space		
21,000	Laboratory (sq. ft.)	
12	Draw Stations	

Ranked #12 – Top U.S. Outreach Labs by Volume (g2reports.com)

Saint Francis Health System

Saint Francis Hospital Laboratory
Striving for Continuous Improvement

Project Selection and Management

- Identify Gaps or Areas for Improvement
- Impact on Process, Patient or Physician
- Options to Solve
- Technical Expertise Needed

Health System SaintFrancis

Saint Francis
Predicting Scarcity/Complexity to fix now

Staff Scarcity

New Staff (y)

Saint Francis Lab

Retirements (x)

y > x = surplus
y < x = scarcity

Note: this model assumes STATIC volumes, not the current, expected growth!

Unnecessary Complexity

Multiple platforms
- More training
- More inventory
- More contracts
- Higher total vial TAT

Often labs (and other areas) build complexity over time (for many reasons, which includes long contracts that don't allow for adaptability of new situations) which could be reduced by utilizing newer methods.

Budget Reductions

"Protecting Access to Medicare Act of 2014 (PAMA) includes the most extensive reform of the Medicare Clinical Laboratory Fee Schedule (CLFS) since it was established in 1984."

– American Clinical Laboratory Assoc

Limited phase in of CLFS reductions on PAMA systems

2017: Not more than a 10% from the prior year
2018: Not more than a 10% from the prior year
2019: Not more than a 10% from the prior year
2020: Not more than a 15% from the prior year
2021: Not more than a 15% from the prior year
2022: Not more than a 15% from the prior year

Saint Francis Health System

Saint Francis Hospital Laboratory
Striving for Continuous Improvement

Project Selection and Management

Date Added	Tech	Dept	Issue/Problem	Notes	Pri	Form	Resp Person	Needed	Complete?
6/3/2010	JH	Core	Hepatitis testing move from Axsym to Architect	Jay will email Charlotte the s/co ratios	1	Not needed	PM/SA/CC	Mar-12	Y
6/3/2010	JH	Core	Iris Urinalysis	Specs to Charlotte 10-11-10	1		SS/SA/CC	Mar-12	Y
6/9/2010	SC	Core	Installation of BioRad Unity Program	SP upgrade needed - 10-20-11	2		PM/SA/SC	Mar-12	Y
6/14/2010	DL	STH/STW	Ruby - Will do ULTICARE interface	UltiCare quote $12,500	2		SS/SA/CC	Mar-12	Y
6/17/2010	JH	Core	Folate move from Axsym to Architect - ROLL NOT NEEDE	Folates ready - waiting for Art	2		PM/SC/SA/CC	Mar-12	Y
6/17/2010	JH	Core	B12 move from Axsym to Architect	B12 not released from Abbott yet	2		PM/SC/SA/CC	Mar-12	Y
6/23/2010	JH	Core	CA-125 and CA-15.3 Axsym to Architect	Same as Folates	1		JH/SA/SC/CC	Jan-13	
8/24/2010		Immun	Immunocap Interface	After Ruby - Task for new IS position	1			Jun-12	Y
10/8/2010		Immun	New DSX Test - Cardiolipin	Testing in progress 6-13-11	2	Completed	SA/CC	Mar-12	Y
1/27/2011		Immun	Immunology & Vitamin D Procedures through the track	For centrifuging	3			Mar-12	Y
1/28/2011		Immun	Transition DSX result entry into Inst Mgr	IM training prior to roll date	2		SA	Mar-12	Y
2/14/2011		Core	Keppra - New Procedure for C8000 (with database roll)	QA completed - Ready for DB roll	1		PM/SC/CC	Mar-12	Y
2/23/2011		Core	Build AT III, Protein S, and Protein C in IM	QA completed - Ready for DB roll	2		SS/CC	Mar-12	Y

- Laboratory Project Selection
- Prioritization
- Accountability Assigned
- Ongoing Meetings to Monitor Success

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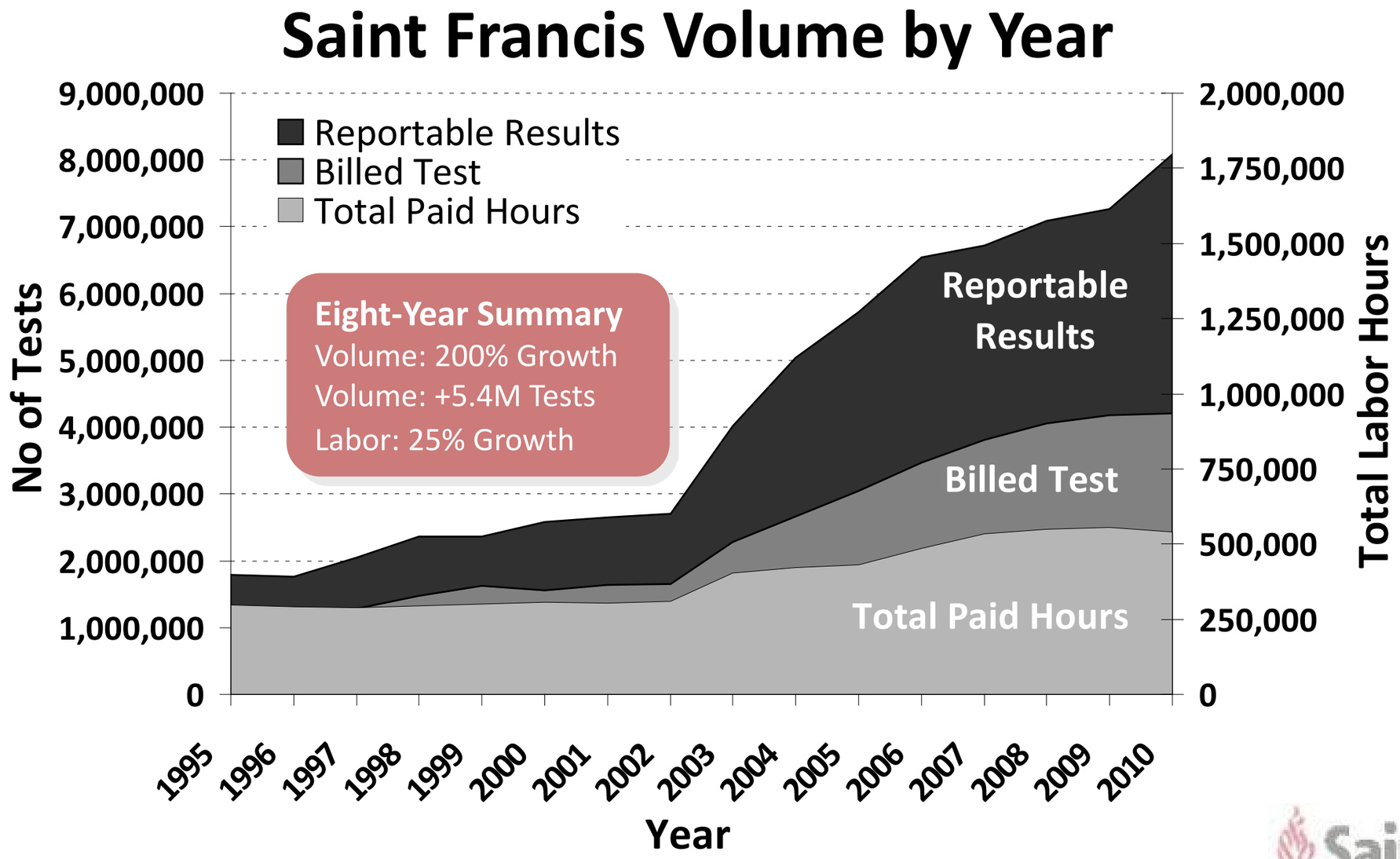
Solving for Scarcity in Complexity

LABOR CHANGES

Saint Francis Health System

Saint Francis Hospital
Saint Francis Annual Performance



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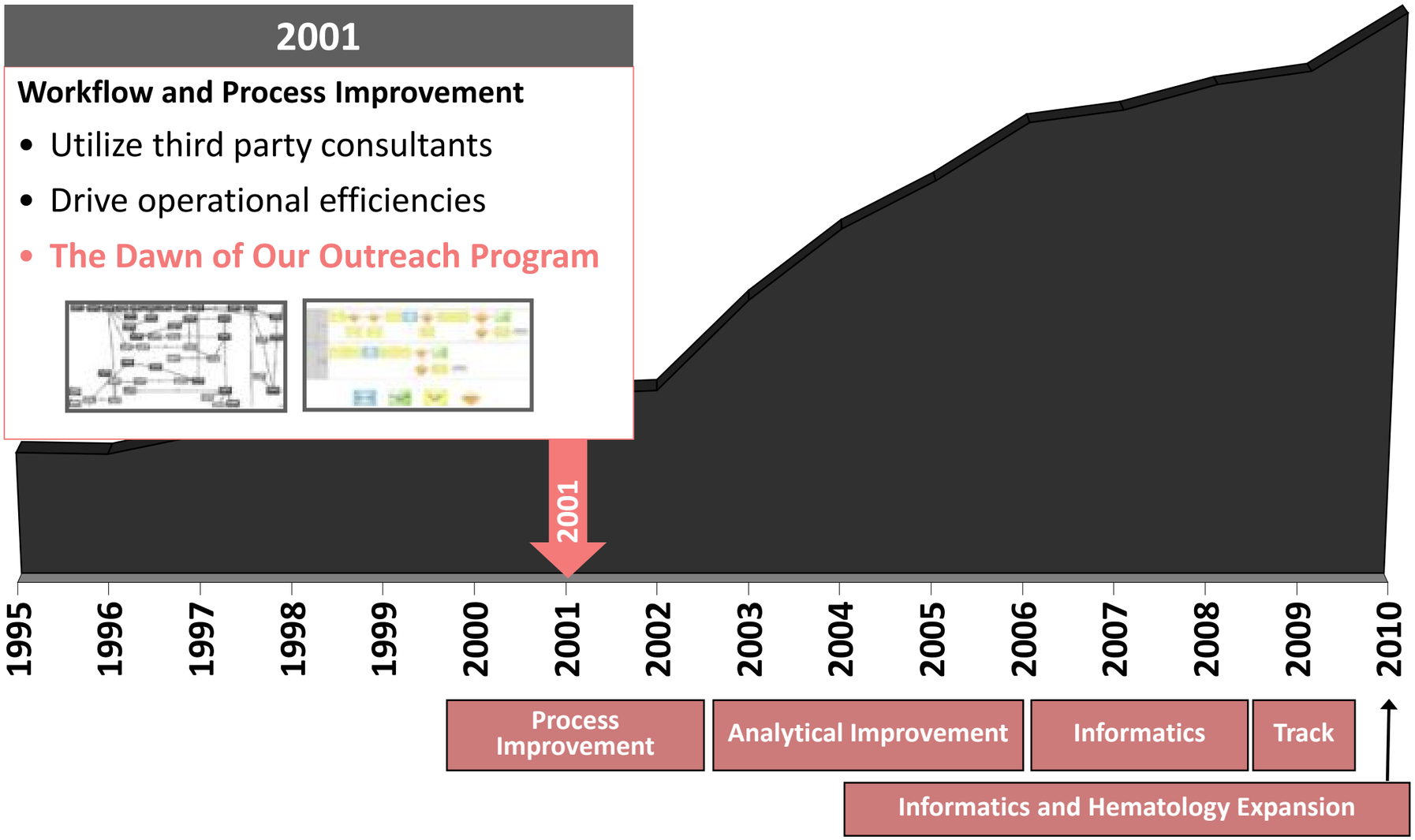
Saint Francis Hospital Laboratory
Striving for Continuous Improvement

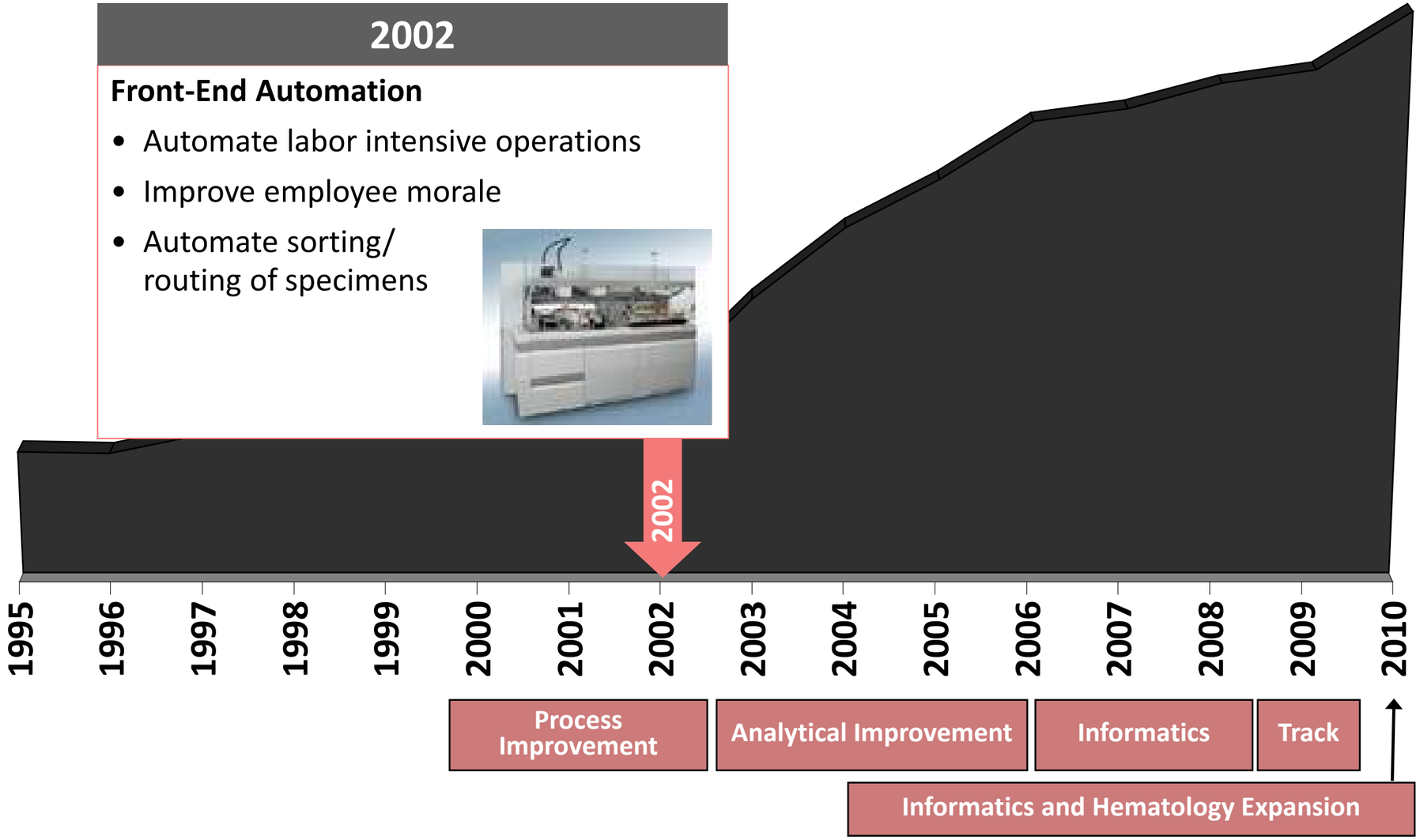
2001

Workflow and Process Improvement

- Utilize third party consultants
- Drive operational efficiencies
- **The Dawn of Our Outreach Program**



Saint Francis Hospital Laboratory
Striving for Continuous Improvement



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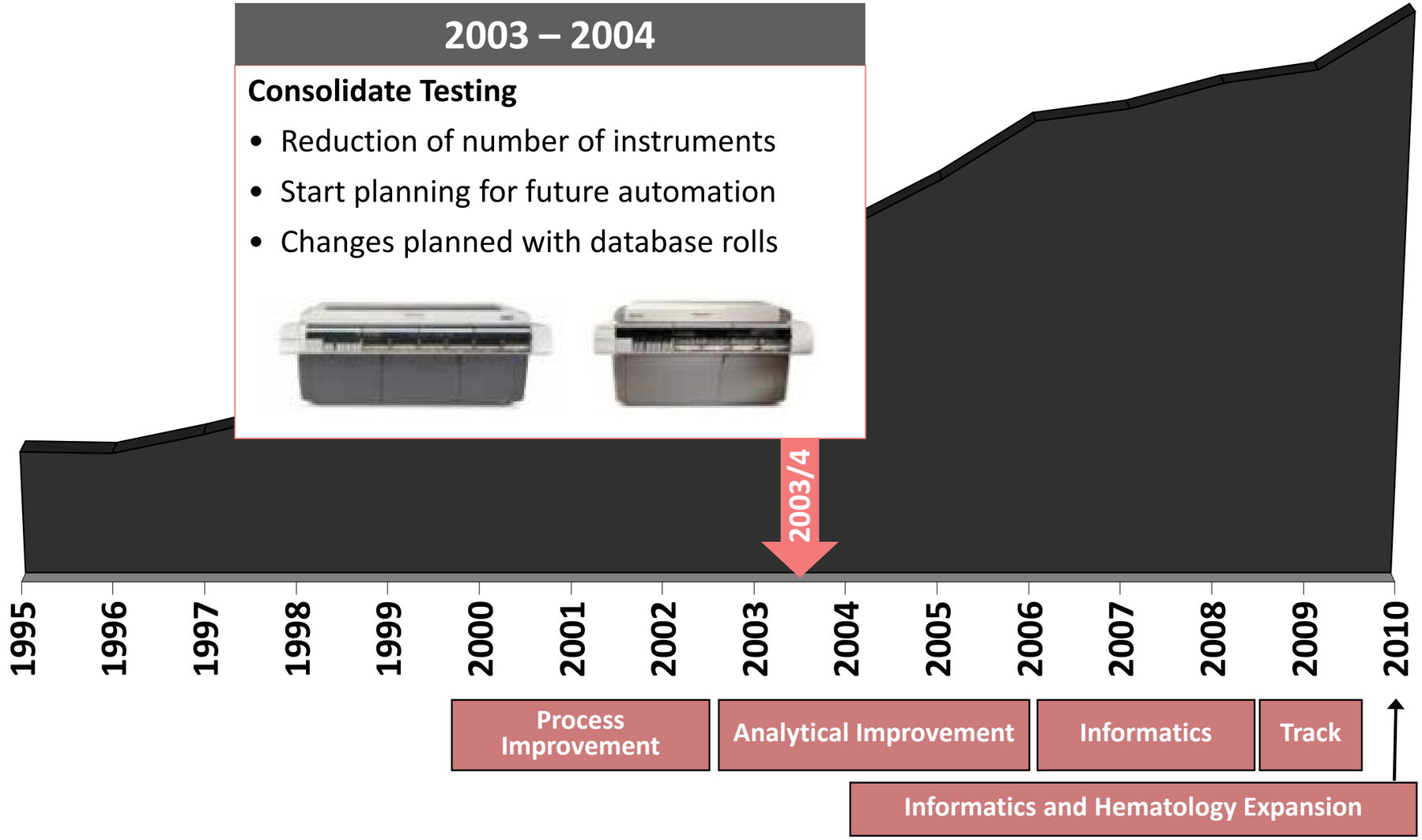
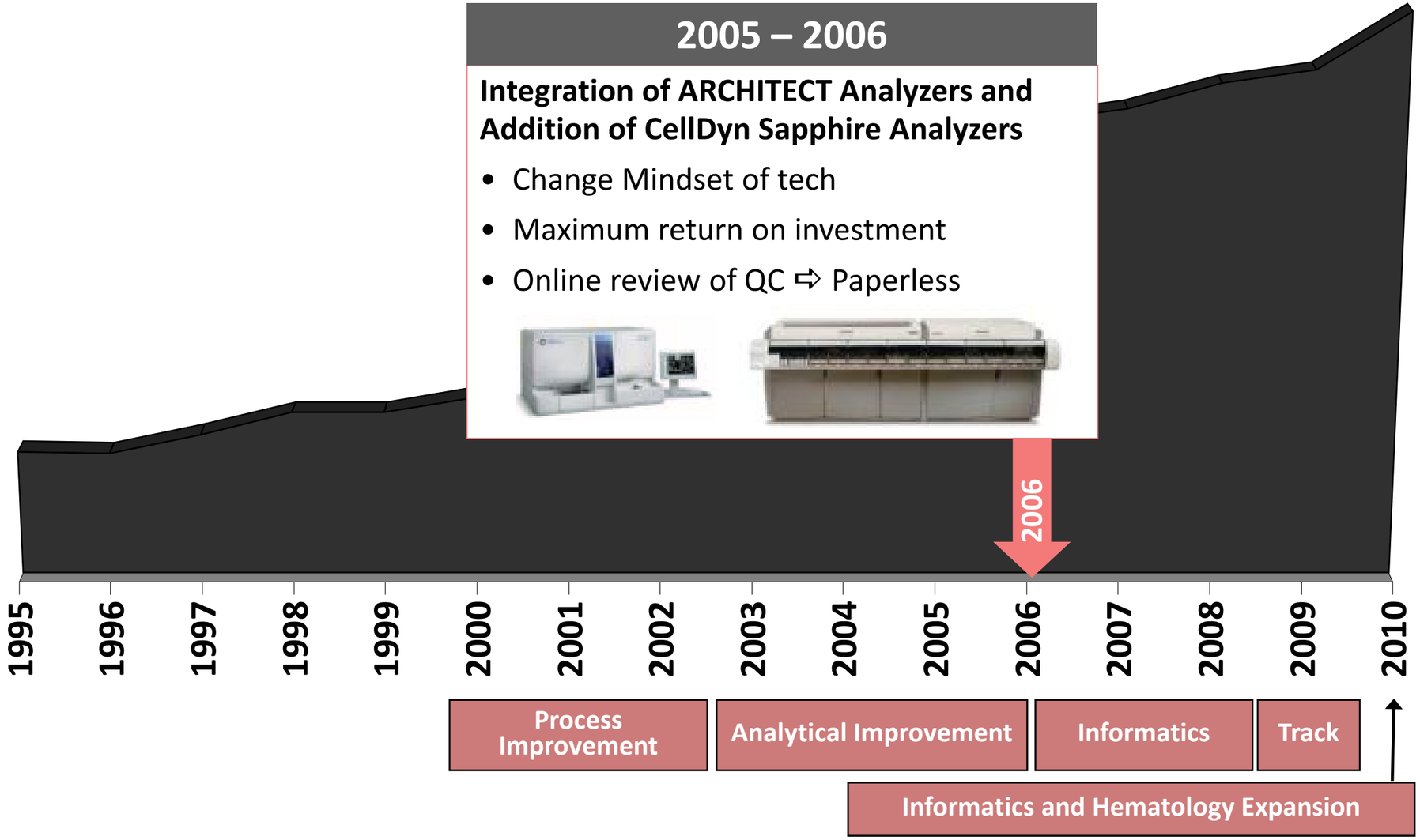
Striving for Continuous Improvement



Saint Francis Hospital Laboratory
Striving for Continuous Improvement



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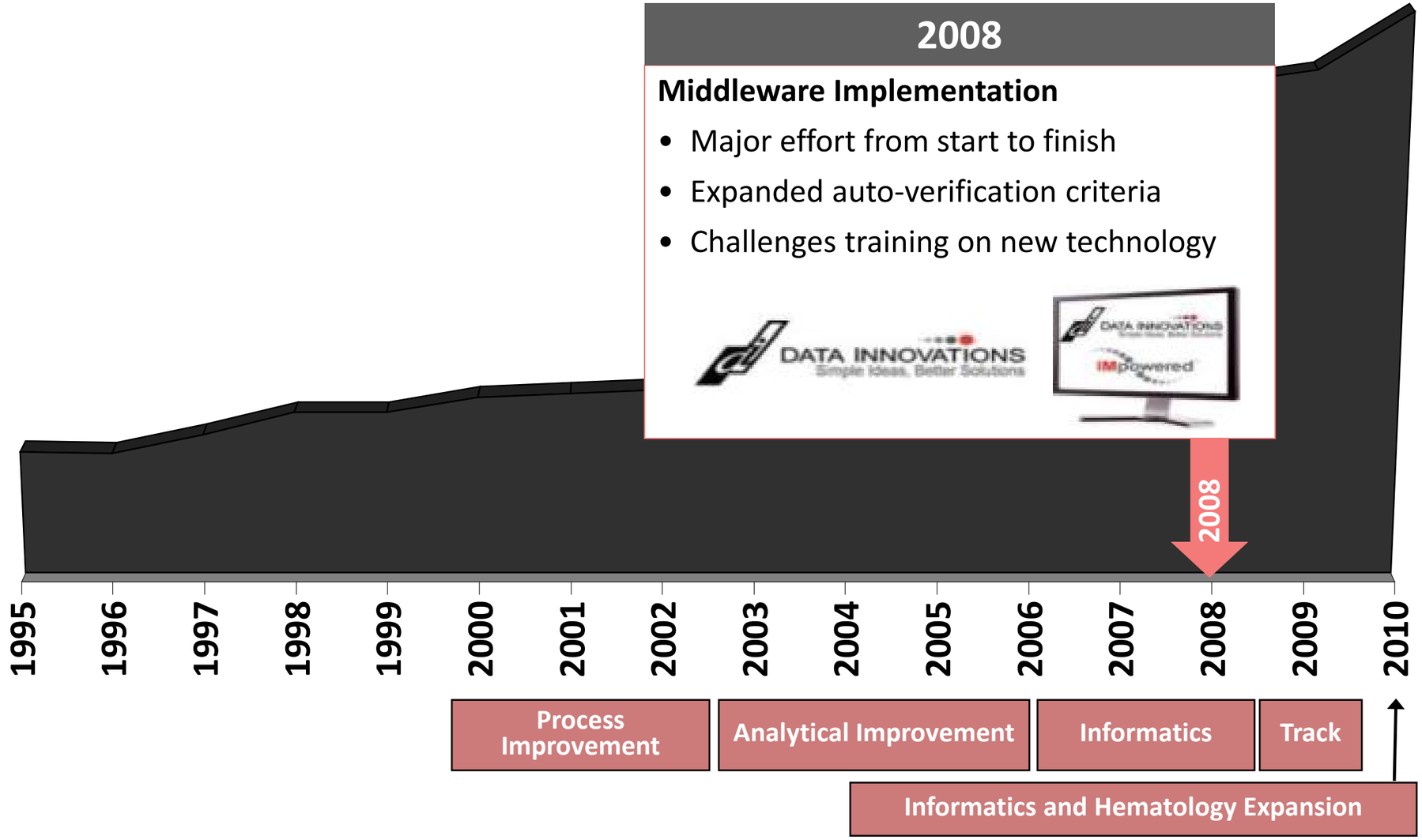
Saint Francis Hospital Laboratory
Striving for Continuous Improvement



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Striving for Continuous Improvement

- ✓ Run pediatric samples on the line
- ✓ Run stats on the track. No offline analyzer, no manually loading.
- ✓ Use the IOM like an ARCHITECT RSH, automated reflex/retest
- ✓ Use the IOM as a front-end sorter to accession, sort, and centrifuge if needed, every tube coming into core lab
- ✓ Have maintained STAT turnaround times while using the track

2009

Total Lab Automation

- Project management drives success
- 90 days start to go live
- Leadership and accountability

2009

1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010

Process Improvement | Analytical Improvement | Informatics | Track

Informatics and Hematology Expansion

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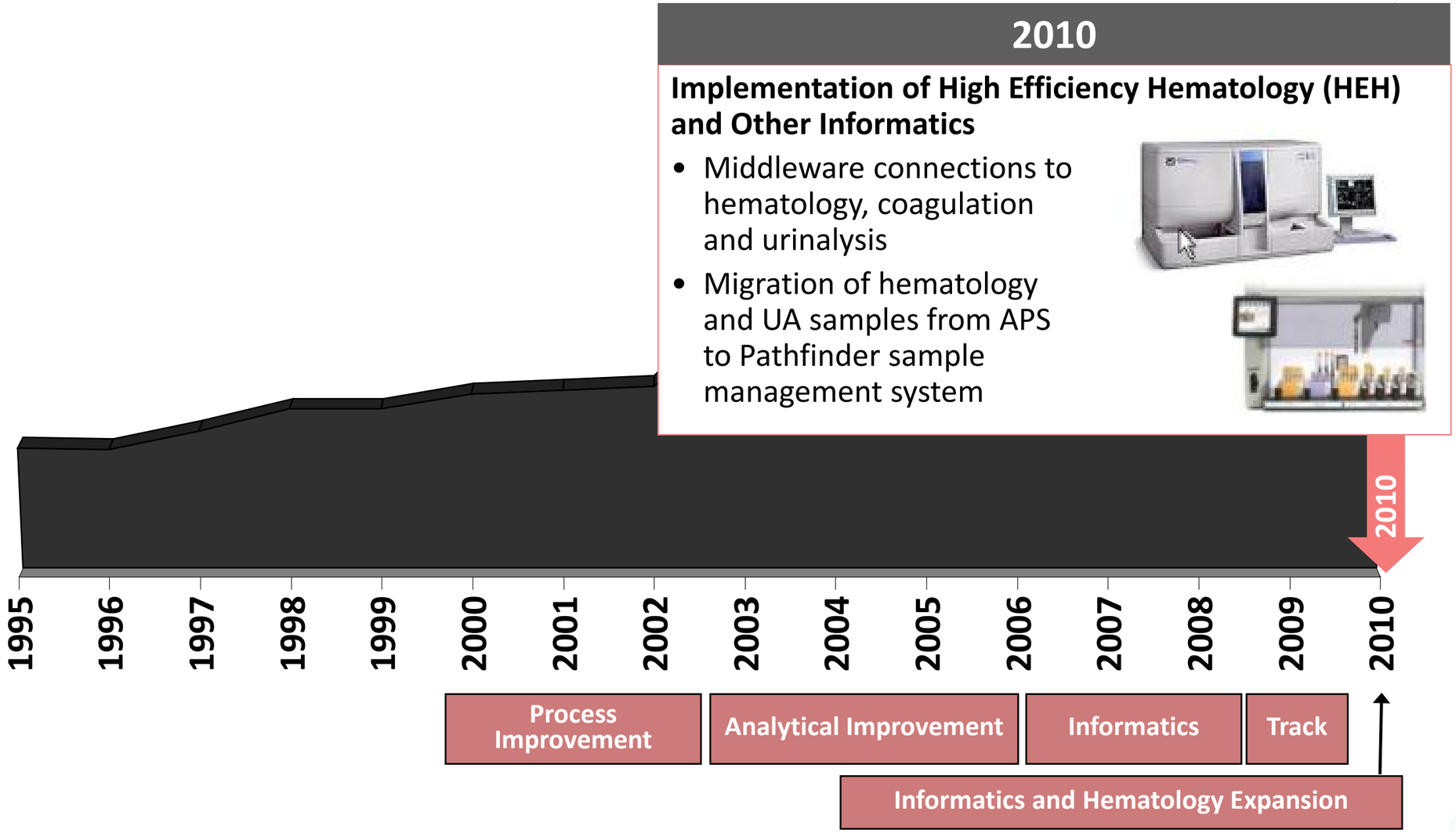
Saint Francis Hospital Laboratory
Striving for Continuous Improvement



Saint Francis Hospital
Choosing the right product - Six Sigma Monitoring

Measurable Quality Results

- Six Sigma Analysis
  - All Assays above 3 Sigma
  - 68% World Class Performance
  - 96% Excellent Performance
  - Allows for QC Optimization

	Total Number	Percentage
Number of Sigma Values above ≥6.0	**21**	**84%**
Number of Sigma Values Between 5.9 - 5.0	**0**	**0%**
Number of Sigma Values between 4.9 and 4.0	**2**	**8%**
Number of Sigma Values above ≤2.9	**2**	**8%**
Number of Sigma Values Between 3.9 and 3.0	**0**	**0%**

Using high quality products allows for fewer re-runs, QC optimization, and higher test confidence

Test	TEa	Units	Control Mean	Bias %	CV %	Sigma	Rules	NOPSx	NOPSy
Albumin	10%	g/dL	2.73	-0.73	1.39	6.7	1:3s N=2	13.9	7.3
Alk Phos	30%	U/L	103.43	0.92	1.85	15.8	1:3s N=2	6.2	3.1
ALT	20%	U/L	97.11	3.39	1.52	10.9	1:3s N=2	7.6	16.9
Amylase	30%	U/L	70.79	-2.47	1.04	26.5	1:3s N=2	3.5	8.2
AST	20%	U/L	35.71	3.24	1.69	9.9	1:3s N=2	8.4	16.2
Bili D	44.5%	mg/dL	0.54	-1.83	8.83	4.8	1:2.5s N=2	19.8	4.1
Bili T	**32.52**	mg/dL	1.23	-2.38	11.29	2.7	1:3s/2:2s/R:4s/4:1s/8:x N=2 R=4	0.3	0.1
Calcium	8.29%	mg/dL	12.41	-0.76	0.91	8.3	1:3s N=2	11.0	9.2
Chloride	5%	mmol/L	99.38	0.30	0.66	7.1	1:3s N=2	13.2	6.1
Chol.	10%	mg/dL	258.11	-1.87	0.88	9.2	1:3s N=2	8.8	18.7
CK	30%	U/L	513.01	-0.24	1.02	29.3	1:3s N=2	3.4	0.8
CO2	25%	mmol/L	28.44	-0.59	3.87	6.3	1:3s N=2	15.5	2.4
Creatinine	**37.04**	mg/dL	0.81	-1.22	1.85	19.4	1:3s N=2	0.0	0.0
GGT	23%	U/L	34.29	-9.48	2.06	6.6	1:3s N=2	8.9	41.2
Glucose	10%	mg/dL	84.08	-1.86	1.33	6.1	1:3s N=2	13.3	18.6
HDL	30%	mg/dL	73.95	-4.49	3.50	7.3	1:3s N=2	11.7	15.0
Lipase	37.88%	U/L	65.04	-3.86	4.10	8.3	1:3s N=2	10.8	10.2
Magnesium	25%	mg/dL	1.96	5.68	3.18	6.1	1:3s N=2	12.7	22.7
Phosphorus	10.11%	mg/dL	2.90	-1.02	1.43	6.4	1:3s N=2	14.1	10.1
Potassium	**12.63**	mmol/L	3.96	0.64	1.49	8.1	1:3s N=2	0.1	0.1
Total Protien	10%	g/dL	6.75	-1.10	0.98	9.1	1:3s N=2	9.8	11.0
Sodium	3.59%	mmol/L	124.50	0.42	0.75	4.3	1:3s/2:2s/R:4s/4:1s N=2 R=2	20.8	11.6
Triglycerides	25%	mg/dL	189.15	-3.68	1.33	16.0	1:3s N=2	5.3	14.7
Urea (BUN)	9%	mg/dL	47.88	-2.45	2.20	2.98	1:3s/2:2s/R:4s/4:1s/8:x N=2 R=4	24.4	27.3
Uric Acid	17%	mg/dL	4.21	-0.36	1.23	13.6	1:3s N=2	7.2	2.1

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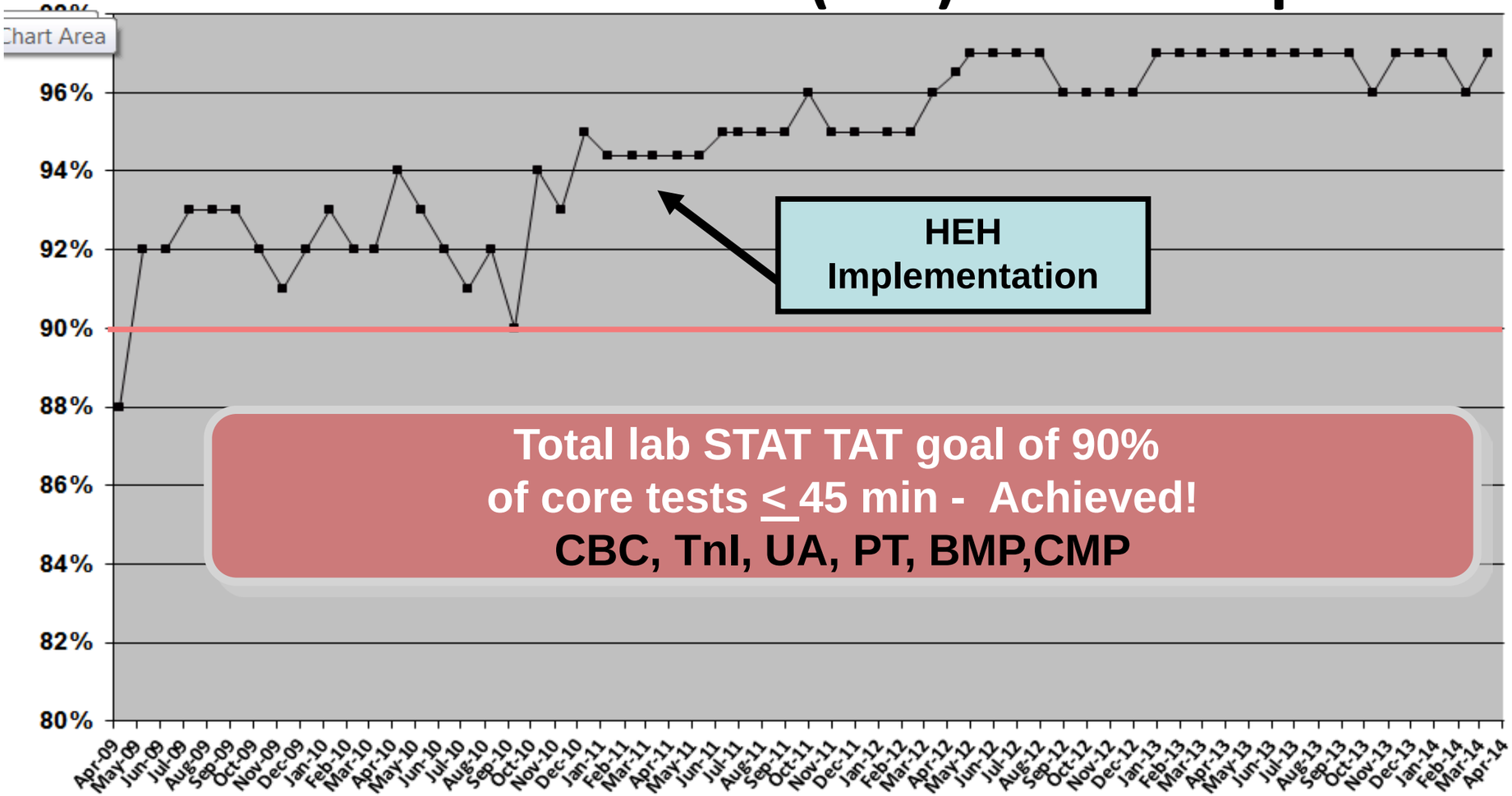
Saint Francis Hospital
Saint Francis STAT TAT Improvements

STAT Turn Around Time (TAT) Goal Compliance



*Data from April 2014 weekdays

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Saint Francis Hospital

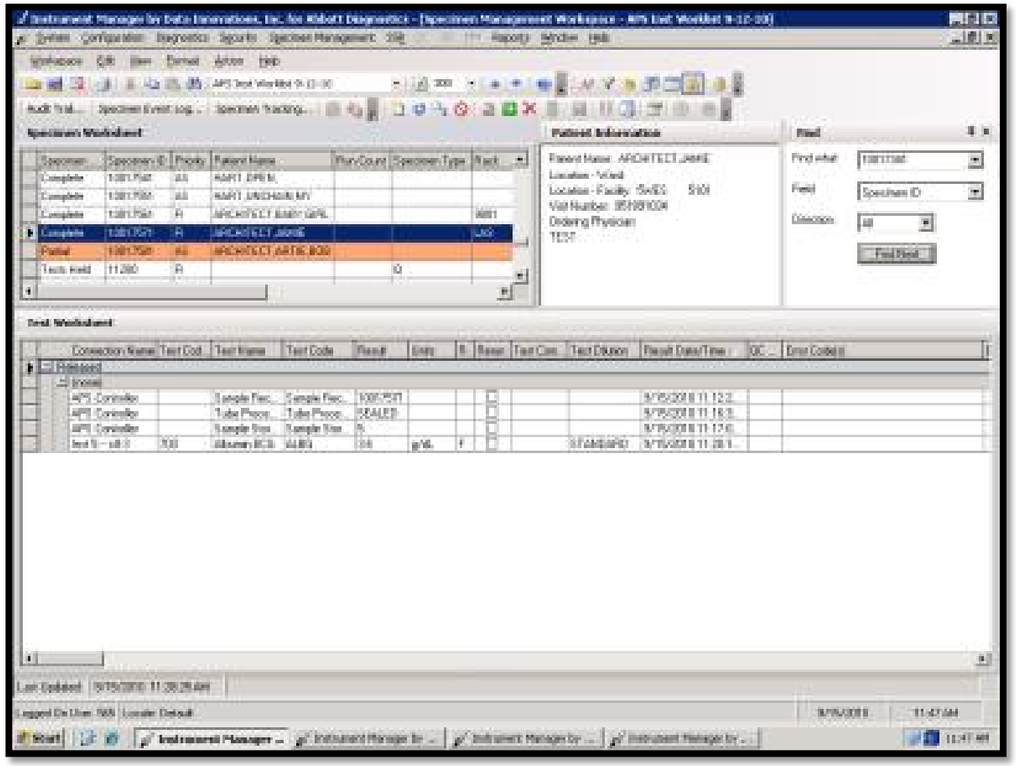
Rule-based Auto Verification Speeds Up Patient Result Time

Outpatient Auto Verification Rates

*Data from March 2014 weekdays

Hematology **91.0%**

Immunochemistry **85.0%**



Once you have confidence in results, you can automate delivery to reduce manual operation time

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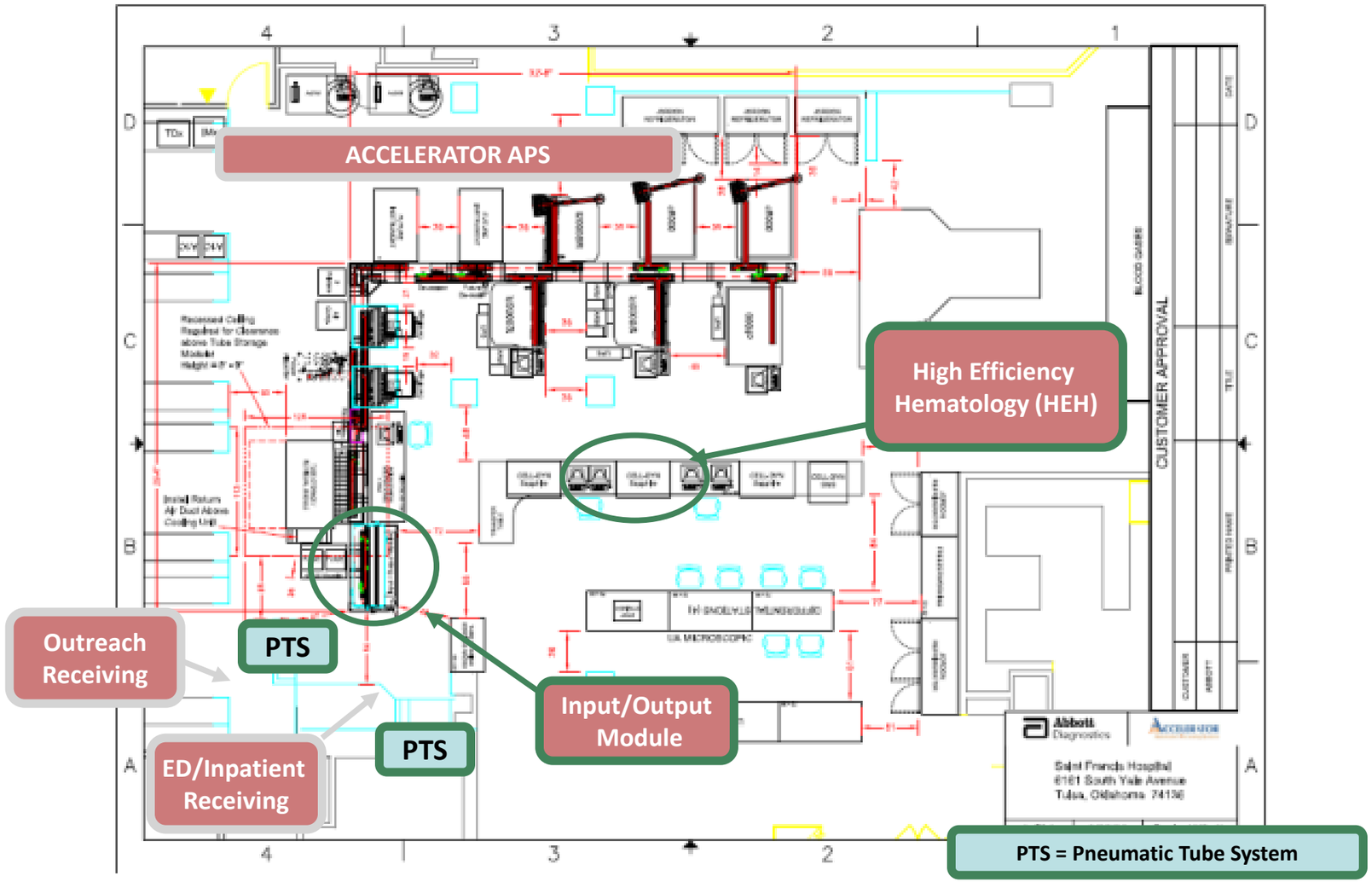
Solving for Scarcity in Complexity

COMPLEXITY

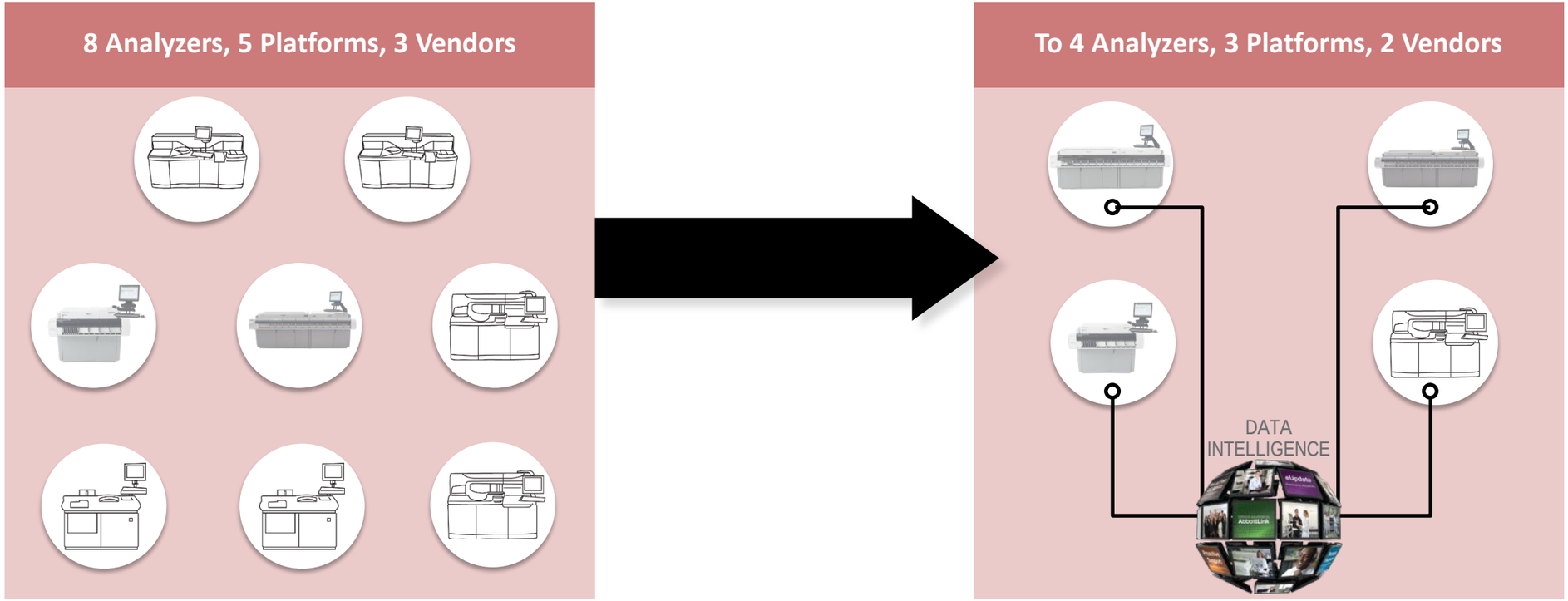
Saint Francis Health System

Saint Francis Hospital
Saint Francis Lean Layout Implementation



Saint Francis Health System

Saint Francis Hospital Laboratory
Cleaning House: removing complexity that built over time



Multiple platforms
- More training
- More inventory
- More contracts
- Higher total vial TAT

Reduced Platforms
- Removing the complexity that built over time
- Simplifies Operational Metrics
- Improves Morale

Health System SaintFrancis

Process Inefficiencies
Inventory Management Prevailing Issues

- Personnel Time Costs
  - Too much time spent ordering and managing inventory
  - Products delivered with little or no vendor notification
  - Manual check-in / check-out processes lead to errors in inventory levels

- Manual Process Error Costs
  - Frequent, time-consuming demand or physical inventories
    - Required annually and to reconcile discrepant inventory levels
  - Inefficient product usage and waste due to expired material

Current inventory process is manual, time consuming, and inefficient.

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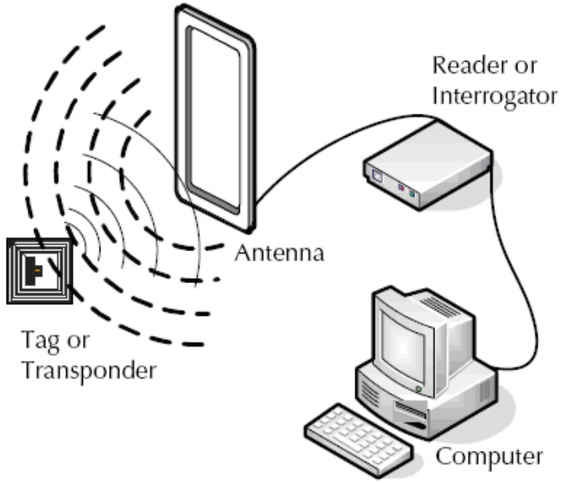
Technology Solution
Inventory Management by Abbott Laboratories



- ***R***adio ***F***requency ***ID***entification (RFID)
  - Provides a unique identifier for each tagged item
  - Requires no direct line-of-sight (LOS)

- Benefits when used in Saint Francis:
  - Avoid preventable stock outs (save money on send out costs)
  - Track inventory levels (save money on overnight shipping)
  - Track product expiration (save money on expired products)
  - Lab staff utilization (less time managing inventory)
  - Improve employee moral (reduction of mundane tasks)

Saint Francis Health System

Outcomes

Initial Savings of $296k and annual savings of $169k (ROI < 6 months)

$38.6 k
Savings in Annual Cycle Count Costs

$26.6 k
Annual Savings in Overnight Shipping

$296 k
Reduction in Inventory On Hand

$35.1 k
Annual Savings from Drop in Handling Time**

$68.3 k
Annual Savings from Reduction in Inventory Error Rate* (27% to 1.1%)

****Hands on Handling**
Annual Labor Hours: 1,219
$ Amount: $35,121

***Inventory Error Rate**
Expired Stock on Hand: $33,242
Urgent Order Costs: $15,836
Out of Stock Losses: $19,269

Saint Francis Health System

Increasing Amounts of Data
Driving Operational Productivity and Throughput Optimization

Too much time spent analyzing reports when faced with:

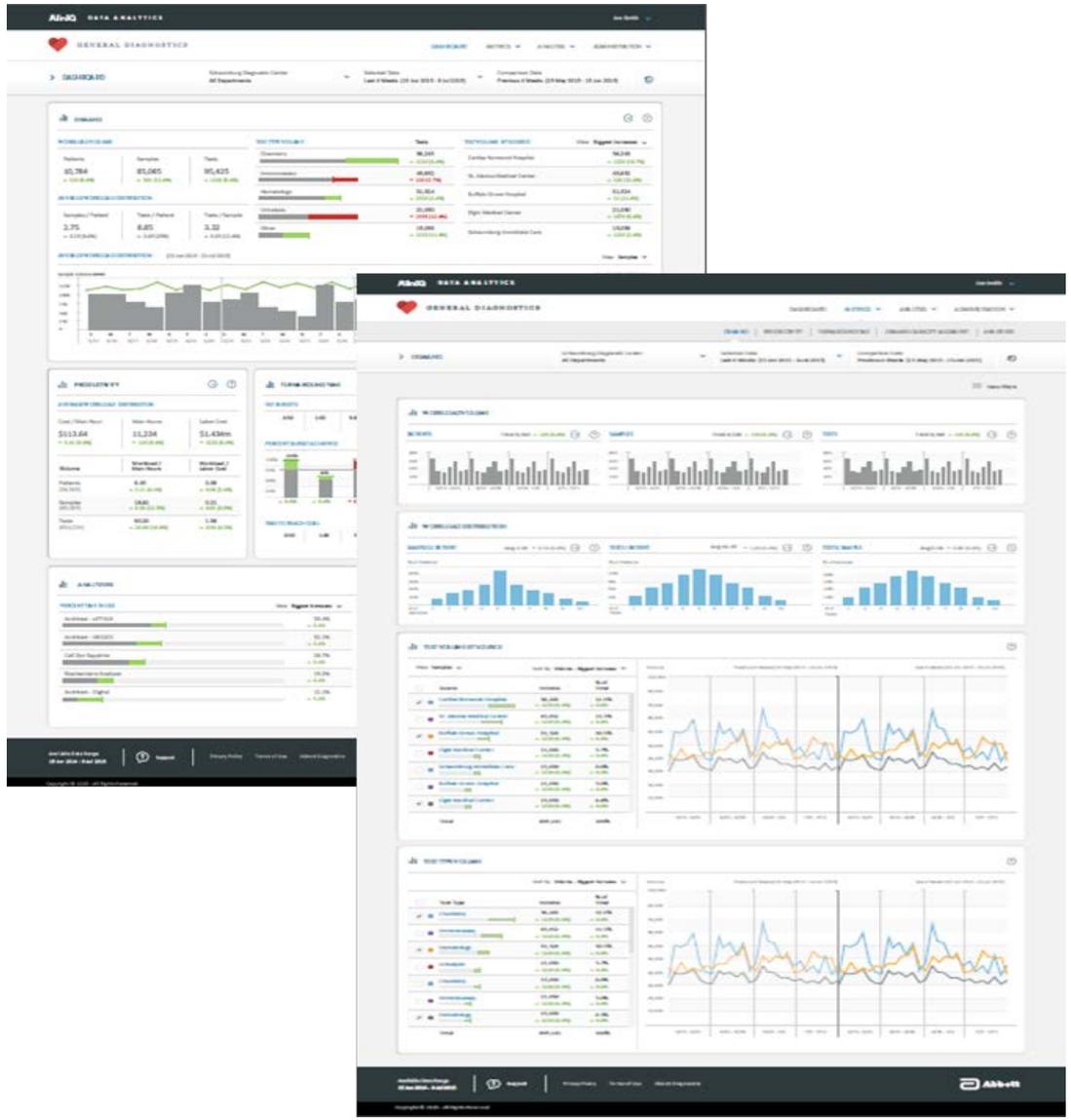
- Flat Budget
- Maximizing Capacity
- Optimizing Labor Intensive Processes
- Maintaining High Quality Standards and Service
- Making a Positive Contribution to the Broader Healthcare Organization

Measuring what matters most to make an organizational impact

SaintFrancis Health System

Data Driven Insights

Business Intelligence Solution by Abbott Laboratories



AlinIQ BIS measures and monitors our performance against KPIs and key targets through 5 indicators

- Demand
- Productivity
- Turnaround Time
- Demand Capacity Alignment
- Analyzer Time in Use

Benchmark reports will compare standard Key Performance Indicators (KPIs) against our peers

Health System SaintFrancis

Five Indicators
Identify Issues and Plan for Improvement

DEMAND: The primary driver of both lab costs and income. Learn whether workload metrics are in line with expectations.

PRODUCTIVITY: The output of your lab's resources. Determine effectiveness of applied resources and monitor the impact of efficiency improvements.

ANALYZER TIME-IN-USE: Understand the operating patterns of primary analyzers. Quickly and easily see changes in analyzer use patterns and take action.

TURNAROUND TIME (TAT): An indication of your lab's ability to consistently deliver results. Work more closely with clinicians to better define required service levels, and report how your lab is delivering against these goals.

DEMAND CAPACITY ALIGNMENT: Measures the degree to which resources are aligned to the true workload demand of the lab. Determine necessary improvements in workforce scheduling and equipment capacity to deliver agreed-upon service levels with an optimized mix of resources.

In-depth reports that allow you to dig deeper and identify root cause of issues

Solving for Scarcity in Complexity

IMPROVING RESOURCE UTILIZATION

Saint Francis Health System

Saint Francis Hospital Laboratory
Leveraging New Technology to Solve Old Problems

Informatics & Automation creates new efficiencies in processes and systems

- Solution:
  - Visualization of complex data to improve efficiency and quality of results
    - Trends - Moving Averages
    - Remote instrument performance monitoring
    - Real time QC monitoring
    - Monitoring of Analyzer and Assay Performance using Sigma Metrics
    - Inventory Management

- Outcomes
  - Improved resource utilization and employee morale
    - Automated manual processes
    - Error reduction
    - Sustainable peak performance
    - Product loss reduction

Bottom line: Informatics & process automation optimizes manual or already efficient structures

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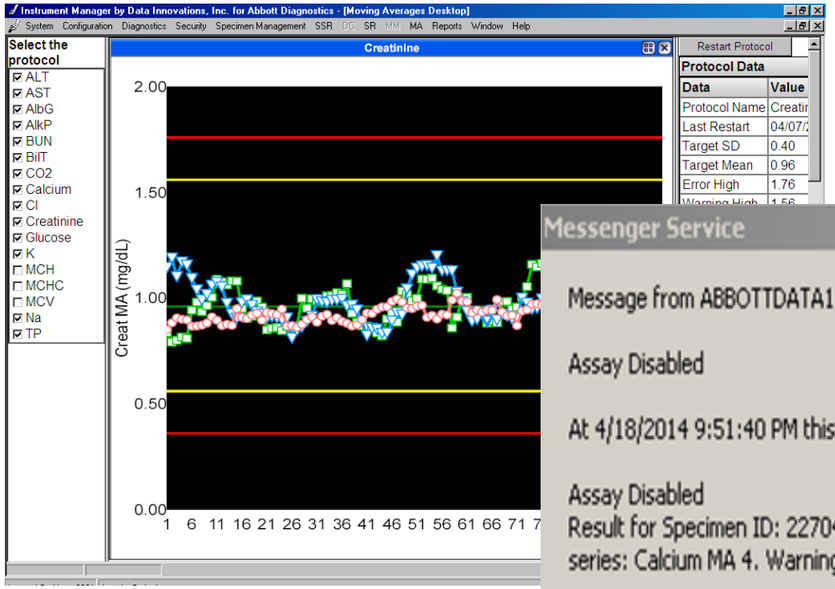
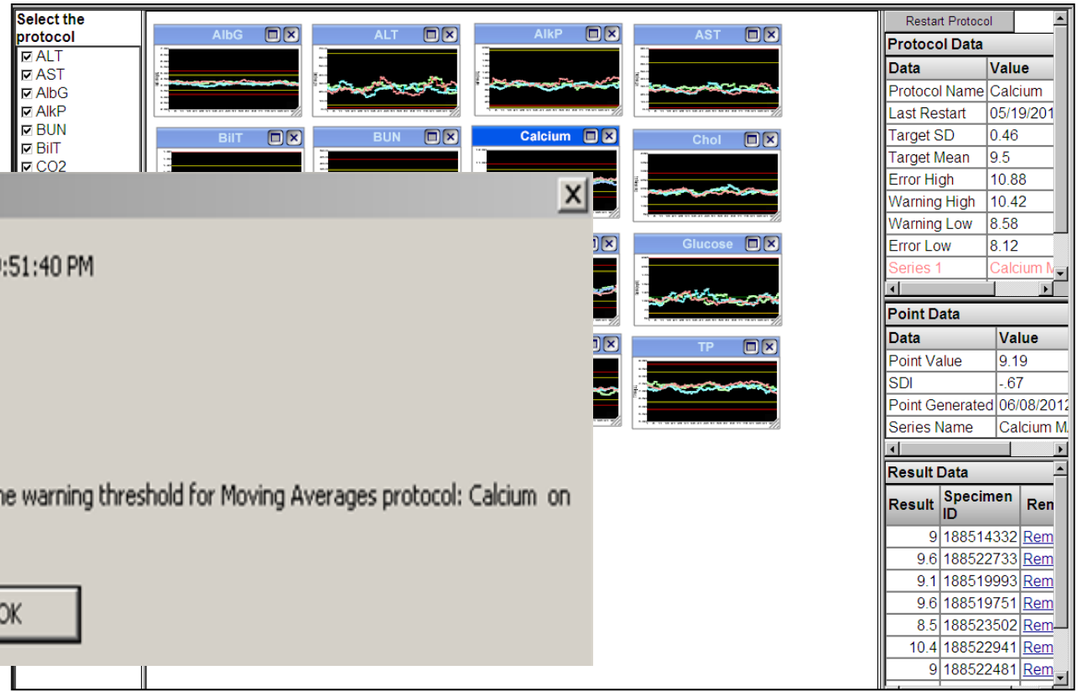
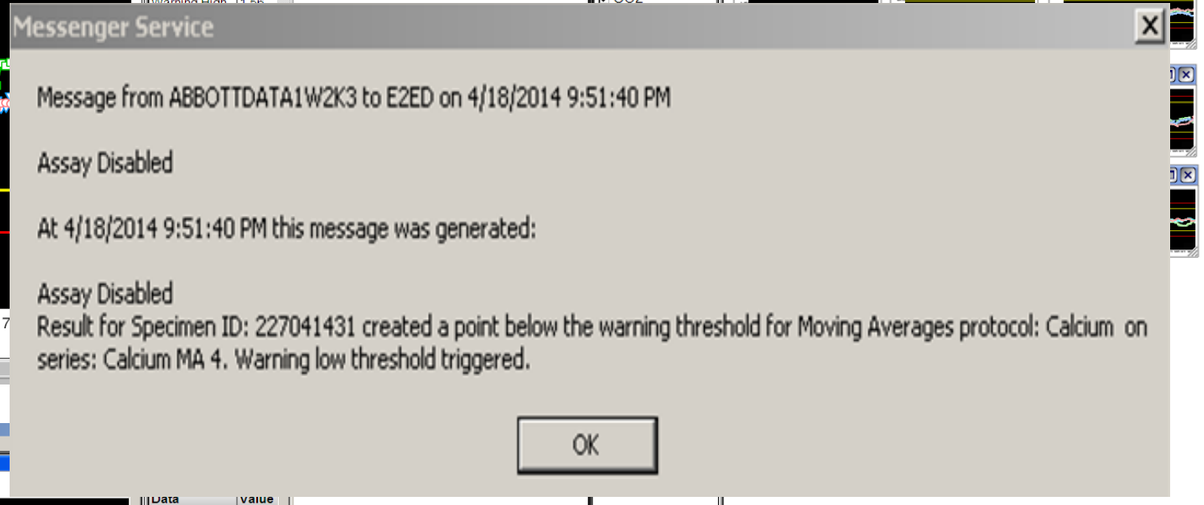
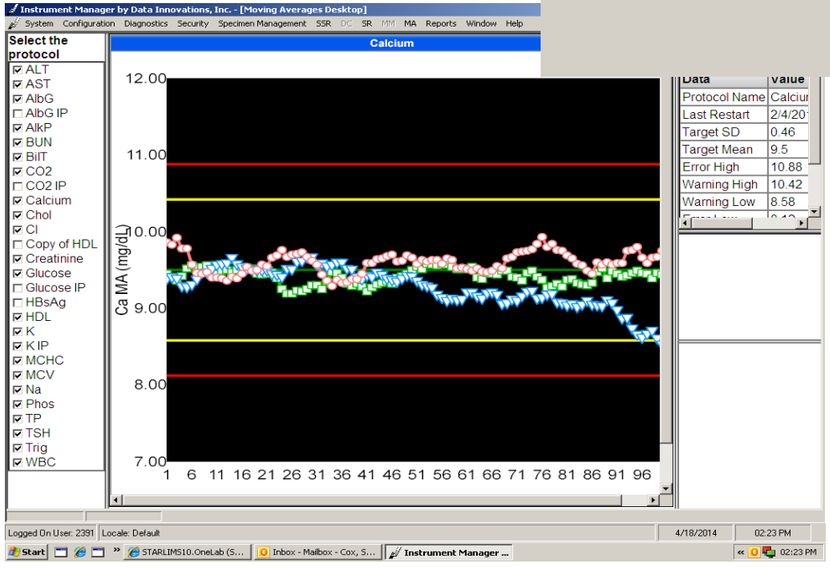
Saint Francis Hospital

Informatics: Visualization of Quality Trends – Moving Averages









To maintain quality, visualizing trends allows identification of performance issues before they impact patient results

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Saint Francis Hospital
Informatics: Automated Proficiency Test Reporting

E-Lab Solutions Connect

- Inventory Manager passes results from ARCHITECTs to CAP
  - Saves time
  - Reduces manual errors

Run proficiency testing like a patient sample

"What used to take **four hours**, now takes **two minutes**."

– Mark Shearer, MCLT, MT(ASCP)
Director of Chemistry, CompuNet Clinical Laboratories

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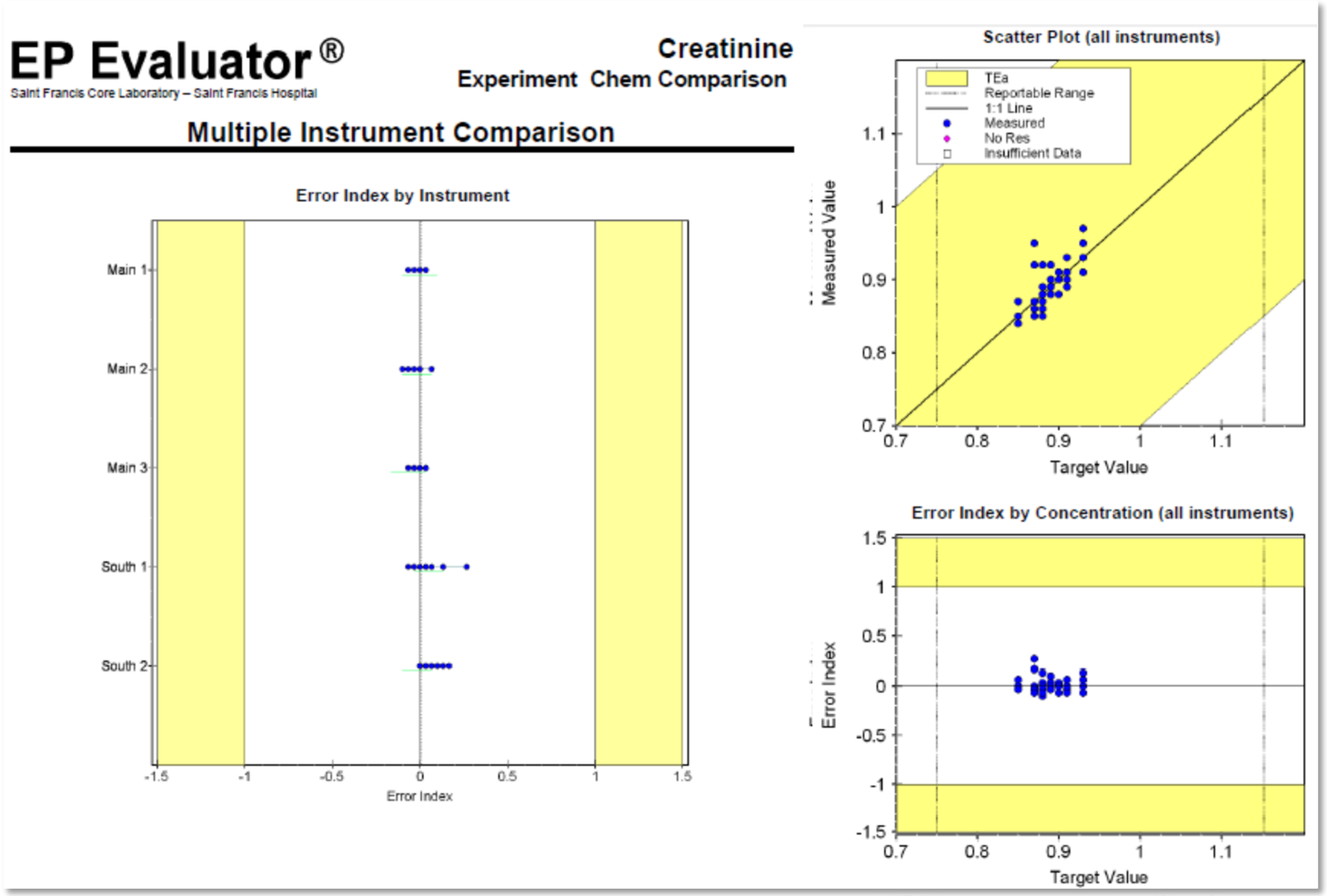
QC Management – Instrument Correlations with EP Evaluator

- Instrument Correlations
  - Visual representation of instrument performance
  - Allows rapid understanding of issues and where to correct



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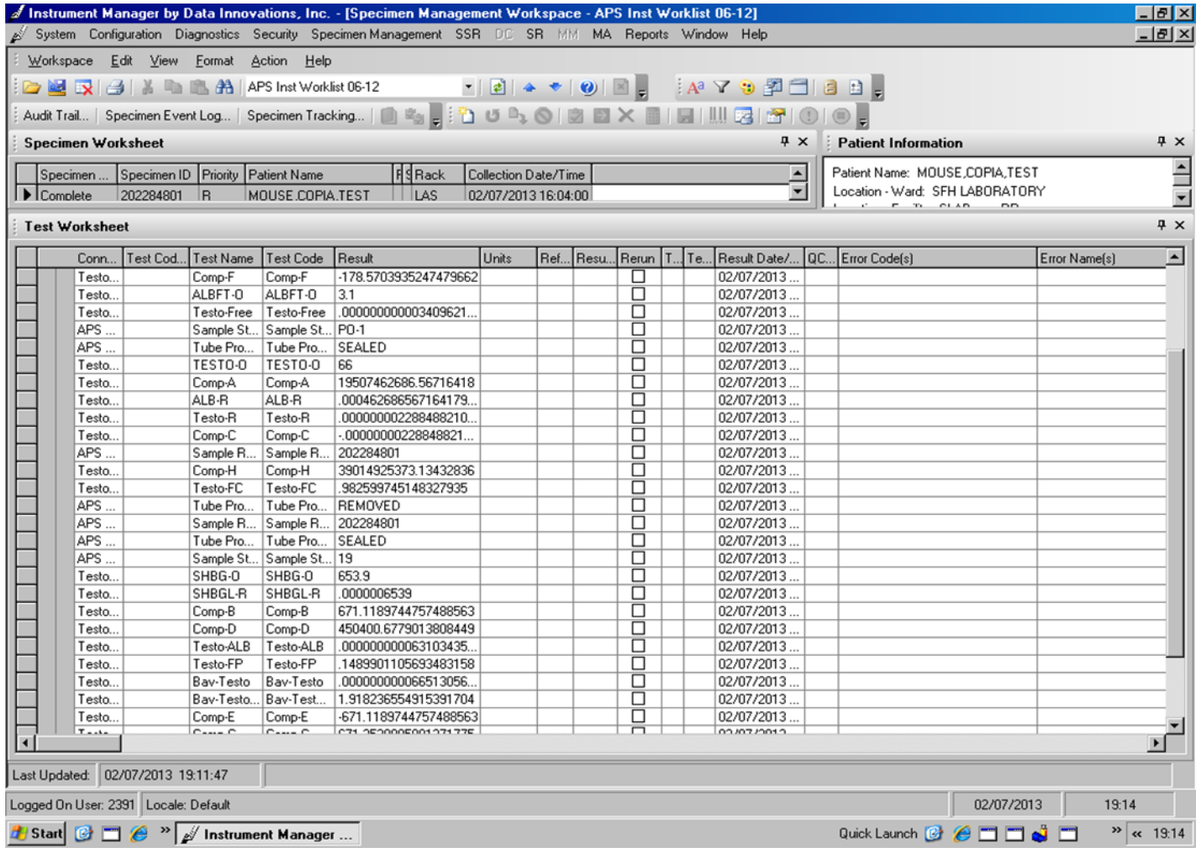
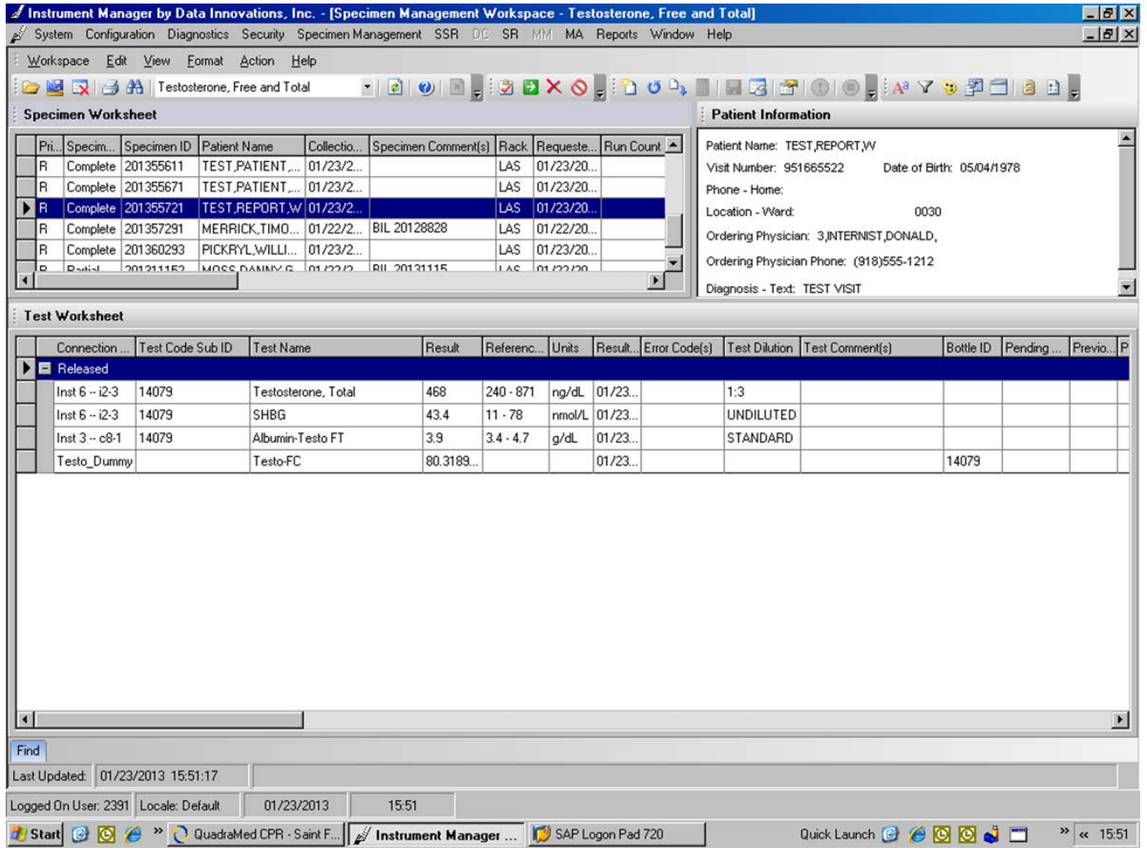
Instrument Manager Algorithm Utilization

Use of Complex Quadratic Equation Algorithm





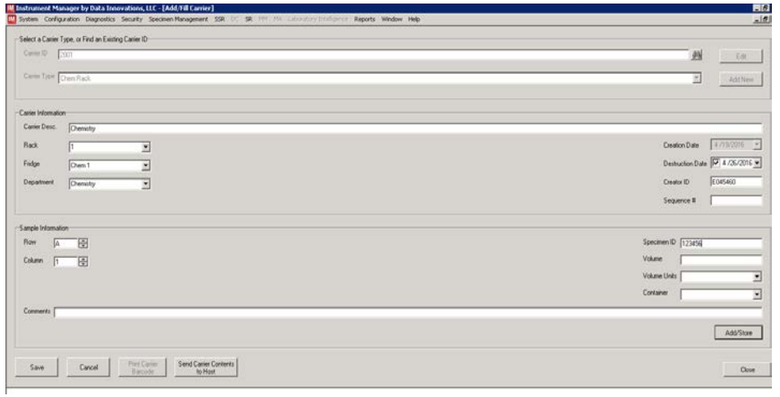
Example: Free Testosterone Automatically Calculated

MS_11_18463/v1

Saint Francis Hospital
Instrument Manager – Storage and Retrieval

- Previous
  - spent $5K per year for a 3rd party offline storage software package
- Current
  - Offline store about 6,000 tubes, urine cups, jugs, etc. of samples in all our labs across the health system.
  - IM contains a module called SSR that will accomplish this task.

Savings of $5,000 simply by utilizing software and capabilities we already have



Specimen Screen

Lookup Screen

MS_11_18463/v1

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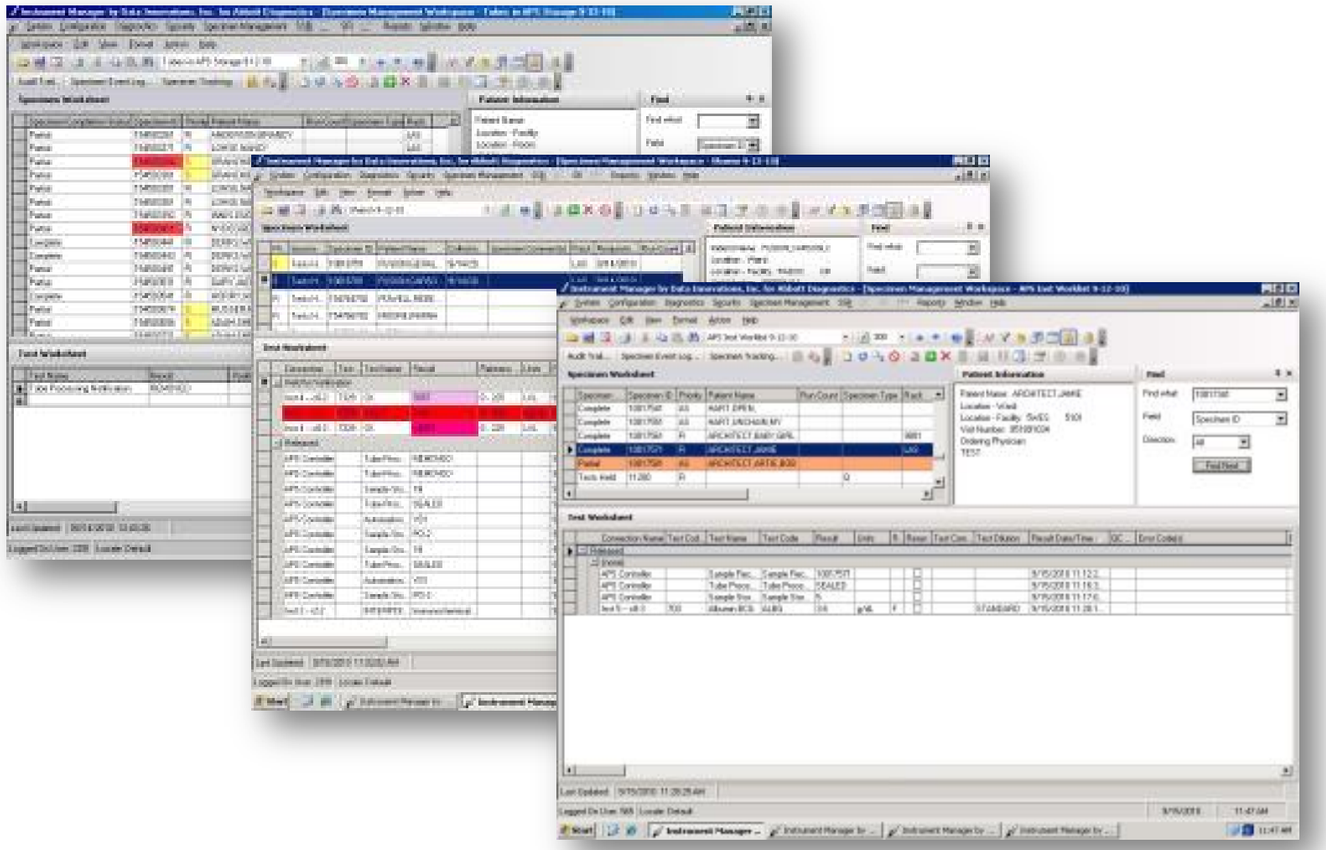
Automated QC Management – Unity Real Time

- Unity real time
  - A QC data management tool for
    - regulatory compliance
    - statistical process control with audit trails
  - Allows for automatic operation action if QC is out of range



Quality is maintained by operational warnings and stops so fast action can be taken

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Saint Francis Hospital
Quality Results with Dashboard

- Dashboard
  - Key quality indicators at a glance
  - Color guides provide immediate indications of status

Dashboards and reports allow for faster trouble shooting to ensure quality operation

Saint Francis Hospital
May 2012

Core Lab Daily Dashboard Report

Legend
- More than 10% away from Threshold
- Within 10% of Threshold
- Threshold Met

Performance Measure	8	9	10	11	12	13	14	15	16	17	18	19	20	24	25	26	27	28	29	30	31	Monthly
Stat Turnaround Time																						
Complete Blood Count	94%	96%	97%	97%	93%	91%	89%	1	94%	95%	96%	93%	96%	97%	95%	91%	91%	92%	97%	97%	96%	95%
PT-INR	100%	96%	100%	99%	96%	96%	96%	1	100%	96%	100%	97%	97%	100%	94%	97%	100%	96%	100%	100%	100%	99%
Urinalysis	100%	96%	99%	99%	96%	100%	96%	1	100%	97%	96%	100%	93%	90%	87%	100%	96%	96%	99%	100%	100%	97%
Comprehensive Metabolic Panel	96%	96%	93%	96%	92%	93%	97%	1	96%	93%	93%	91%	96%	94%	96%	96%	93%	96%	96%	96%	96%	96%
Troponin	96%	100%	96%	96%	94%	96%	100%	1	96%	96%	100%	94%	93%	92%	100%	93%	91%	94%	100%	93%	96%	97%
Total STAT Turnaround Time	96%	96%	96%	96%	96%	97%	97%	1	96%	97%	96%	96%	93%	96%	93%	91%	96%	96%	99%	93%	96%	97%
																						96.8%
Median STAT Turnaround Time																						
Complete Blood Count	6	6	6	5	7	6	11	6	7	5	6	6	5	7	7	8	8	5	6	5	7	6
PT-INR	14	13	12	13	13	14	15	12	15	15	14	14	14	14	13	15	14	14	14	15	15	14
Urinalysis	8	9	10	9	9	8	12	9	11	13	10	9	8	14	13	8	7	9	11	12	9	11
Basic Metabolic Panel	19	20	22	21	19	19	22	21	20	21	19	23	22	25	20	29	21	19	20	22	19	21
Comprehensive Metabolic Panel	24	23	22	23	24	23	23	23	25	24	22	23	23	24	22	23	22	21	24	24	23	23
Troponin	25	25	24	25	25	25	25	25	26	24	24	27	25	26	24	26	25	24	25	24	25	25
Routine Turnaround Time																						
Complete Blood Count	16	19	16	17			30	25	19					18	20				20	15	1	19
Comprehensive Metabolic Panel	17	15	15	15			16	17	16					16	15				16	17	16	16
Thyroid Stimulating Hormone	33	33	34	34			33	33	36					34	33				34	33	35	34
PT-INR	56	60	46	49			66	52	57					57	57				51	66	60	57

STAT TAT % Compliance

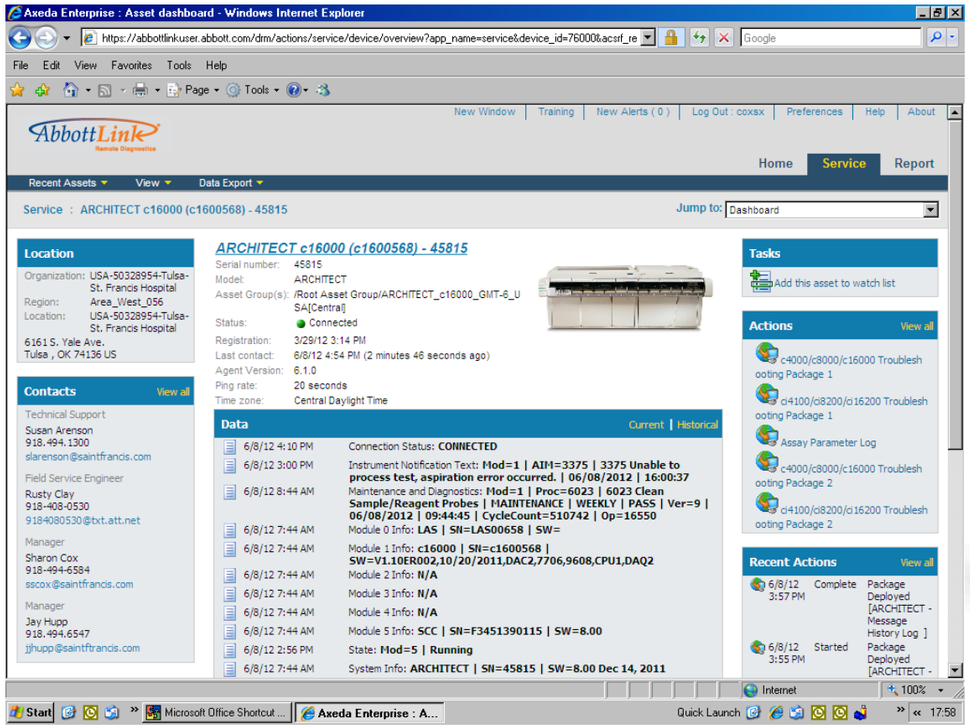
STAT Median TAT

Routine Median TAT

Saint Francis Health System

Saint Francis Hospital
Remote Analyzer Monitoring

- Remote monitoring
  - Easy to access web portal
  - Instrument error messages
  - Maintenance performance
  - QC and Calibration Failures

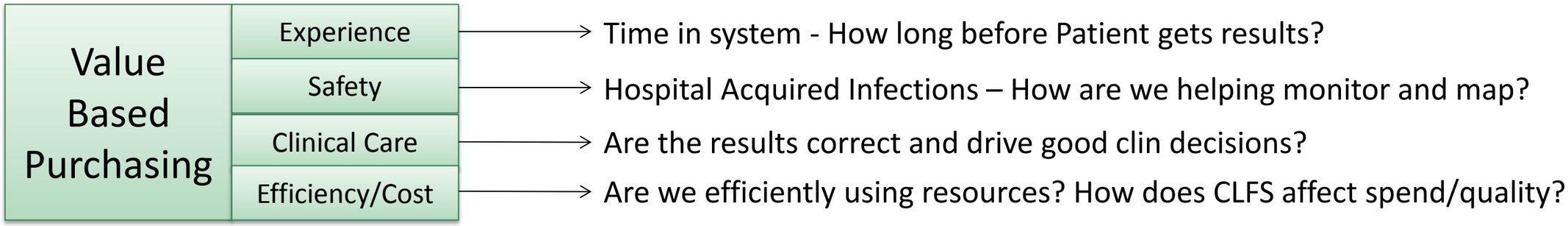


Laboratory management can now check the quality of operations anywhere

Saint Francis Health System

Saint Francis Hospital
ACA – the LAB impacts the ACA!!!

A short shout out to ACA as we look forward:



Saint Francis Health System

Saint Francis Health System
Clinical Excellence

2011, 2012 and 2013 Awards
Clinical and Emergency Excellence

- Recipient of HealthGrades Distinguished Hospital Award for **Clinical Excellence** and **Emergency Medicine Excellence**
  - Only hospital in Oklahoma to earn the award in 2011, 2012 and 2013
  - One of only 269 hospitals in the country!
  - Top 5% of hospitals in the U.S. in emergency medicine
- Received the most “5 Star” ratings (12) in the state of Oklahoma in HealthGrades’ 2011 ratings
- Received PRC “5 Star” rating for **Medical Staff Satisfaction** for laboratory services
- Received PRC “5 Star” rating for **Patient Satisfaction** for inpatient care at Children’s Hospital and NICU

Saint Francis Health System

THANK YOU!

Saint Francis Health System