Intersection of LEAN and the LIS

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Agenda

- Manufacturing Mindset
  - LEAN Principles in the Lab
- Six Sigma Methodology
  - Role of LIS in DMAIC
- LEAN Redesign at Florida Hospital
  - Focus Areas and Tools Used
  - Process and Software Utilized
- Results
  - Improvement metrics
  - Controls in place
  - Advice for those just embarking on LEAN in the Lab

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A Manufacturing Mindset in the Lab

LEAN Principles

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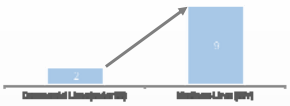
Laboratory Medicine faces production pressure

- Increase in lab tests with age and aging population are leading to expected increase in number of tests performed per year (increasing demand)
- Coincides with a decrease in the number of technologists in the field – average med tech age is +50 and retirements expected. Meanwhile, less techs coming on board (decreasing supply)
- Labs will be tasked with managing workflow shortages while growing business and maintaining TAT
- Efficient processes and automation are needed to meet the demand with less resources

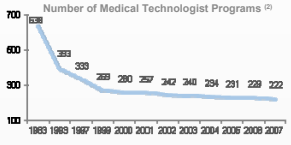
A Robust Workflow Excellence Solution is Key to Ensuring Reliable Collection and Management of Lab Data

Lab Tests Per Person Per Year (1)



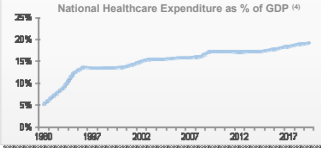
- Utilization of lab tests increases dramatically for 65+ year old people
- 80 million baby boomers today are rapidly advancing into this age cohort

Number of Medical Technologist Programs (2)



- The U.S. is graduating 30% fewer lab practitioners than 10 years ago and 50% fewer than 20 years ago (3)
- Shortage of medical lab personnel demonstrates an urgent need for continued improvement in workflow automation

National Healthcare Expenditure as % of GDP (4)



- Rising U.S. healthcare costs continue to put pressure on hospitals to:
  - Maximize efficiency by increasing adoption of automation
  - Improve the quality of care in order to hold down overall healthcare costs

(1) Source: Opening keynote at the Executive War College, April 2010, by Robert Michel.
(2) Source: National Accrediting Agency for Clinical Laboratory Sciences.
(3) Source: American Society for Clinical Pathology.
(4) Source: CMS.

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An efficient laboratory workflow is critical

Order → Specimen Collection → Accessioning and Planning → Analysis → Results and Reporting

Clinical Workflow?

Or “manufacturing” workflow that delivers a clinical product?

- High volume environment
- Quality must be maintained
  - High degree of accuracy required
  - Repeatable process desired

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Manufacturing Mentality

- *LEAN*
  - Identify and reduce *waste*
  - Eliminate *non-value added activities*
  - Improve *responsiveness to the customer, adding value*
  - *Reengineering* labs to optimize workflow
- *SIX SIGMA*
  - Methodology of *Continuous Improvement*
  - Reduce *Cost of Poor Quality*
  - Elimination of *Defects*
  - Minimize *Variation*
  - *DMAIC*: Define, measure, analyze, improve, control

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When to do a workflow Assessment

- Considering
  - Work force reductions
  - Issues with TAT, ED
  - Issues with lost, missing or delayed samples
  - Implementing or removing an automated line
  - New hospital adding on
  - Collection Management systems
  - Growing Outreach

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LEAN Principles

Reduce Waste

•Eliminate Non-value added activities

Reduce Variability

•Demand fluctuations

Reduce inflexibility in labor pool

•Cross-train, plan shifts to peak demand

Instill performance management

•Real time operational metrics

Involve all levels of organization

•Waste-aware workforce with visibility to metrics

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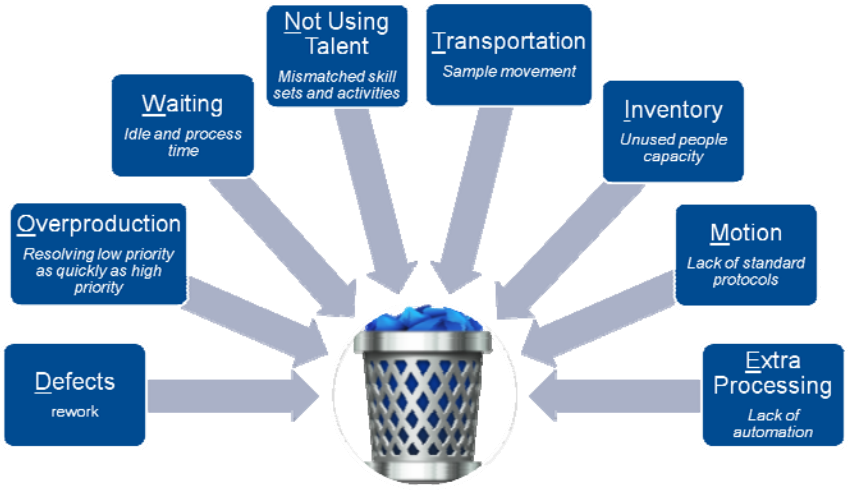
Typical Sources of Waste



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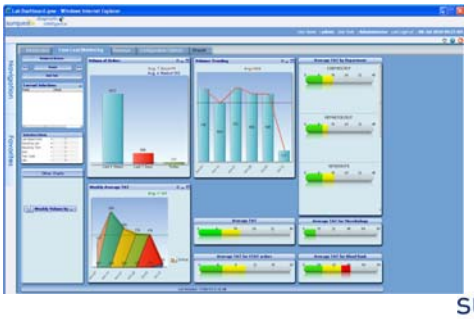
Performance Management

- Identify Trends and Proactively Address
- Data driven decisions
  - Increase organizational transparency
  - Increase patient safety
- Accurate diagnostic KPI tracking
- Real-time alerts



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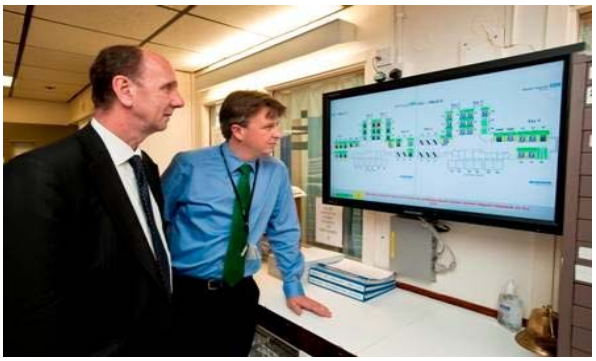
Engage all levels of the organization

- Share the data
- React real time
- Share successes



» Sunquest Diagnostic Intelligence Whiteboard

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Continuous Improvement in the Lab

Six Sigma Methodology: *DMAIC*
Define, measure, analyze, improve, control

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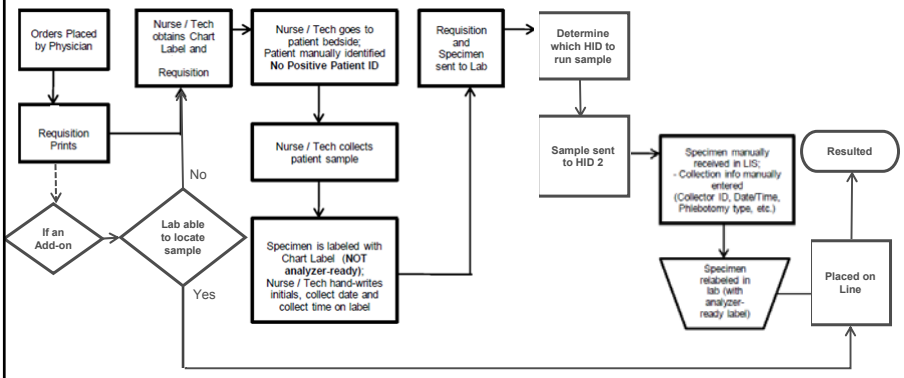
Define



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Measure

- Average TAT per test (mins)
- Specimen Collects
  - Number of specimen collects per day
  - Time spent relabeling
  - Number of labeling errors
  - Number and cost of adverse events due to mislabeling
- Processing
  - Time spent receiving
  - Time spent routing specimens in the lab - per specimen (mins)
- Add-ons
  - # of add-ons needed per day
  - Time spent looking for existing specimen (mins)
  - # of misplaced specimens per day
  - Time spent looking for specimens (mins)

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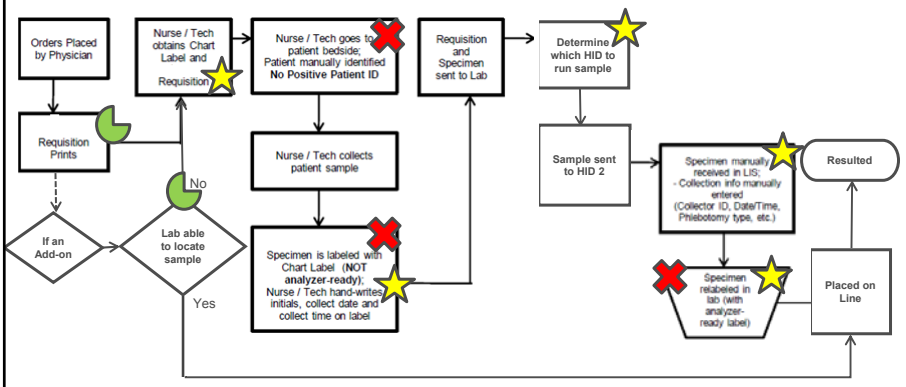
Analyze



Non-value added

Opportunity for error

Wasted time

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Implement changes

- *Integrated Collection Manager*
  - Print instrument-ready labels at bedside
  - Receive immediate alert on hand-held for add-on orders
- *Lab Automation*
  - Integrate Robotic Lines to automatically receive and process
- *Specimen Routing Tracking*
  - LIS determines HID, lab and spot to route the sample
  - Track the location of any specimen at any time anywhere in the lab or enterprise
- *Advanced Accessioning*
  - Enable system to use a foreign barcode for outside samples

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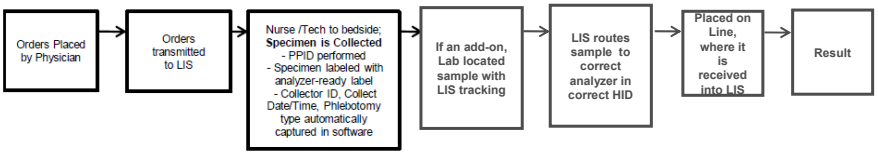
Improve - New Process



- *Efficiencies*
  - *Handling an outside specimen reduced from 5 minutes to 1 minute.*
  - *50,000 outside samples a month = annual benefit over one million dollars.*
- *Quality*
  - *LIS tracking functionality reduced misplaced specimens from 10 a day to 0,*
  - *Eliminated 25 minutes per misplaced specimen previously required to find them*
- *Turn Around Time*
  - *Route optimization resulted in 30% reduction in turnaround times for lab tests*
  - *Added over 40% more capacity as a result, while actually reducing FTE*

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Control

- *Specimen Management*
  - Pre-planning instructions for specimen processing and routing
  - Business Intelligence and Analytics

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LEAN at Florida Hospital

Improved Process and Turn Around Times

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Florida Hospital Orlando

- Part of a 7 hospital system in Central Florida
- FH Orlando >1,000 beds
- Core Lab
- Specialty Laboratories: Micro, Histology, Serology, Infectious Disease, Molecular Diagnostics

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Lean Journey – Why?

- Unacceptable TAT's
  - Major Chemistry, Order to Collect 70 – 80 minutes
  - Hematology, 50 – 60 minutes
- Separate laboratories for Processing, Hematology and Chemistry
- Label driven process in phlebotomy

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Lean Journey – Areas of Focus

- IP Stat TAT
  - Processing
  - Chemistry
  - Hematology
  - Blood Collection

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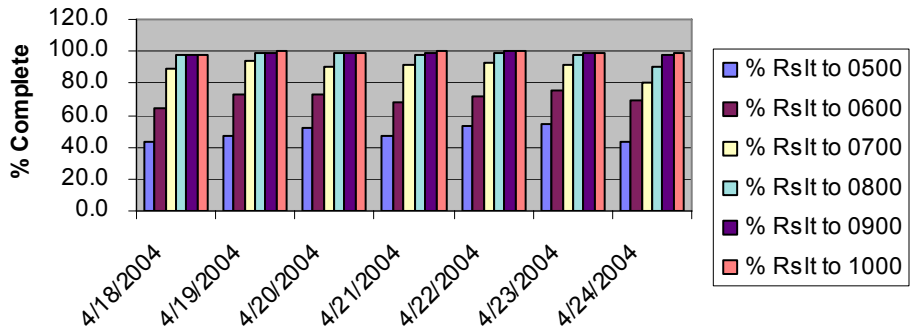
AM Lab Completion (Orlando)



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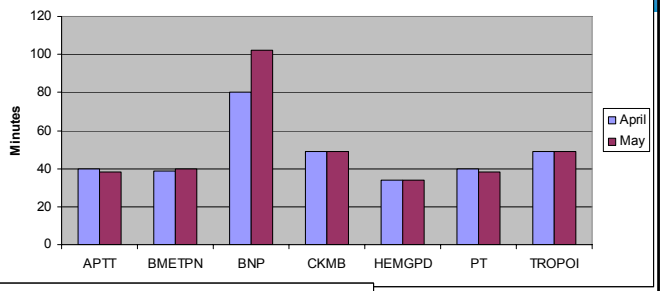
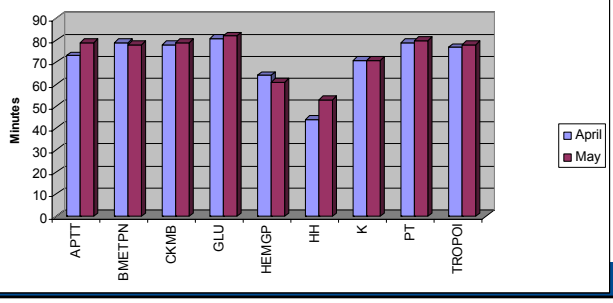
ED TAT Collect to Result Orlando



IP Stat TAT Order to Result Orlando



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Lean Journey – Tools

- Process Flow Mapping (Order to Machine)
  - Phlebotomy
  - Processing
- Spaghetti diagrams
- Video Taping – Product
- 5S and standard workstation
- Standard Work

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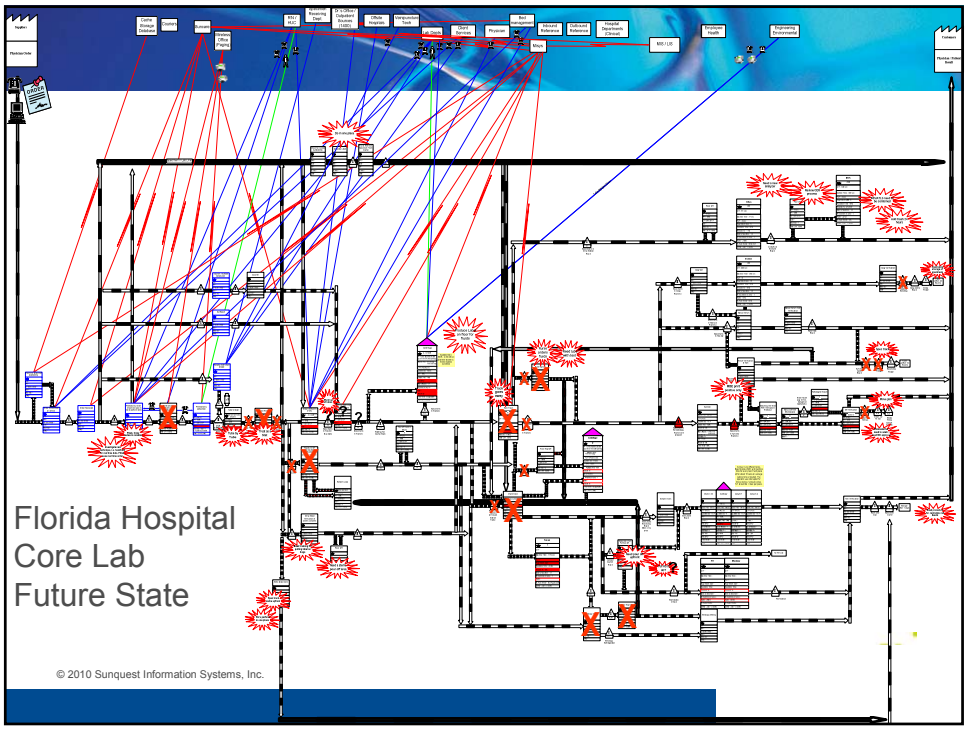
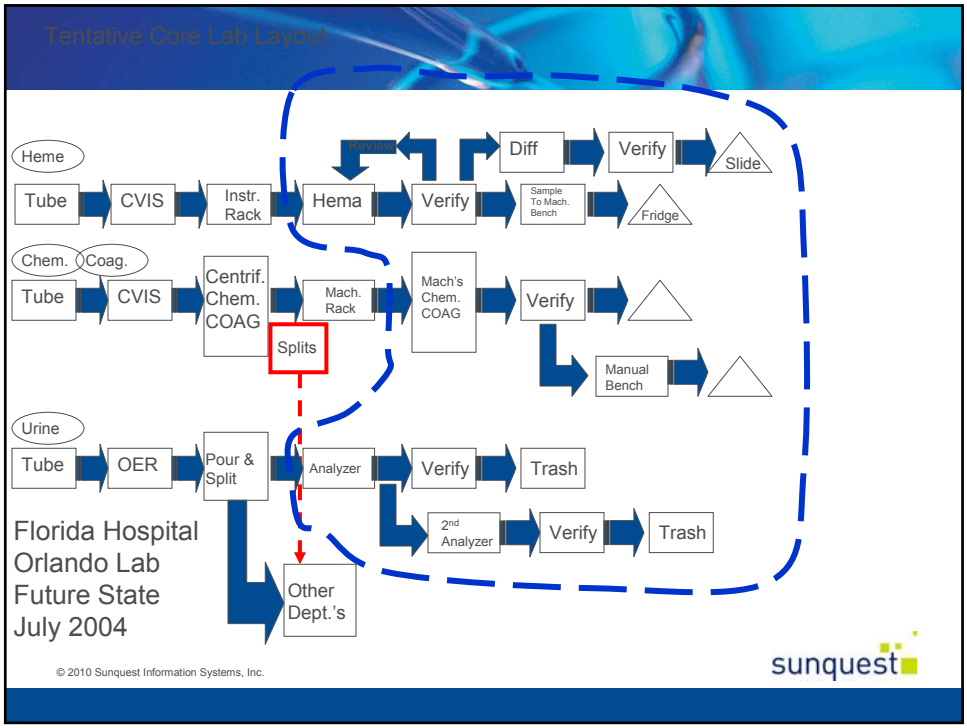


Florida Hospital
Core Lab
Future State



Lean Journey – Tools

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Lean Journey – Focus

- Phlebotomy
  - Reduce waste in wait time process
  - Keep phlebotomist on the floor and eliminate Transport delays (people and label processes)
- Solutions
  - Electronic collection System
  - Real time information to phlebotomist, eliminate walking to lab to get labels/orders
  - Maximize tube system to deliver sample
  - Utilize Single piece Work Flow

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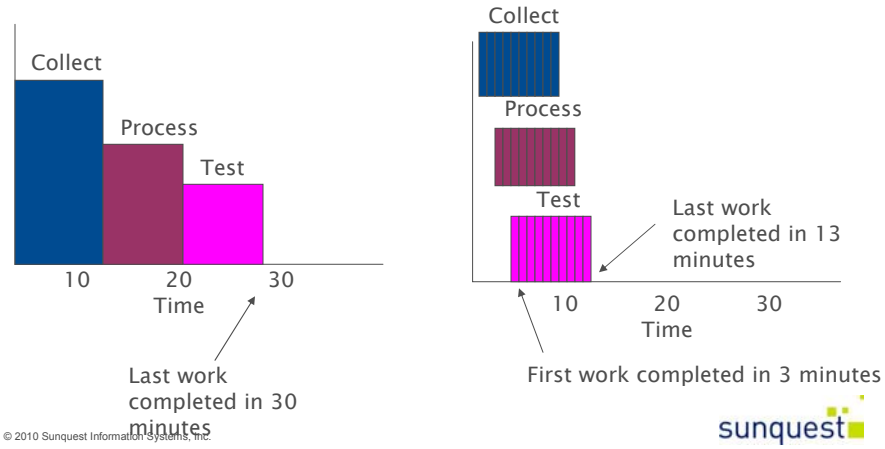
Positive
Patient ID
Bedside
Label Printing

Single piece workflow example



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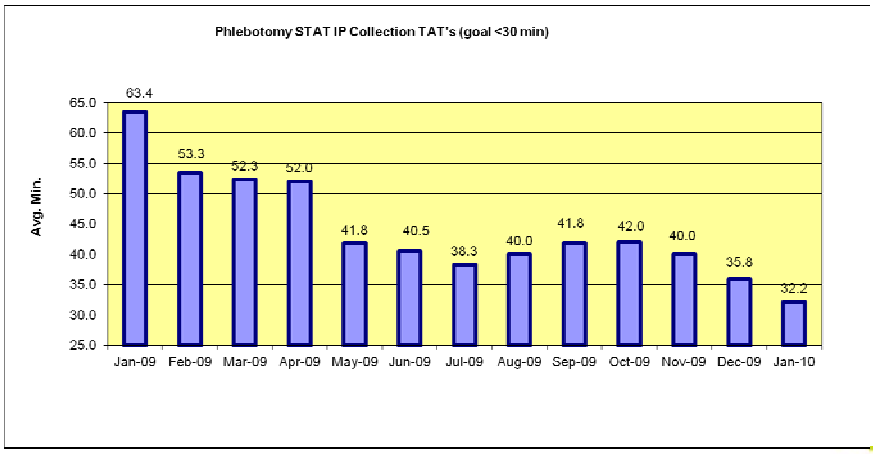
Results – Stat TAT



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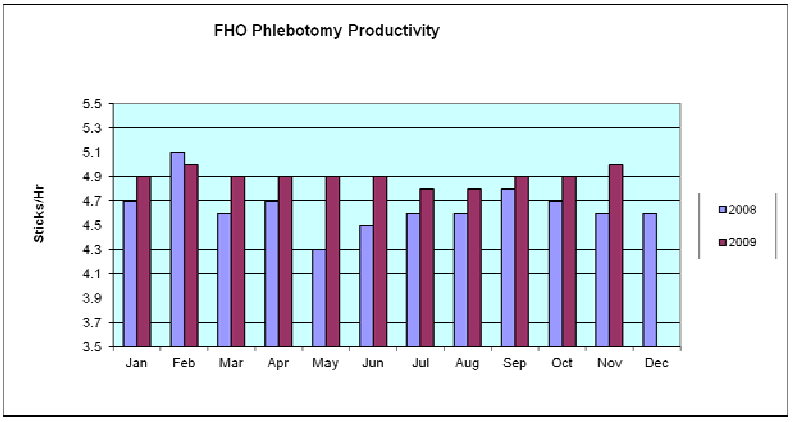
Results – Productivity



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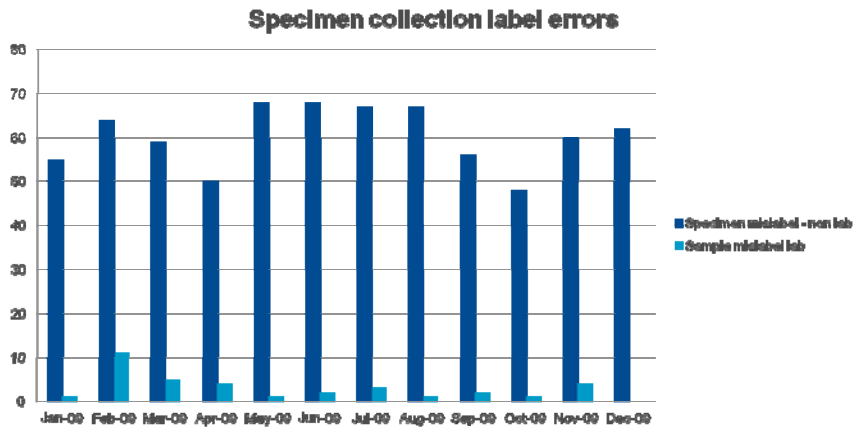
Results - Errors



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Lean Journey – Focus

- Processing
  - Reduce Waste, motion and “tube wait time”
  - Accelerate tube processing and loading of analyzers.
  - Not in scope : Instrumentation
  - Autoverification already being utilized
- Solutions
  - Move Processing to Central area
  - Remove walls and create core lab to contain Processing, Chemistry and Hematology
  - Staff to meet workload demand

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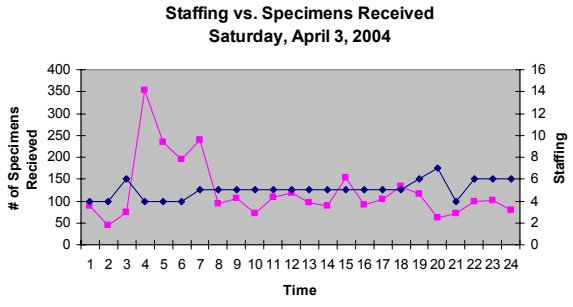
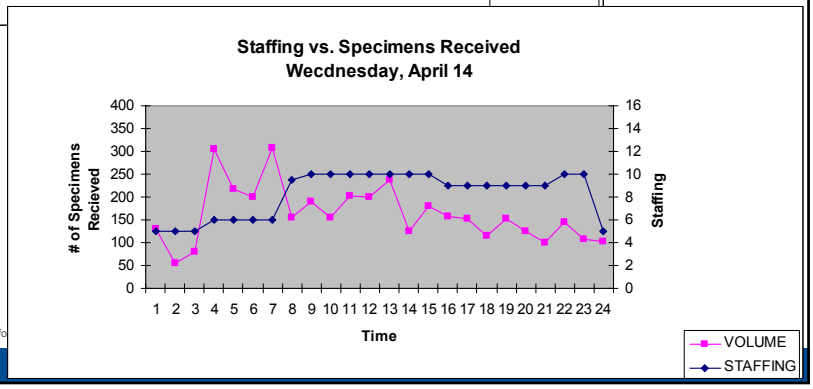
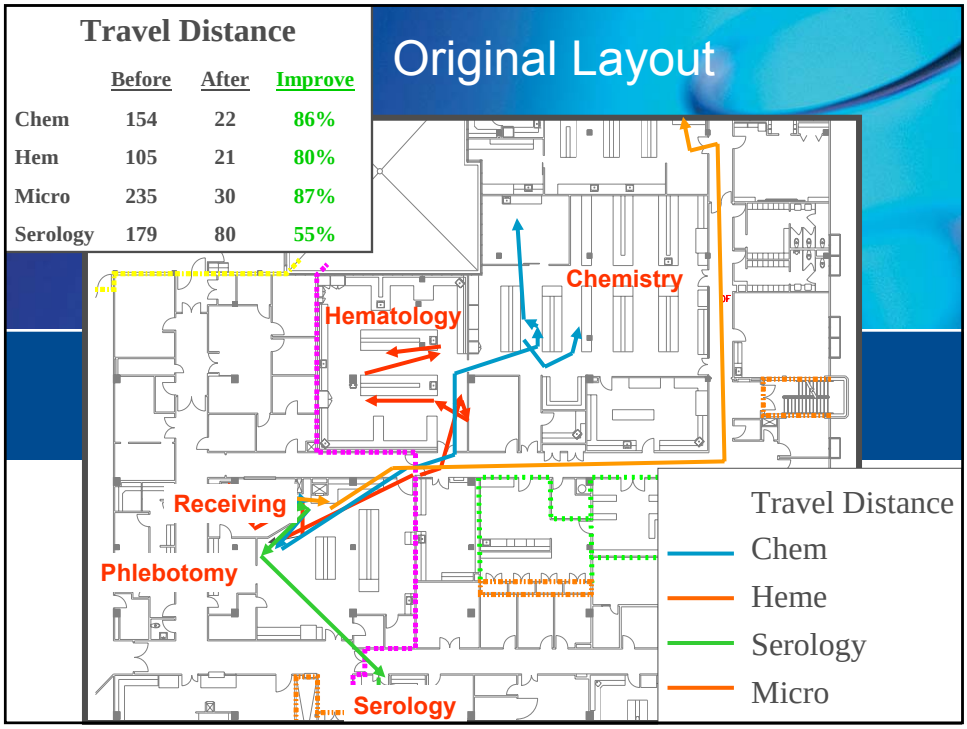
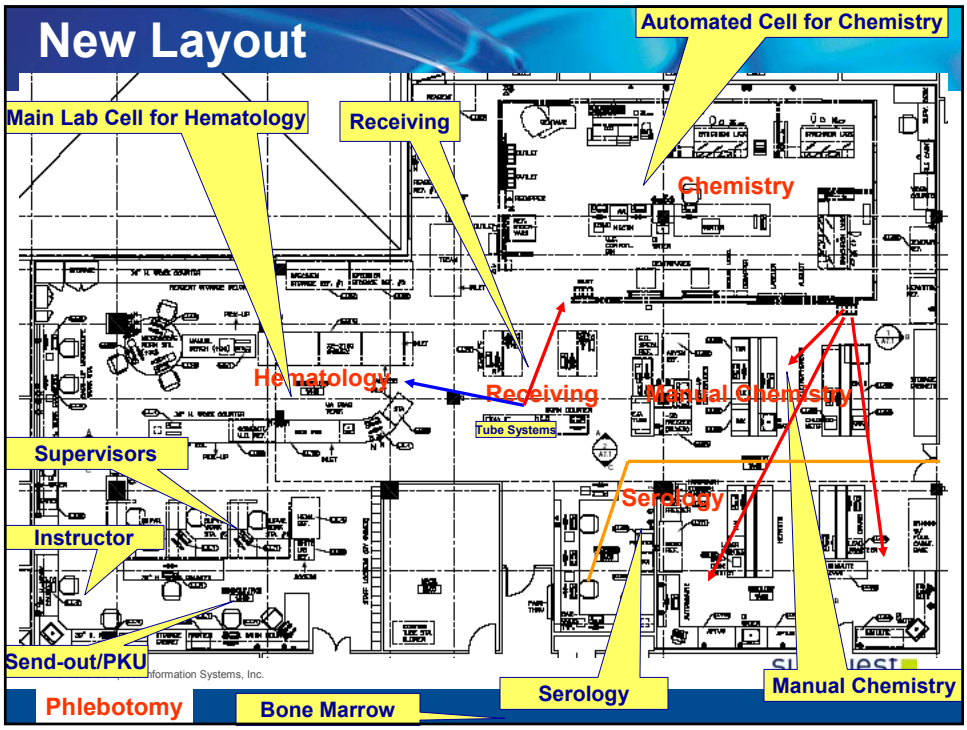


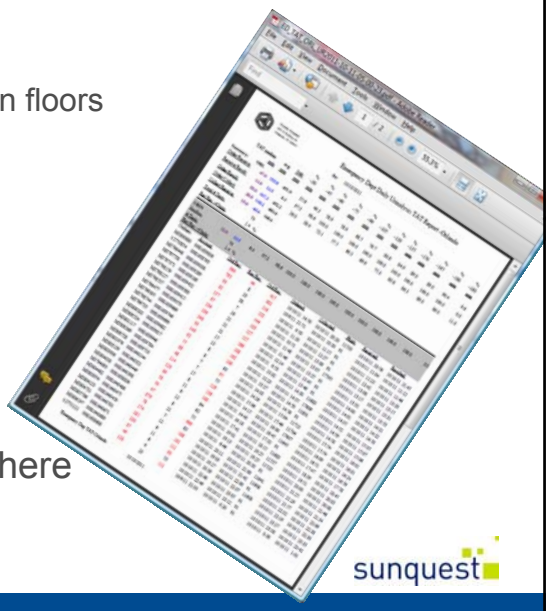



Travel Distance
Before After Improve
Chem 154 22 86%
Hem 105 21 80%
Micro 235 30 87%
Serology 179 80 55%
Original Layout
Chemistry
Hematology
Receiving
Phlebotomy
Serology
Travel Distance
Chem
Heme
Serology
Micro


New Layout
Automated Cell for Chemistry
Main Lab Cell for Hematology
Receiving
Chemistry
Hematology
Receiving
Manual Chemistry
Tube Systems
Supervisors
Instructor
Send-out/PKU
Serology
Phlebotomy
Bone Marrow
Serology
Manual Chemistry

Additional tools needed

- Collection Manager
  - Keep phlebotomist on floors
  - To receive or not?
- Real time feedback
  - Daily reports
    - AM TAT
    - STAT IP TAT
    - ED TAT
- Close but not quite there



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Additional Tools & Tasks

- Enhanced front end automation
  - Tecan FE500 to Beckman power processor
- Container tracking and post analytical storage tracking
- Real time monitoring
- Utilizing automation to receive samples
  - Collection managers already have collector and collection time
  - Visual Clues

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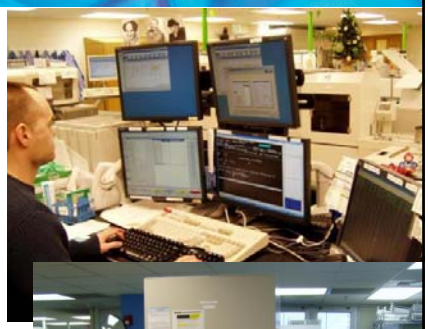
New Tools

- Enhanced Autoverification
  - Normal Values
  - Non critical values
  - Criteria based
    - Instrument flags
    - Delta failures
- Automated Storage
  - Real time location information



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New Tools, New Processes

- Automated Storage
  - Real time location information
  - Automated Retrieval and rerun capabilities

Continued Monitoring (DMAI"C")

Laboratory - Orlando

2011 Scorecard

2010 Actual	Key Performance Indicators	Goal 2011	Jan 2011	Feb 2011	Mar 2011	Apr 2011	May 2011	June 2011	July 2011	Aug 2011	Sept 2011	Oct 2011	Nov 2011	Dec 2011	Avg. Year to Date
	TEAM														
12.1%	*Overall Separation	15.5%	11.7%	11.4%	13.9%	13.8%	12.5%	12.8%	12.6%	13.6%					
	SERVICE														
27.5	ED Stat TAT Receipt to Result (Avg Min)	<30	27.7	28.9	28.9	28.7	28.2	27.2	25.5	24.9					
90.3%	AM Lab Completion by 0630	≥90%	89.0%	86.9%	84.6%	88.1%	87.7%	87.3%	90.7%	90.4%					
82.1%	P STAT TAT (order to result in 120 minutes)	≥80%	80.9%	79.0%	80.9%	82.3%	79.1%	80.2%	81.8%	80.2%					
	CLINICAL														
79%	Brain Attack Lab TAT (order to result in 45 min)	>80%	100%	83%	79%	80%	89%	90%							
2.39%	Campus Blood Culture Contamination Rate	<2.75%	1.91%	1.80%	1.46%	1.73%	1.79%	1.62%	1.91%	1.95%					
	MARKET														
	FINANCE														
100.6%	First Look Productivity Index	≥ 100%	103.7%	102.8%	99.2%	99.1%	96.4%	97.1%	100.7%	100.3%					

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If I had to do it again…

- Do a piece at a time in rapid succession
  - Maybe??
  - Is big bang a better way?
- Chose tools based on the desired new processes
- Continue to leverage automation and reduce hands on time and chances for error

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Florida Hospital Orlando Laboratory

Innovation for better patient care

Robotic Specimen Delivery

Pre and post analytical Automation with chemistry analysis

First Integrated system in the US

4th Generation Automated Blood Bank Testing

First in US

DNA Sequencing

Detecting bone marrow transplant chimerism

Electronic Positive Patient ID

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