Vital Statistics About Atlantic Health
8,900+ employees
2,100+ physicians
218 residents
1,133 licensed beds
56,400 admissions
5,867 births
116,878 ED
530,520 outpatient visits

Vital Statistics About Morristown Memorial Hospital
5,000+ employees
1,200+ physicians
154 medical residents
629 licensed beds
36,756 admissions
3,414 births
72,229 ED visits
263,886 outpatient visits

Vital Statistics About Overlook Hospital
2,300+ employees
1,200+ physicians
65 medical residents
504 licensed beds
19,644 admissions
2,453 births
44,649 ED visits
144,717 outpatient visits
First Town Meeting - 2002

Top 3 Issues

- Need More People
- Need More People
- We need more parking?
2002 – Issues affecting the Lab

- Change in leadership
- Laboratory Information system problems
- Staffing Shortage and low morale.
- Increasing Volume with increasing cost
- Competition for capital not only among hospitals but other services (i.e. radiology).
- Poor laboratory design, highlighted by silos versus an open layout.
- Aging equipment and infrastructure

Steps towards Change

- Strategic Planning
- Improve Customer Service
- Decrease Turnaround Time
- Six Sigma/Lean
- Automation
Strategic Planning

- **Mission** – what you are, the overall purpose of the organization
- **Vision** – what you want to be
- **Customers**
- **Future Forces and assumptions** – internal and external forces affecting the organization
- **Strategies** – course of action created to achieve a long term goal
- **Goals/Tasks** – focus on desired changes/actions

**Mission**

- To deliver accurate, timely value driven diagnostic laboratory information and services
Vision

To be the premier laboratory, anticipating, pursuing and implementing advances in laboratory medicine, while providing exceptional service to meet the needs and expectations of the people we serve.

Future Forces/Assumptions

2002

1. Customer Demands
2. Increased competition from larger outside labs
3. Image/perception of the Lab by Caregivers
4. Demand to deliver a wide range of services for self-pay patients
5. Rapid increase in costly technology

2008

1. Increased demand for consultative interpretation of lab results
2. AP Competition
3. Serious shortage of personnel skill sets
4. National Focus on Hospital Acquired Infections or safety measures
5. Growth in decentralization in technology
6. Shift towards commoditization of lab tests
7. Continuous demand for blood products
8. Continuous demand for cost containment and value
9. Trend towards hospital employed physicians
10. Consumers and businesses focusing on healthcare cost reductions

Faster - Better - Friendlier - Customer Service
Strategies

- Staffing Retention and Recruitment
  - Employer of Choice
  - Engagement Survey
- Service Delivery
  - Data Delivery (Reports)
- Reimbursement
- Physician/Caregiver Relationships
  - Enhance Reputation
  - TAT
- Process Improvement
  - LEAN
- Technology – Value Driven
  - Leading Edge – Develop Relationships
- Business Opportunities

THE PASSION TO LEAD

Goals

2002

- Develop a client service department
- Standardize Chemistry
- Standardize Coagulation
- Implement LIS upgrade Develop a communications strategy to get messages across to customers
- Develop a consolidation of testing
- Identify new Blood Bank LIS
- Improve 2-way communication with staff
- Build Recruitment/feeder systems and enhance training programs.
- Consolidate Donor Recruitment Process
- Develop Multi-year space and renovation plan

2008

- Develop outreach capability
- Sales and Marketing
- Staff Development
- Expand Lean – Outside of Lab
- Develop plans for new services
- Anatomic Pathology
- “One Lab” Strategy
- Vendor/Pharmaceutical collaborations

THE PASSION TO LEAD
AHS Core Lab Goals 2002

- Replace and standardize outdated Technology. Vendor?
- Decrease current TAT and AM Run Result availability.
- Improve Lab Efficiency and Productivity
  - Consolidate Work stations
  - Reduce reagents and supplies
  - Eliminate sample splitting
- Eliminate Staff stress
- Improve and standardize across the system.
- Low Maintenance and no downtime
- Best Pricing with flexible financing options

-----

Six Sigma—Process Improvement

**Cost**

<table>
<thead>
<tr>
<th>Year</th>
<th>Financial Contribution</th>
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<tbody>
<tr>
<td>2006</td>
<td>$2,002,000</td>
</tr>
<tr>
<td>2008</td>
<td>$5,180,850</td>
</tr>
<tr>
<td>2007</td>
<td>$4,900,000</td>
</tr>
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</table>

**People**

- 184 Certified Staff
- Problem Solving Skills
- Recognized competence
- 126 Projects ‘05-'07

**Quality**

Six Sigma Helps the enterprise improve what we do!
Origins of Six Sigma®

- Term coined by Bill Smith of Motorola in the mid-80s; later embraced and further developed by GE.

Principles

- Existing processes produce too many defects.
- Measuring defect rate in percent is not granular enough.
- We need to drive for orders of magnitude improvement in products and services.
- Be coldly data-driven, rather than intuitively-driven, as you seek out root causes.

Six Sigma is...

A Statistical Quality Methodology

- "Sigma" = Standard Deviation (Measurement of Variation)
- Variation Predicts % Defects
- Rigorous... Measurement-Based Approach
- New Way of Measuring Performance

<table>
<thead>
<tr>
<th>σ</th>
<th>% Defects</th>
</tr>
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<tbody>
<tr>
<td>2</td>
<td>30.85%</td>
</tr>
<tr>
<td>3</td>
<td>6.68%</td>
</tr>
<tr>
<td>3.8</td>
<td>1.00%</td>
</tr>
<tr>
<td>4</td>
<td>0.02%</td>
</tr>
<tr>
<td>5</td>
<td>0.023%</td>
</tr>
<tr>
<td>6</td>
<td>0.00034%</td>
</tr>
</tbody>
</table>

"Move the Mean...Reduce Variability"
Because Healthcare delivery is a complex process involving diverse professional skills; different patient needs and advanced technology variation is inherent. A high degree of variation makes it challenging to anticipate and manage results.

The core Six Sigma concept focuses on reducing variation found in any process such as billing, physician practices, treating patients, patient triage or for the Laboratory “turnaround times”.

THE PASSION TO LEAD
Six Sigma focuses on reducing the variations that can occur in a process such as:
- Materials
- Personnel
- Equipment
- Methods
- Conditions
- Customer Orientation

Bottom line = Variation is the enemy!!
High Level Process Map:

**Define - Review**

**R4 Template**

**Laboratory Testing Cycle**

- Physician Orders → Order Requested → Laboratory Processing → Billing

**Laboratory Total Processing**

- Specimen Collection → Specimen Processing → Specimen Analysis → Results Reporting

**Focus of this Project:**

- LIS Receipt
- LIS Receipt
- Centrifuge, If needed
- Centrifuge, If needed
- Analyzer
- Analyzer

**Detailed Process Map:**

**Detailed Process Flow For Specimen Processing**

- Inpatient Pneumatic Tube
  - Unload Pneumatic and deliver to LIS workstation
  - Time = 0.22 mins
  - Output = 0.25 mins

- Outpatient Pneumatic Tube
  - WAIT = 1.01 mins

- LIS Receipt
  - Time = 0.38 mins

- Delivery to Spin Station
  - Time = 0.43 mins

- Load Centrifuge
  - Time = 0.08 mins

- Stat Centrifuge
  - Time = 5.5 mins

- Unload Centrifuge
  - Time = 0.08 mins

- Outpatient Centrifuge
  - Time = 10.5 mins

- WAIT = 6.42 mins

- WAIT = 6.00 mins

- Aliquot/Prep
  - Time = 0.44 mins

- Delivery to Analyzer Workstations
  - Time = 0.69 mins

- WAIT = 8.00 mins

- Stop
Measure - Review

Pareto Chart for Inpatient Specimens

<table>
<thead>
<tr>
<th>Category</th>
<th>Time</th>
<th>Percent</th>
<th>Cum %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web</td>
<td>20.41</td>
<td>72.3</td>
<td>72.3</td>
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<tr>
<td>Machine</td>
<td>5.50</td>
<td>19.5</td>
<td>91.8</td>
</tr>
<tr>
<td>Task</td>
<td>2.32</td>
<td>8.2</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Cause and Effect Diagram:

- People
  - Med Tech Vs. Specimen Tech - X
  - Experience Level - N
  - Staffing Level - X
  - Communication Barriers - N
  - New Employee Training - C

- Materials
  - Labels - X
  - Inventory / Stocking of tubes - X
  - Inventory of Racks - X

- Equipment
  - Repair and Prev Mtce Tools - X
  - LIS Availability, Response Time - C
  - HIS availability, Response Time - C
  - Label Printers - Jam, Misalignment of Print - X
  - Centrifuge Availability, Reliability - C
  - Pneumatic Tube Logistics - C
  - Number of Workstation - X

- Process
  - Routine VS. STAT - C
  - Source location of patients - C
  - Other Duties (phone, fax, transport) - X
  - Delivery within Core Lab - X
  - Category of test order - C
  - Sample Quality - N
  - Centrifuge Loading - X
  - Aliquoting - X
  - How Receives Specimens - (Categories) - X
  - Delinination of duties - X
  - Time of Day - X
  - Room Temperature - N
  - Time of Day - X
  - Ergonomic Workstations - C/X
  - Workstation Configuration - X
  - Space Availability - C
  - Task Length - C/X
  - Tube Labeling - C/X
  - Fax Inquiries - C/X
  - Specimen Waiting Time - X
  - SPECIMEN MANAGEMENT - X

- Environment
  - Space Availability - C
  - Jacking - C
  - Centrifuge Availability, Reliability - C
  - Pneumatic Tube Logistics - C

Test Order Categories:
- Bar Codes
- Name Plate (Order in HIS)
- Miscellaneous paper registration / non-registered
- Miscellaneous paper registration / ULS
What X's (inputs) cause the most variation?
Staff, Pneumatic Tube location, Priority, Centrifuges and Aliquoting.

What are some potential solutions? How can you change the process?
Redesign layout, reallocate duties, change staffing patterns to match volume demands, add centrifuges, automate to eliminate steps.

What is your improvement strategy? How will you implement the change?
Short-term will redesign work stations, reallocate duties, change staffing patterns, and add centrifuge. Will implement and measure impact on cycle time. Long-term plan is to automate.

Back to AHS Core Lab Goals 2002
1. Replace and standardize outdated Technology. Vendor?
2. Decrease current TAT and AM Run Result availability.
3. Improve Lab Efficiency and Productivity
   1. Consolidate Work stations
   1. Reduce reagents and supplies
   1. Eliminate sample splitting
   1. Eliminate Staff stress
4. Improve and standardize across the system.
5. Low Maintenance and no downtime
6. Best Pricing with flexible financing options
6 Sigma Recommended Automation

- Vendor (Top 3)
- Site Visits including Manufacturer
- Work Flow Analysis
- Site Standardization
- Final Vendor Presentation
- Review of Financials

Replace Equipment

Outline for Presentations

- Brief Company Introduction (10 minutes)
  - History
  - Financial Performance last 3 years
  - Strategies for next 5 years
- Discussion on Workflow at each location (15 minutes)
  - Describe Workflow Study Process (i.e., Direct Observation, Computer generated reports, etc.)
  - Discuss Pre-Analytical/Analytical and Post Analytical Process (Auto-verification) configurations
- Proposed Instrumentation at each location (15 minutes)
- Service (10 minutes)
  - Annual Downtime Data per analyzer (hours)
  - Number of Service Calls per year for each analyzer
  - Number of PM’s per year
Replace Outdated Equipment

Outline for Presentations cont..

1. Cost (2 Scenarios) (10 minutes)
   1. Purchase of Capital
      1. Cost per analyzer
      1. Cost for annual service per analyzer
      1. Reagent Cost
   1. Reagent Rent/Cost per Billable (10 minutes)
      1. Monthly Cost per analyzer for equipment
      1. Monthly Cost per analyzer for service
      1. Reagent Cost per Billable or Reportable

1. Other Costs (10 minutes)
   1. Interface. (Quantity and Cost)
   1. Consumables
   1. Water Supply
   1. Sequestering of Reagents across system

1. Summary (10 minutes)
1. Question & Answer

Instrument Consolidation

Overlook

THE PASSION TO LEAD
Detailed Process Map:

**Detailed Process Flow For Specimen Processing**

- **Inpatient Pneumatic Tube**
  - Unload Pneu tube and deliver to LIS workstation
  - Inpat = 0.22 mins
  - Outpt = 0.25 mins
  - LIS Receipt Time = 0.38 mins
  - Delivery to Spin Station Time = 0.43 mins
  - Stat Centrifuge Time = 5.5 mins
  - Aliquot/Prep Time = 0.44 mins
  - Delivery to Analyzer Workstations Time = 0.69 mins
  - **WAIT = 1.01 mins**

- **Outpatient Pneumatic Tube**
  - Unload Centrifuge Time = 0.08 mins
  - Unload Pneu tube Time = 0.08 mins
  - Outpatient Centrifuge Time = 10.5 mins
  - **WAIT = 6.42 mins**

- **WAIT = 6.00 mins**

- **WAIT = 6.42 mins**

- **WAIT = 6.42 mins**

- **WAIT = 4.98 mins**

- **WAIT = 12.56 mins**

- **WAIT = 8.00 mins**
## Review of Turnaround Times

### STAT Basic Metabolic Panel Comparison

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2008</th>
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<tbody>
<tr>
<td>Mean</td>
<td>41</td>
<td>29</td>
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<tr>
<td>Median</td>
<td>37</td>
<td>26</td>
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<tr>
<td>SD</td>
<td>23</td>
<td>13</td>
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</table>

### Routine Basic Metabolic Panel Comparison

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<th>2002</th>
<th>2008</th>
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<tr>
<td>Mean</td>
<td>56</td>
<td>29</td>
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<tr>
<td>Median</td>
<td>49</td>
<td>26</td>
</tr>
<tr>
<td>SD</td>
<td>40</td>
<td>14</td>
</tr>
</tbody>
</table>

---

The Passion to Lead
Dollars and Sense

- Competition for Capital
- Rapid Changes in Technology
- New Testing – Addition without subtraction
- Costs: Instrument, Reagents, Instrumental Services, Consumables.
- Other Considerations: Inventory Management, Staffing, Shipping, Sample Splitting, # of Vendors (4 to 1)
- Estimated Savings: $400,000

Actual Annual Savings: $420,000

Other Benefits

- 2.5 MT FTE’s reassigned to new department: Client Services
- Work Station Reduction (12 to 5)
- Process Improvement
- 5 Customer Service Reps
  7am -7 pm
- Over 400 calls per day
- Main reasons to call: Fax or Verbal Results
AHS Core Lab Goals 2002

- Replace outdated Technology
- Decrease current TAT and AM Run Result availability.
- Improve Lab Efficiency and Productivity (Workstation Consolidation)
- Reduce reagents and supplies
- Eliminate sample splitting
- Eliminate Staff stress
- Improve and standardize Pre-Analytic, Analytic and Post Analytic processes across the system.
- Low Maintenance and no downtime
- Best Pricing with flexible financing options

THE PASSION TO LEAD

Next Step in Process Improvement

- A strategy that focuses on the elimination of waste, process variation and imbalance.
- Each step must create value for the customer

Develop a Lean Culture – “Getting the right things, to the right place, at the right time, in the right quantity to achieve perfect work flow, minimize waste and maintain flexibility.”

- Cost Reduction
- Efficiency – elimination of MUDA
- Standardization
- Employee Driven

THE PASSION TO LEAD
The ten rules of lean production can be summarized:
1. Eliminate waste
2. Minimize inventory
3. Maximize flow
4. Pull production from customer demand
5. Meet customer requirements
6. Do it right the first time
7. Empower workers
8. Design for rapid changeover
9. Partner with suppliers
10. Create a culture of continuous improvement

LEAN Projects

Blood Bank
- Implementation of Galileo
- Implementation of Electronic X-match
- Standardize workstations
Lean Projects

Cytology – Reduce TAT (less than 5 days)
- Led to consolidation at one site
- Cytotechs only read slides – no prep or clerical work

Gyn TAT average TAT registration to sign-out

<table>
<thead>
<tr>
<th>Days</th>
<th>Jan</th>
<th>Feb</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
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<td>MMH</td>
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<td>3.5</td>
<td>3.9</td>
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<td>3.8</td>
<td>3.8</td>
<td>4.0</td>
<td>5.3</td>
</tr>
</tbody>
</table>

Microwave

- Reduction of $145,000 in annual Supply expense
- Standardization of procedures across campuses
- Poster at Lab Quality Confab 2007
Other Six Sigma Projects

- Anatomic Pathology – Six Sigma
- Gross Room – Histology - Pathologists
  - Move towards continuous flow – decrease TAT
- Same Day Tissue Processing
- Increased Capacity – Op Referrals
- Decreased Overtime
- Standardize Across Campuses
- New Gross Room at MMH
- New IHC Instrumentation

THE PASSION TO LEAD

Histology Workflow
Annmarie Dockery, Christopher Scoano, Craig Dise MD, Joe Immordino, Marilyn Ivento, Michael Overa, Nancy Mitchell, Ron Delacruz, Veronica Fraser
99 Beauvoir Avenue
Summit, NJ 07901
(T) 908-522-2194
(F) 908-522-2320

Abstract

Goals:
- Decrease the time it takes to process pathology slides
- Increase our Z score to at least 3.38
- Reduce our DPMO to 30,396
- Reduce average time to slide availability to 120 minutes from the current 232 minutes
- Create continuous flow processing
- Implement rapid tissue processor
- Reduce overtime

Methodologies utilized:
- Six Sigma

Introduction

Project Objective:
To create a continuous flow process to improve overall turn around time, patient care, and physician and patient satisfaction.

Problems/Opportunities:
- The single batch overnight process ran approximately 12 hours and did not include the final phase of slide preparation for pathology review.
- Changes in the day to day request and volume can make it difficult to make a diagnosis and treat the patient in a timely manner due to the delays incurred in the start of the overnight process.
- Improve efficiency and increase employee satisfaction.
- Unpredictable process and an increase in defects.

Results/Changes:
- Adjusted staff schedules
- Reallocated tasks
- Reorganized tech workflow to accommodate new rapid tissue processor
- Reorganized case priority
- Utilize partially full racks
- Added a third shift
- Adjusted Transcription and Pathology Assistant hours
- Increased process batches from one to four per day
- The overnight run has a larger volume and consists of mostly major specimens versus biopsies.
- Decreased utilization of xylene, alcohol and paraffin
- Decrease in overtime
- Decreased turn around time from 232 minutes to an average of 117 minutes.
- Since results are available within the same day the specimen is received, physicians can make same day diagnosis.

Conclusion:
- Staff is empowered
- Processing time has decreased
- Increased efficiency
- Overtime has decreased
- Reduced the total number of steps to process slides. (red steps were eliminated)
- Instead of one batch overnight. Slides are processed continuously throughout the day.

PROCESS CAPABILITY

Z Score DPMO Defects

We implemented changes in 2 phases
Phase 2 included the addition of the rapid tissue processor
Our process capability improved dramatically.
We reduced the number of defects by 67%
LEAN Project – Reference Lab

- Significant Cost Reductions through control
- Identified new referral laboratory

Reference Lab Cost Per Test 2007

<table>
<thead>
<tr>
<th>Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
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<th>Jul</th>
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<th>Dec</th>
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<td>30.05</td>
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<td>31.76</td>
<td>31.35</td>
<td>30.48</td>
<td></td>
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</table>

2006 CPT

25% Reduction

Current Hematology - OH
Automated Hematology - OH

THE PASSION TO LEAD

Employee Engagement

1. Engagement measures:
   - SAY
   - STAY
   - STRIVE

THE PASSION TO LEAD
Employee Engagement Index
Overall Results – Trend improving

![Bar chart showing employee engagement results for different years and categories.]

Laboratory Employee Engagement

<table>
<thead>
<tr>
<th>Year</th>
<th>MMH</th>
<th>OH</th>
<th>All AH Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>38%</td>
<td>57%</td>
<td>48%</td>
</tr>
<tr>
<td>2007</td>
<td>79%</td>
<td>83%</td>
<td>81%</td>
</tr>
</tbody>
</table>
Lab PACT Program for 2007

- Professional Advancement Career Track
- Developed for laboratory staff based on RN PACT Program at MMH & Overlook
- Job Titles eligible - Full time or PT (22.5 hours or greater)
  - CLS, LMT, LDT, MT, MLT, HT, CT, DT
  - Coordinator, POCT
  - Coordinator, Lab Services

Lab PACT Program - Description

- Meet objectives “above and beyond” the normal day to day job responsibilities
- Criteria based on AH shared values
- One year to meet objectives
- Three Levels on PACT Ladder
  - Progressive levels of difficulty
- Receive Bonus at end of year if level completed
  - $1,000 - $1,500 - $2,000
Lab PACT Program - Criteria

1. **Examples**
   - **Service**: Receive ACE awards related to customer service
   - **Performance**: Conduct PI project in lab section (Lean or Six Sigma participation)
   - **Openness**: Present in-service to staff in lab section
   - **Teamwork**: Participate on formal lab committee; assume leadership role – Lean Project
   - **Empowerment**: Attain # Continuing education Units; Teach in School of Med Technology

Future Goals

1. **Medical Technologist** –
   1. Manage Information associated with waived and moderately complex testing
   2. Perform highly complex testing
   3. Ensure Quality at all levels

1. **Lab Assistants** –
   1. Prepare samples for testing
   2. Operate instrumentation for waived and moderately complex testing
   3. Store samples
Present and Future Impact of Lean/Six Sigma at Atlantic Health

1. Employee Engagement
2. Succession Planning
3. Efficiency/Productivity
4. Vendor Selection
5. Cost Control
6. Outcomes measurement
7. Physician Satisfaction
8. Patient Satisfaction