Lean Six Sigma

Attacking Variation
Improving Quality
Gaining Efficiency
Reducing Costs
“The processes we have created today as a result of our thinking thus far have problems which cannot be solved by thinking the way we thought when we created them.”

Albert Einstein
Today’s Objectives

• Very high-level overview of Six Sigma and Lean

• Why Lean Six Sigma - The Value of Lean Six Sigma

• Real life Lean Six Sigma PI Example

• Keep it simple and inspire
Lean Six Sigma & Health Care

A prescription for facilitating improvement and performance excellence
What is Lean?

- The relentless pursuit of the perfect process through waste elimination...

We Spend 75-95% of Our Time Doing Things That Increase Our Costs and Create No Value for the Customer!

In healthcare, Lean is about eliminating all non-value added time, motion, and steps.
Waste… According to Customers

- Something that consumes resources but adds no value to a product or service

Anything other than the minimum amount of equipment, materials, space, and worker’s time which are essential to add value to the product or service.

A symptom, not a cause, of a problem.
What is Lean Thinking

To do more with less

LESS EFFORT ***** LESS EQUIPMENT***** LESS TIME***** LESS SPACE*****

While coming closer and closer to providing customers what they expect!
The 8 Types of Waste Processing

1. Over Production
2. Motion
3. Material Movement
4. Waiting
5. Inventory
6. Correction
7. Under Utilization
8. Redundant or unnecessary work that is giving the customer more than he/she is willing to pay for

- People not able to work to their skill level
- Rework, work done because errors in a previous process
- Information or material waiting in queue
- Making more than necessary
- Unnecessary people motions, travel, walking, searching
- Unnecessary handoffs, transfers, distances of material & information
- People waiting on machines or information.
### TIM WOOD, Waste & Time Elements Summary

<table>
<thead>
<tr>
<th>Waste</th>
<th>T</th>
<th>I</th>
<th>M</th>
<th>W</th>
<th>O</th>
<th>O</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Transportation</td>
<td>Inventory</td>
<td>Motion</td>
<td>Waiting</td>
<td>Overprocessing</td>
<td>Overproducing</td>
<td>Defects</td>
</tr>
<tr>
<td>Definition</td>
<td>Information or material movement that adds no value to service</td>
<td>Supply in excess of customer requirements</td>
<td>Movement of people or service that adds no value</td>
<td>Idle time created when processes are not synchronized</td>
<td>Extra effort which adds no value to a product or service</td>
<td>Producing more than needed or processing faster than needed</td>
<td>Rework required to meet customer requirements</td>
</tr>
</tbody>
</table>

#### Benefis Examples

- **Value Added**
  - Customer willing to pay for
  - Transforms product or service
  - Done right 1st time

- **Non Value Added**
  - Consumes resources but doesn't contribute to service

- **Non Value Added But Required**
  - Non value added but currently required based on legal or compliance issues

#### Visual

- ![Visual Example](image1.png)
- ![Visual Example](image2.png)
- ![Visual Example](image3.png)
- ![Visual Example](image4.png)
- ![Visual Example](image5.png)
- ![Visual Example](image6.png)
What does Six Sigma mean?

The term “Sigma” is a **measurement** of the number of “defects”. Six Sigma correlates to just 3.4 defects per million opportunities.
Raising the Standard

• Goal of the program:
  – Design processes or products that do what they are suppose to do, with reliability.

Most companies operate between 2 and 3 sigma, which means they produce between 65,000 and 300,000 defects for every one million opportunities.
# Key Characteristics and Comparisons

<table>
<thead>
<tr>
<th>Topic</th>
<th>Six Sigma</th>
<th>Lean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improvement</td>
<td>Reduce Variation</td>
<td>Reduce Waste</td>
</tr>
<tr>
<td>Justification</td>
<td>Six Sigma (3.4 DPMO)</td>
<td>Speed</td>
</tr>
<tr>
<td>Main Savings</td>
<td>Cost of Poor Quality</td>
<td>Operating Expenses</td>
</tr>
<tr>
<td>Learning Curve</td>
<td>Long</td>
<td>Short</td>
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<tr>
<td>Project Selection</td>
<td>Various Approaches</td>
<td>Value Stream Mapping</td>
</tr>
<tr>
<td>Project Length</td>
<td>2-6 Months</td>
<td>1 week-3 months</td>
</tr>
<tr>
<td>Driver</td>
<td>Data</td>
<td>Demand</td>
</tr>
<tr>
<td>Complexity</td>
<td>High</td>
<td>Moderate</td>
</tr>
</tbody>
</table>
Translating LSS into Results

The Big Picture - To Be The BEST

Clinical excellence
Patient safety
Financial results
Patient satisfaction
Physician/staff satisfaction
Community service

ALL DRIVEN BY PROCESSES
What to Expect

Results
• How does the customer view my process?
• What does the customer look at to measure performance?
Success Stories

• Mt. Carmel Medical System- (Columbus, OH)
  Implemented Six Sigma in 2000 in the face of break-even operating performance. By the end of 2002, they had generated $14.5 million in hard cost savings or revenue enhancements.
Success Stories

• Quest Diagnostics – Tripled net income as a percent of sales from 1999-2002

• McKesson – Achieved $40 million in net operating savings in 3 years – in their Pharmaceutical Solutions Segment

• ThedaCare – built a $90 million patient tower
The Power of Seeing

Benefits of a Visual System

- Eliminates non-value-added search time
- Provides a foundation for process standardization
- Reduces “space requirements”
- Communicates “how we are doing” to everyone
- Can trigger corrective action

Pharmacy RPI

BEFORE

AFTER
More Appropriate Stock Levels – based on need

Before

After
A Benefis Project
Missing Orders
Why This Project

A significant number of charges are going to be written off secondary to missing orders or invalid orders exists.
<table>
<thead>
<tr>
<th>DATE</th>
<th>MISSING ORDERS</th>
<th>CHARGES</th>
<th>INVALID ORDERS (No Dx)</th>
<th>CHARGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/28/2012</td>
<td>707</td>
<td>$151,601</td>
<td>481</td>
<td>$128,083</td>
</tr>
<tr>
<td>9/4/2012</td>
<td>727</td>
<td>$169,968</td>
<td>508</td>
<td>$142,936</td>
</tr>
<tr>
<td>9/7/2012</td>
<td>751</td>
<td>$187,188</td>
<td>518</td>
<td>$146,254</td>
</tr>
<tr>
<td>9/14/2012</td>
<td>801</td>
<td>$172,488</td>
<td>567</td>
<td>$166,286</td>
</tr>
<tr>
<td>9/21/2012</td>
<td>882</td>
<td>$202,183</td>
<td>602</td>
<td>$177,462</td>
</tr>
<tr>
<td>9/28/2012</td>
<td>795</td>
<td>$227,889</td>
<td>621</td>
<td>$179,411</td>
</tr>
<tr>
<td>10/5/2012</td>
<td>710</td>
<td>$238,954</td>
<td>616</td>
<td>$177,881</td>
</tr>
<tr>
<td>10/12/2012</td>
<td>802</td>
<td>$309,723</td>
<td>623</td>
<td>$176,572</td>
</tr>
<tr>
<td>10/20/2012</td>
<td>845</td>
<td>$419,097</td>
<td>655</td>
<td>$186,998</td>
</tr>
<tr>
<td>10/26/2012</td>
<td>954</td>
<td>$493,882</td>
<td>645</td>
<td>$186,576</td>
</tr>
<tr>
<td>11/2/2012</td>
<td>1,073</td>
<td>$491,544</td>
<td>655</td>
<td>$179,692</td>
</tr>
<tr>
<td>11/23/2012</td>
<td>1,216</td>
<td>$635,274</td>
<td>648</td>
<td>$184,809</td>
</tr>
</tbody>
</table>
**Process Name and Purpose: Lost Physician Orders**

There are a significant number of medical record charts that are going to be written off, versus billed, secondary to missing physician orders. In trying to find missing orders, there is waste in search, duplication, and over processing, that is producing caregiver and provider frustration. There is a need to identify process root causes to ensure efficient and effective solutions are identified.

**Problem Statement:**

1. Multiple requests for re-work/finding lost orders to ancillary services and physician offices
2. There are currently 648 invalid physician orders ($184,809)
3. There are currently 1216 missing physician orders ($635,274)

**Process Sponsor:** Steve Ballock, CFO

**Process Boundaries:**

Starting Point: Patient presents for Procedure at Benefis Health System after outpatient physician care referral.
Stopping Point: Order is scanned and available in medical record to code and drop bill timely (within 4 days)

**Process Owner:** Julie Wall
Team Lead: Laura Merchant

**Team Members:** Joe LoDuca, Judy Rosales, Patty Harris, Sarah Hall, Greg Hilpert, Marci Huntsinger, Ingrid Dieudonne, Vicki LeBrun, Amy Linder, Shellie Curtis, Eric Peterson, Nathan Hough, Kristen Rowen, Hasim Turhan, Laura Merchant, Peter Gray, Julie Wall

**Team Leaders:** Laura Merchant

**Key Customers:** Patients, Physicians, Internally – Accounting, PBS, HIMSS Dept., Ancillary Services Departments, Quality Improvement

**Project Start Date:** 10 December 2012
**Proposed End Date:** 15 June 2013

**Project Vision Statement:**

All charts, following outpatient procedures will have a valid order 4 days post DOS, available for coding and billing on the electronic medical record.

**Project Deliverables:**

1. A reliable and capable process.
2. Reduction of charts with missing orders by 50% by June 2013

**Resource Representatives:** Coding, Billing, Radiology, Laboratory, BMG offices, Quality Improvement – SCIP Coordinator
The Vision

• All charts, following outpatient procedures will have a **valid** order available for coding and billing on the electronic medical record within **4 days** of service

• CTQ- Order on chart within 4 days from date of service on right patient D number
Digging into the Process

• Went to the Gemba – Walked the process
  – Determined the interconnecting processes and inputs
  – Determined what and where the variation existed
  – Completed high level SIPOC
  – Detailed process map
    • All inputs into the process, steps, output and customers
    • Identify the inputs with the most significant impact
SIPOC Map

**Inputs**
- Physicians
- Physician office staff
- Patient
- Patient & resident care departments
- Labor
- Computer systems
- Scanner
- Medical record documents

**Process**
- Order Written
- Order to Service Dept
- Patient Presents for Service
- Complete Registration - Document - Care Agreement, Order, Labels
- Code MR
- Archive Medical Records
- Documents to Medical Records
- Provide ordered Service

**Outputs**
- Patient Treatment Coded timely and accurately so can bill for services

**Customers**
- Patients
- Physicians and their office staff
- Internal – Ancillaries, coding, Medical Records team members
- Third party payers

**Input Metrics**
- Treatment to order scanned
- Treatment to coded
- Time orders in system available to coders
- Medical Records (D#) without orders when coder opens to code

**Process Metrics**
- Number of Handoffs
- Number of orders without labels
- How orders get to medical records
- Volume of encounters

**Output Metrics**
- Number of Service D numbers missing orders by month and by department -% defects
- Date of service to coded
- $\$\text{ value of un-codeable encounters reduced}

**Quality**

**Speed**

**Cost**
Volume of Lost Orders by Dept

Missing Orders by Location

<table>
<thead>
<tr>
<th>Location</th>
<th>Number Records</th>
<th>Percent</th>
<th>Cum %</th>
</tr>
</thead>
<tbody>
<tr>
<td>PN MGMT</td>
<td>345</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Pre Admit</td>
<td>15</td>
<td>14</td>
<td>46</td>
</tr>
<tr>
<td>SCI PADONC</td>
<td>12</td>
<td>11</td>
<td>57</td>
</tr>
<tr>
<td>M I.A.BMOB</td>
<td>6</td>
<td>9</td>
<td>66</td>
</tr>
<tr>
<td>M.RADMOB</td>
<td>5</td>
<td>8</td>
<td>75</td>
</tr>
<tr>
<td>Neurodiagnostics</td>
<td>3</td>
<td>5</td>
<td>79</td>
</tr>
<tr>
<td>UNSKILLED LTC</td>
<td>3</td>
<td>3</td>
<td>83</td>
</tr>
<tr>
<td>CVS</td>
<td>3</td>
<td>3</td>
<td>86</td>
</tr>
<tr>
<td>M RAD</td>
<td>2</td>
<td>2</td>
<td>89</td>
</tr>
<tr>
<td>SCI</td>
<td>1</td>
<td>1</td>
<td>91</td>
</tr>
<tr>
<td>Park Place</td>
<td>1</td>
<td>1</td>
<td>92</td>
</tr>
<tr>
<td>Electrodiagnostics</td>
<td>1</td>
<td>1</td>
<td>93</td>
</tr>
<tr>
<td>MRM</td>
<td>1</td>
<td>1</td>
<td>95</td>
</tr>
<tr>
<td>Other</td>
<td>48</td>
<td>4</td>
<td>100</td>
</tr>
</tbody>
</table>
Charges on these accounts

Pareto Chart of Location

<table>
<thead>
<tr>
<th>Location</th>
<th>Total Charges</th>
<th>Percent</th>
<th>Cum %</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCI RAD</td>
<td>272247</td>
<td>41.6</td>
<td>41.6</td>
</tr>
<tr>
<td>PN MGMT</td>
<td>119580</td>
<td>18.3</td>
<td>59.9</td>
</tr>
<tr>
<td>Pre Admit</td>
<td>68214</td>
<td>10.4</td>
<td>70.3</td>
</tr>
<tr>
<td>SCI RADOnc</td>
<td>48452</td>
<td>7.4</td>
<td>77.7</td>
</tr>
<tr>
<td>Neurodiagnostics</td>
<td>35692</td>
<td>5.5</td>
<td>83.2</td>
</tr>
<tr>
<td>CVS</td>
<td>25829</td>
<td>3.9</td>
<td>87.1</td>
</tr>
<tr>
<td>M. RAD</td>
<td>25769</td>
<td>3.9</td>
<td>91.1</td>
</tr>
<tr>
<td>M. LAB/IMOB</td>
<td>13833</td>
<td>2.1</td>
<td>93.2</td>
</tr>
<tr>
<td>CT</td>
<td>8461</td>
<td>1.3</td>
<td>94.5</td>
</tr>
<tr>
<td>PET</td>
<td>7957</td>
<td>1.2</td>
<td>95.7</td>
</tr>
<tr>
<td>Other</td>
<td>28266</td>
<td>4.3</td>
<td>100.0</td>
</tr>
</tbody>
</table>
2012 Performance Level – Locations Impacted

- 2012 Total # opportunities = 107,711
- Number Defects: 3290
- DPMO = 30,545

*** 1.9 Baseline Sigma Level ***
Current Process – Out of Control

P Chart of Orders Missing

Tests performed with unequal sample sizes

UCL=0.04135
P=0.03590
LCL=0.03046
Fishbone Diagram
5 Why Analysis

- **WHY #1**: How service departments manage orders and paperwork – unorganized, multiple paper charts are collected in baskets.

- **WHY #2**: The process for getting charts to medical records varies from daily pick up by medical records staff to departments delivering when big enough batch (can be 2 weeks from DOS before gets to medical records).

- **WHY #3**: Silos - departments and functions.
  - Coders are only looking for orders in Meditech 4 days after service, faster than medical records gets charts processed and scanned into Meditech.
  - Service area do not know the process of how orders get scanned into Meditech -- they have to be scanned to patient’s D number so that coders can find order (they are off site).
  - Charts with non-valid orders are sent back to review without any communication of what is missing.
5 Why Analysis (Continued)

WHY #4  Training and access to systems is lacking.
• Not all services being coded "no orders" require an order (a physician is providing the service)
• Not all orders for services are in the Meditech documentation system (many providers are in Next Gen).
• Coders do not have access to systems they need - only Meditech

WHY #5  Lack of standard process for capturing orders where needed and education

HOW: TEMPORARY COUNTERMEASURE
1. Training - what is a valid order, what services have orders in what system,
2. Provide coders access to systems needed

FINAL COUNTERMEASURE- A standard process with reduced handoffs and batching, capturing the power of technology
Scatter Plot and Regression Analysis

\[ y = 17.195x - 25.136 \]
<table>
<thead>
<tr>
<th>Project</th>
<th>Importance to Customer</th>
<th>Cost to Implement</th>
<th>Feasibility (Likelihood of Success)</th>
<th>Cost Reduction</th>
<th>Leverage (Positive Impact On Other Processes)</th>
<th>Total Project Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>POS Scanner</td>
<td>Rate 1 to 5</td>
<td>Rate 1 to 5</td>
<td>Rate 1 to 5</td>
<td>Rate 1 to 5</td>
<td>Rate 1 to 5</td>
<td>900</td>
</tr>
<tr>
<td>Central Repository</td>
<td>High = 5</td>
<td>High = 1</td>
<td>High = 5</td>
<td>High = 5</td>
<td>High = 5</td>
<td>900</td>
</tr>
<tr>
<td>Coder Training</td>
<td>Low = 1</td>
<td>Low = 5</td>
<td>Low = 1</td>
<td>Low = 1</td>
<td>Low = 1</td>
<td>540</td>
</tr>
<tr>
<td>Eliminate Time Stamping</td>
<td>3</td>
<td>X</td>
<td>5</td>
<td>X</td>
<td>5</td>
<td>150</td>
</tr>
<tr>
<td>Eliminate Triplicate order sheet</td>
<td>1</td>
<td>X</td>
<td>2</td>
<td>X</td>
<td>3</td>
<td>90</td>
</tr>
<tr>
<td>Coder Access to Next Gen</td>
<td>4</td>
<td>X</td>
<td>2</td>
<td>X</td>
<td>5</td>
<td>800</td>
</tr>
<tr>
<td>Coder Access to Manager of clinic</td>
<td>4</td>
<td>X</td>
<td>5</td>
<td>X</td>
<td>1</td>
<td>300</td>
</tr>
<tr>
<td>Barcode on 90% of documents</td>
<td>1</td>
<td>X</td>
<td>1</td>
<td>X</td>
<td>4</td>
<td>12</td>
</tr>
</tbody>
</table>
## FMEA

**Process Name:** Central Repository and POS Scanning  
**Process Number:** 2013  
**Date:** 6/1/2013  
**Revision Level:** 3

<table>
<thead>
<tr>
<th>FAILURE MODE</th>
<th>A) SEVERITY</th>
<th>B) OCCURRENCE Probability</th>
<th>C) DETECTION Probability</th>
<th>RISK PRIORITY NUMBER RPN</th>
<th>ACTION TO IMPROVE</th>
<th>REVISED VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Long list to search though to find order</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>12</td>
<td>Auto delete established</td>
<td>3</td>
</tr>
<tr>
<td>- increase staff time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2) Select right patient but wrong order</td>
<td>9</td>
<td>2</td>
<td>8</td>
<td>144</td>
<td>When scanning have to enter test ordered</td>
<td>9</td>
</tr>
<tr>
<td>3) Scan order to wrong D number</td>
<td>10</td>
<td>5</td>
<td>6</td>
<td>300</td>
<td>Have to match date of service during entry</td>
<td>10</td>
</tr>
<tr>
<td>4) Order scanned into wrong category into Meditech</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>45</td>
<td>Made only access is to order category</td>
<td>3</td>
</tr>
<tr>
<td>5) Scan an order that is not &quot;valid&quot;</td>
<td>10</td>
<td>6</td>
<td>10</td>
<td>600</td>
<td>Training, written reference document provided at desktop. MR random audit</td>
<td>10</td>
</tr>
</tbody>
</table>
Trial Results

Feb 2013 Radiology - SCI Orders - Total to Missing

**Continue to have 0 Missing Orders through May 31, 2013**
Go Live

- 31 Departments
- Built access for 441 in Repository
- Set Up 8 Kodak Scanners and 30 All in One Scanners and access for 200
- 33 G drive folders built
- Set up 190 with new Meditech access
- Employees Trained in all 31 departments
Control Phase

Sustaining and Continuing Improvement
Control Tools

- Documented Standard Work
- Measurement Feedback
- Control Plan - what accountable will do measurement trend
- Control Charts - Before and After Comparisons
Tests performed with unequal sample sizes
Tests performed with unequal sample sizes
Tests performed with unequal sample sizes
Tests performed with unequal sample sizes
Go Live with Pilot (SCI and S.Tower Radiology)
Go Live with New Process Date April 9, 2013
## Average Days to Bill All Orders

<table>
<thead>
<tr>
<th></th>
<th>2013 YTD</th>
<th></th>
<th>2012 Days to Bill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>12.72</td>
<td>Jan</td>
<td>20.22</td>
</tr>
<tr>
<td>Feb</td>
<td>11.15</td>
<td>Feb</td>
<td>18.12</td>
</tr>
<tr>
<td>Mar</td>
<td>12.68</td>
<td>Mar</td>
<td>16.67</td>
</tr>
<tr>
<td>April</td>
<td>9.19</td>
<td>Apr</td>
<td>17.25</td>
</tr>
<tr>
<td>May</td>
<td>10.63</td>
<td>May</td>
<td>23.34</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jun</td>
<td>24.82</td>
</tr>
</tbody>
</table>
Financial Impact

- Coders have to final code to be able to bill for services
- Prevented Write off of $635,274 (at 40% reimbursement rate = $254,109.60 revenue)

Days to Final Abstract Status by Coding:

<table>
<thead>
<tr>
<th></th>
<th>Total Missing Orders (areas impacted by project)</th>
<th>Ave Days to Bill these Encounters</th>
<th>Sum of Charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>3290</td>
<td>95.45 DAYS</td>
<td>$1,845,984.00</td>
</tr>
</tbody>
</table>

Increased cash flow in one time collections by $705,177
Lessons Learned

- Test Pilot Invaluable
- Document during process
  - Struggled with being able to ID go live date
    - 4/15/13 IM 318 orders email - attaching before deleting (no attached order document in CR)
  - Communication Opportunities
    - Standardization – How search; enter provider names, how year entered
    - Remembering where training resources are
      - How to and Valid Order
    - Once Live – need to still hear about issues - continue to improve
      - DOB
  - Education Enhancements
- Impatience can be a barrier – CI/PI is a journey
- Leaders must become coaches – process discipline and follow up are critical
- Technology alone is not the answer
In Simple Terms

• Listen (to customers, our experts…)
• Go to the gemba
• Measure and seek to understand
• Make it better (improve)
• Prove the improvement is real and meaningful
• Make it stick
“The starting point for improvement is to recognize the need.” IMAI