Practicing Six Sigma for Medical Group Practice Success

Cardiovascular Consultants Pasteplus Improvement Team

Author: Mark Stewart
Heartland Health

• Tertiary care regional hospital
• 21 county service area; 285,000 people
• Services include:
  – Medical group practices
  – Health maintenance organization (HMO)
  – Preferred provider organization (PPO)
  – Acute and post acute care services
  – Regional community foundation
  – Regional clinics and affiliations
Heartland Health

- 70+ employed physicians
- 430,000 outpatient visits
  - Includes 250,000 Medical Group Practice (MGP) visits
- 26,000 covered HMO/PPO lives
- 42,000 annual emergency room visits
- 19,000 annual hospital discharges
- 2,600+ employees
Heartland Health

Vision
- “Best and safest”
- “Healthy and productive”

Mission
- Improve health of individuals and communities
- Right care, right time, right place, right cost
- Outcomes second to none
Project

• This project involved cardiology services at Heartland Health. We were missing charges and the times between delivery services and dictation, transcription, report delivery and charge entry were very high.
Team Membership

- Steve McCamy
- Dottie Bray
- Scott Koelliker
- Ellen Ellis
- Donna Gibson
- Dr. Hindupur
- Regina Tillman
- Cheryl Baldwin
- Dr Griffin
- Carrie Till
- Lindsey Minton
- Vanessa Strasser
- Deb Webb
- Lori Stickler
- Mark Stewart
Project Timeline

• Kick off Meeting: July 11, 2002
• P roblem Phase: August 9, 2002
• A nalyses Phase: September 26, 2002
• S olution Phase: November 22, 2002
• T ransition Phase: December 27, 2002
• E valuation Phase: January 10, 2003 Ongoing
Charge Throughput Process

Patient Services Rendered → Documentation Dictation → Transcription → Coding → Charge Entry
Opportunity Statement

• Opportunity to improve the timeliness, accuracy, comprehensiveness, and efficiency of the charge throughput process resulting in cost savings, increased productivity and net revenue.

Problem statement

• Charge throughput is not timely, accurate, comprehensive or efficient.
## Current and Desired Sigma

<table>
<thead>
<tr>
<th></th>
<th>Current Stats</th>
<th>Desired Stats</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yield</td>
<td>Sigma</td>
</tr>
<tr>
<td>Physician Productivity</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>97.90%</td>
<td>3.54</td>
</tr>
<tr>
<td>Timely Charge Entry of 5 days from Date of Service</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.50%</td>
<td>-0.46</td>
</tr>
<tr>
<td>1st pass accuracy of encounter form</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>92%</td>
<td>2.91</td>
</tr>
<tr>
<td>Comprehensive for services rendered</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>97.50%</td>
<td>3.46</td>
</tr>
<tr>
<td>Efficiency: Clerical FTE’s per 10,000 Work RVU’s</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>38th Percentile of MGMA</td>
<td>2.61</td>
</tr>
</tbody>
</table>
**SIPOC**

developed to present an “at-a-glance” view of important variables to the work flow.

- **Supplier** – the person/group providing key information, materials, or other resource to the process
- **Input** – the “thing” provided
- **Process** – the set of steps that transforms – and ideally, adds value to – the Input
- **Output** – the final product of the process
- **Customer** – the person, group, or process that receives the Output
SIPOC Diagram

**Suppliers**
- Physician
- Clinical Staff
- Cath Lab Staff
- Heart Ctr Staff
- Outreach Staff

**Inputs**
- Documentation
- Encounter Form
- Cath Lab Log
- Non-invasive Log

**Process**
- See Below

**Outputs**
- Charge Form
- Coded and Entered into Computer

**Customers**
- Patient
- Physician
- Ref. Physician
- Patient
- Financial Services

**Key Quality Characteristics**
- Accurate
- Timely
- Comprehensive

**Patient Services Rendered**
- Document Encounter & Services
- Transcription
- Match documentation with Encounter forms

**Dictation**
- Transcribed Report
- Matched Documentation
- Coded Encounter

**Entry of encounter form into Computer**

**Output**
Workout Teams

- ICQC, Inc.
  - CARES +
    - Core Service
      - Outcomes Mgt
    - Access
      - Scheduling
      - Communications
    - Representation
      - Patient relations
    - Economics
      - Cost of Service
      - Value for Service
    - Staff & Support
      - Goal: Patient Satisfaction
      - 25% Improvement

- Provider Documentation
  - Goals
    - One day turnaround time
      - DOS to Dictated
      - Dictated to Transcribed
    - Reduce Transcription Cost
      - Approx 15%
Analysis

• Review previous reports
• Cause & Effect Diagram
• Cause & Effect Pareto
• Collect data on Cause & Effect
• Flowchart problem processes
• ANOVA
• Descriptive Statistics
Review of Previous Projects

• Reviewed PARM team measures for practice
  – % of charges posted in 5, 10, 30, < 30 days
  – Encounter forms returned by coder
  – Additional charges found, not on enc. Form
  – Point of service collections
  – Write-offs: Contractual and Administrative

• Hospital Logs; Cath lab, Non-Invasive lab

• Other MGP reports
Cause and Effect (Fishbone) Diagram

- Used to trigger ideas and promote group brainstorming to list potential causes of the problem
- Rules of brainstorming apply
- Causes are categorized and clarifies
- Group multi-votes on causes
Why is charge throughput not timely accurate, comprehensive or efficient?
Pareto Chart Multivote Result of Cause and Effect

Pareto Chart of C8

Count

Percent

Count  8  7  6  6  5  5  5  4  3  2  2  2  2  2  2  2  2  1  1  1  1  1  1  1  3
Percent  11  9  8  8  7  7  5  4  3  3  3  3  3  3  3  3  3  1  1  1  1  1  1  4
Cum %  11  20  28  36  43  49  56  61  65  68  71  73  76  79  81  84  87  89  91  92  93  95  96  100
## Cardiovascular Consultants Overall Current State Process Capability

### Process Data

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>USL</td>
<td>6.0000</td>
</tr>
<tr>
<td>Target</td>
<td>*</td>
</tr>
<tr>
<td>LSL</td>
<td>*</td>
</tr>
<tr>
<td>Mean</td>
<td>20.0088</td>
</tr>
<tr>
<td>Sample N</td>
<td>678</td>
</tr>
<tr>
<td>StDev (Within)</td>
<td>4.98522</td>
</tr>
<tr>
<td>StDev (Overall)</td>
<td>8.96243</td>
</tr>
</tbody>
</table>

### Potential (Within) Capability

<table>
<thead>
<tr>
<th>Z.Bench</th>
<th>Z.USL</th>
<th>Z.LSL</th>
<th>Cpk</th>
<th>Cpm</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2.81</td>
<td>-2.81</td>
<td>*</td>
<td>-0.94</td>
<td>*</td>
</tr>
</tbody>
</table>

### Overall Capability

<table>
<thead>
<tr>
<th>Z.Bench</th>
<th>Z.USL</th>
<th>Z.LSL</th>
<th>Ppk</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1.56</td>
<td>-1.56</td>
<td>*</td>
<td>-0.52</td>
</tr>
</tbody>
</table>

### Observed Performance

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPM &lt; LSL</td>
<td>992625.37</td>
</tr>
<tr>
<td>PPM &gt; USL</td>
<td>997523.49</td>
</tr>
<tr>
<td>PPM Total</td>
<td>992625.37</td>
</tr>
</tbody>
</table>

### Exp. "Within" Performance

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPM &lt; LSL</td>
<td>992625.37</td>
</tr>
<tr>
<td>PPM &gt; USL</td>
<td>997523.49</td>
</tr>
<tr>
<td>PPM Total</td>
<td>992625.37</td>
</tr>
</tbody>
</table>

### Exp. "Overall" Performance

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPM &lt; LSL</td>
<td>992625.37</td>
</tr>
<tr>
<td>PPM &gt; USL</td>
<td>997523.49</td>
</tr>
<tr>
<td>PPM Total</td>
<td>992625.37</td>
</tr>
</tbody>
</table>
### Data

**One-way ANOVA: DOS to Entry versus Provider**

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provider</td>
<td>5</td>
<td>7054.7</td>
<td>1410.9</td>
<td>20.37</td>
<td>0.000</td>
</tr>
<tr>
<td>Error</td>
<td>666</td>
<td>46129.6</td>
<td>69.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>671</td>
<td>53184.3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Individual 95% CIs For Mean Based on Pooled StDev**

<table>
<thead>
<tr>
<th>Level</th>
<th>N</th>
<th>Mean</th>
<th>StDev</th>
<th>Pooled StDev</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHO</td>
<td>12</td>
<td>26.500</td>
<td>2.236</td>
<td>8.322</td>
</tr>
<tr>
<td>HINDUPUR</td>
<td>154</td>
<td>23.968</td>
<td>7.777</td>
<td></td>
</tr>
<tr>
<td>JANIF</td>
<td>170</td>
<td>21.641</td>
<td>10.222</td>
<td></td>
</tr>
<tr>
<td>LAMMOGLI</td>
<td>161</td>
<td>16.497</td>
<td>7.513</td>
<td></td>
</tr>
<tr>
<td>NUC</td>
<td>18</td>
<td>22.944</td>
<td>11.259</td>
<td></td>
</tr>
<tr>
<td>ROWE</td>
<td>157</td>
<td>16.873</td>
<td>7.151</td>
<td></td>
</tr>
</tbody>
</table>

Pooled StDev = 8.322

---

HEALTHY CHOICES

Healthy Lives
Other Data

- ANOVA by Site
- ANOVA by Weekday
- ANOVA by Location (office, hospital, interp)
- Regression Analysis
- Descriptive Statistics
Cardiovascular Consultants Overall Descriptive Statistics

Variable: DOS to Charge Entry

Anderson-Darling Normality Test
A-Squared: 8.160
P-Value: 0.000

Mean 20.0088
StDev 8.9591
Variance 80.2658
Skewness 1.13014
Kurtosis 2.59751
N 678

Minimum 4.0000
1st Quartile 14.0000
Median 18.0000
3rd Quartile 25.0000
Maximum 63.0000

95% Confidence Interval for Mu
19.3333 20.6844

95% Confidence Interval for Sigma
8.5063 9.4632

95% Confidence Interval for Median
18.0000 19.0000
**Similar Statistical Analysis**

- Transcription, delivery, coding and entry took 11.5 days on the average.
- Dictate to transcribe took 5.4 days on the average.
- Date of Service to dictate took 4.6 days on the average.
Similar Flow Charts

- Cath lab charge throughput
- Hospital charge throughput
- Cardiology office other charge throughput
## Solution Matrix

1. **Review analysis data**
2. **Incorporate Poka-yoke**
3. **Brainstorm possibilities**
4. **Select criteria & weight to prioritize solutions**
5. **Individual multi-vote**
6. **Team validation of vote**
7. **Assign resources**
8. **Combine solutions**
9. **Test some solutions**
10. **Implement quick fixes**

1. **Flowcharts, data, pareto.**
2. **Change concepts.**
3. **Say what you think.**
4. **Impact on timeliness, accuracy, efficiency and comprehensiveness.**
5. **High-medium-low.**
6. **Subgroup team meetings.**
7. **Dr., Education, I/S, staff, tools, capital, etc.**
8. **Combine solutions for action plan writing.**
9. **Testing solution #24.**
10. **Implemented #1,3,15,16,22,43,58.**
<table>
<thead>
<tr>
<th>Solution by Venue</th>
<th>Impact on Timeliness</th>
<th>Impact on Accuracy</th>
<th>Impact on Efficiency</th>
<th>Impact on (missed charges) Comprehensiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>MGP Charge Throughput</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinic Office Solutions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Access Rep checks off office encounters on reconciliation report daily (same day).</td>
<td>14</td>
<td>7</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>2 Physicians dictates the same day into outsource system (spell patient name, MRN, DOS).</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>3 Separate work type numbers for each provider done thru software.</td>
<td>11</td>
<td>7</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>4 Tech marks services on encounter form for any add-on test performed.</td>
<td>19</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>5 Access Rep looks for missing encounter forms the same day. If not found, access rep cancels encounter and creates a new one. Need to cancel as to not have duplicate charges, which cause reversals in AFM.</td>
<td>20</td>
<td>10</td>
<td>13</td>
<td>20</td>
</tr>
<tr>
<td>6 HIS Clerk prints dictated reports.</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>7 HIS Clerk routes dictation to designated person (days kept together)</td>
<td>10</td>
<td>6</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>8 Designated person matches encounter form to transcription documents.</td>
<td>20</td>
<td>21</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>9 HIS Clerk or Access Rep looks for missing transcribed reports.</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>
**Action Plans**

Individuals assigned solution(s) to draft action plan for team to agree with.

- Action plan worksheet is tool of choice.
  1. What is the action step to be taken?
  2. Who (team or non-team) is responsible for this step?
  3. Method or how the step will be completed?
  4. Resources needed to successfully implement?
  5. Date the step is to be completed?
Action Plans

• By location of services
  1. Office including office testing
  2. Hospital
  3. Cath lab
  4. Non-invasive lab
  5. Outreach clinics

• Includes steps for monitoring or measuring and how the results are communicated

• Includes steps for education & training
Transition

• Monitoring action plans with:
  – All the stake-holders
  – Administration
  – HR planning
  – Physicians and other providers
  – All the hospital departments
  – Public if necessary
  – Other as necessary
  – Revise action plans as necessary
Evaluation

• Results of the new implementations – what variables, how collected and analyzed.
• Process variance analysis including factors by provider and site.
• Six month during team, 1 year post team results.
• Identify need for post-implementation teams.
Process Capability Analysis for DOS to Entry

| Process Data | | | |
| USL | 5.0000 | | | |
| Target | * | | | |
| LSL | * | | | |
| Mean | 13.4269 | | | |
| Sample N | 260 | | | |
| StDev (Within) | 4.24735 | | | |
| StDev (Overall) | 5.39847 | | | |

| Potential (Within) Capability | | | |
| Cp | * | | | |
| CPU | -0.66 | | | |
| CPL | * | | | |
| Cpk | -0.66 | | | |
| Cpm | * | | | |

| Overall Capability | | | |
| Pp | * | | | |
| PPU | -0.52 | | | |
| PPL | * | | | |
| Ppk | -0.52 | | | |

<table>
<thead>
<tr>
<th>Observed Performance</th>
<th>Exp. &quot;Within&quot; Performance</th>
<th>Exp. &quot;Overall&quot; Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPM &lt; LSL</td>
<td>*</td>
<td>PPM &lt; LSL</td>
</tr>
<tr>
<td>PPM &gt; USL</td>
<td>1000000.00</td>
<td>PPM &gt; USL</td>
</tr>
<tr>
<td>PPM Total</td>
<td>1000000.00</td>
<td>PPM Total</td>
</tr>
</tbody>
</table>
One-way ANOVA: DOS to Entered versus Provider

Analysis of Variance for DOS to E

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provider</td>
<td>3</td>
<td>3504.3</td>
<td>1168.1</td>
<td>74.22</td>
<td>0.000</td>
</tr>
<tr>
<td>Error</td>
<td>256</td>
<td>4029.3</td>
<td>15.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>259</td>
<td>7533.6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Individual 95% CIs For Mean Based on Pooled StDev

<table>
<thead>
<tr>
<th>Level</th>
<th>N</th>
<th>Mean</th>
<th>StDev</th>
</tr>
</thead>
<tbody>
<tr>
<td>HINDUPUR</td>
<td>87</td>
<td>12.805</td>
<td>4.547</td>
</tr>
<tr>
<td>JANIF</td>
<td>64</td>
<td>16.719</td>
<td>4.492</td>
</tr>
<tr>
<td>LAMMOGLI</td>
<td>71</td>
<td>8.451</td>
<td>2.902</td>
</tr>
<tr>
<td>ROWE</td>
<td>38</td>
<td>18.605</td>
<td>3.251</td>
</tr>
</tbody>
</table>

Pooled StDev = 3.967

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10.5</td>
<td>14.0</td>
<td>17.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Similar ANOVA

• All the following ANOVAs were statistically significant
  – Dictate to transcribed vs. provider
  – Transcription delivery vs. provider
  – Delivery, coding and entry vs. provider
  – DOS to dictate vs. provider
Cardiovascular Consultants Descriptive Statistics

Variable: DOS to Entry

Anderson-Darling Normality Test
A-Squared: 4.791
P-Value: 0.000

Mean: 13.4269
StDev: 5.3933
Variance: 29.0873
Skewness: 1.19708
Kurtosis: 2.75253
N: 260

Minimum: 7.0000
1st Quartile: 8.0000
Median: 13.0000
3rd Quartile: 17.0000
Maximum: 37.0000

95% Confidence Interval for Mu:
12.7683 to 14.0856

95% Confidence Interval for Sigma:
4.9661 to 5.9014

95% Confidence Interval for Median:
12.7241 to 13.2759
Results

- DOS to dictated average 2.7 days
- Dictate to transcribed average 0.8 days
- Transcribed TAT average 1.5 days
- Delivery coding and entry average 9.7 days
**Sigma Values & Yields**

- **Physician Productivity**
  - Timely Charge Entry of 5 days from Date of Service
    - DOS to Entry = 33%
    - DOS to Dictate = 40%
    - Transcribed = 85.7%
    - Coding & Entry = 17.8%

- 1st pass accuracy of encounter form

- Comprehensive for services rendered

- Efficiency: Clerical FTE’s per 10,000 Work RVU’s

- Yield = 96.7%  Sigma = 3.34

- Yield = 2.05%  Sigma = (.54)

- Yield = 92.2% Sigma = 2.92

- Yield = 97.5%  Sigma = 3.46

- 2.89 = 44th % MGMA
Workout Teams

- **ICQC**
  - Baseline: 3rd Qtr FY02
    - 87.3 = 50th %
  - 1st Qtr FY03
    - 90.2 = 71st %
  - 2nd Qtr FY03
    - Not available

- **Provider Documentation**
  - Turnaround Time: Baseline
    - DOS to Dictate = 4.57 days
    - Dictated to Transcribed = 5.43
  - Transcription Cost: Baseline FY02
    - Total per month = $6,561
    - Per Work RVU = $1.49
  - Turnaround Time: Jan 03’
    - DOS to Dictate = 2.70 days
    - Dictated to Transcribed = .78
  - Transcription Cost: YTD FY03
    - Total per month = $6,409
    - Per Work RVU = $1.55
Net revenue / Cost recovery

• Target FY03
  – $680,000

• Baseline Opportunity 6 months
  – Gross Charges + 25%
    • $1,152,666
  – Accrued Net Revenue
    • $530,226 (46%)
  – Comprehensive Charges
    • $46,888
  – Accuracy (ABN, W/O)
    • $61,393
  – Timely
    • $30,000 Cash flow
  – Efficiency
    • $51,033

• Total $611,259

• Results: July-Dec 2002
  – Gross Charges Increase
    • $1,051,548
  – Accrued Net Revenue Increase to G/L
    • $488,970
  – Comprehensive Charges
    • Included in Accrued Net
  – Accuracy (Included in Accrued Net)
    • $33,829
  – Timely
    • $0
  – Efficiency
    • ($28,788)
    • Transcription & Clerical cost savings expected Jan - June

• Total $460,182
Net revenue / Cost recovery

- Target FY03
  - $680,000
- Baseline Opportunity 6 months
  - Gross Charges + 25%
    - $1,152,666
  - Accrued Net Revenue
    - $530,226 (46%)
  - Comprehensive Charges
    - $46,888
  - Accuracy (ABN, W/O)
    - $61,393
  - Timely
    - $30,000 Cash flow
  - Efficiency
    - $51,033
- Total $611,259

- Results: July 02-June 03
  - Gross Charges Increase
    - $1,670,568
  - Accrued Net Revenue Increase to G/L
    - $768,461
  - Comprehensive Charges
    - Included in Accrued Net
  - Accuracy (Included in Accrued Net)
    - $48,940
  - Timely
    - $0
  - Efficiency
    - $6,216
- Total $774,677