Six Sigma as a Healthcare Quality Initiative

The Quality Colloquium
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Carolyn Pexton, GE Healthcare
Benjamin Williams, Harvard Health Policy Review
Track IC – August 22, 1:45-6:15
Six Sigma Basics

Benjamin Williams

Former Editor-in-Chief, *Harvard Health Policy Review*;
Former Administrative Resident & Six Sigma Green Belt, NewYork-Presbyterian Hospital
History & Early Pioneers

• “Six Sigma” coined at Motorola in the 1980s

• Adopted by Allied Signal (Honeywell) with great success

• Later adopted by Jack Welch (GE) and further developed into a true management system
What is Six Sigma?

A philosophy that underlies efforts to improve business performance and customer satisfaction

- Using facts and data to eliminate waste (muda) and variation
  - Eliminating activities that don’t add value!
What is Six Sigma?

1. The term “Sigma” is a *measurement* of how far a given process deviates from perfection – a measure of number of “defects”. “Six Sigma” implies near zero defects.

2. “A quality *improvement methodology* that applies statistics to measure and reduce variation in processes.”

3. A *management system* that is “comprehensive and flexible for achieving, sustaining, and maximizing business success.”
Conceptual Framework

- **Critical to Quality (CTQ):** Attributes most important to the customer
- **Defect:** Failing to deliver what the customer wants
- **Process Capability:** What your process can deliver
- **Stable Operations:** Ensuring consistent, predictable processes to improve what the customer perceives
**Measurement:** Variance is the Enemy

**Wide Variation**

**Slim Variation**

Ex: MRI TAT Project

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Measurement: Six Sigma as a Quality Goal

The higher the sigma, the fewer the defects.

A increase from 3 to 6 Sigma represents a 20,000 fold improvement in quality.

<table>
<thead>
<tr>
<th>$\sigma$</th>
<th>Defects Per Million Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>697,672.15</td>
</tr>
<tr>
<td>2</td>
<td>308,770.21</td>
</tr>
<tr>
<td>3</td>
<td>66,810.63</td>
</tr>
<tr>
<td>4</td>
<td>6,209.70</td>
</tr>
<tr>
<td>5</td>
<td>232.67</td>
</tr>
<tr>
<td>6</td>
<td>3.40</td>
</tr>
</tbody>
</table>

99% “Good” (3.8 Sigma)

- No electricity for 7 hours per month
- 5,000 incorrect operations per week
- 20,000 wrong prescriptions per year

99.99966% “Good” (6 Sigma)

- No electricity for 1 hour every 34 years
- 1.7 incorrect operations per week
- 68 wrong prescriptions per year
**Measurement:** Comparative Analysis of Process Capability

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**Improvement Methodology:** DMAIC “Backbone”

- **DEFINE**
  - ...the problem in a measurable way

- **MEASURE**
  - ...the current process capability (get the data!)

- **ANALYZE**
  - ...and validate root cause(s)

- **IMPROVE**
  - Devise solution(s) and implement

- **CONTROL**
  - Sustain improvement

**Control Tools**

**Performance Improvement**

**Benchmarking**

**Project Timeline**

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**Improvement Methodology:** Key Players

**Champions/Sponsors:** Trained business leaders who lead the deployment of Six Sigma in a significant business area.

**Master Black Belts:** Fully-trained quality leaders responsible for Six Sigma strategy, training, mentoring, deployment and results.

**Black Belts:** Fully-trained Six Sigma experts who lead improvement teams, work projects across the business and mentor Green Belts.

**Green Belts:** Fully-trained individuals who apply Six Sigma skills to projects in their job areas.

**Team Members:** Individuals who receive specific Six Sigma training and who support projects in their areas.
Management System: Themes

- Customer Focus
- Data- and Fact-Driven Management
- Process is Key
- Proactive Management
- “Boundaryless” Collaboration
- Drive for Perfection; Tolerate Failure

Source: Adopted from “The Six Sigma Way” by P. Pande, R. Neuman, and R. Cavanagh
Scalable Implementation

• Problem Solving

• Strategic Improvement

• Full-Scale Business Transformation

Source: Adopted from “The Six Sigma Way” by P. Pande, R. Neuman, and R. Cavanagh
# How is Six Sigma Different?

**Other Quality Programs**

- Driven internally
- Looks at averages
- Focuses on outcomes
- Retrospective; fixes defects
- Focuses on quality
- Attentive to production
- Training is separate from management system

**Six Sigma**

- Driven by the customer
- Targets variation
- Focuses on processes
- Prospective; prevents defects
- Focuses on quality & ROI
- Attentive to total business
- Training is integral to management system
Industry $uccess!

In a study of Motorola, Allied Signal, GE, and Honeywell -- companies with mature Six Sigma deployments and associated culture changes -- savings as a percentage of revenue were observed to vary between 1.2% and 4.5%.

Charles Waxer (2003), “Six Sigma Costs And Savings”
Industry Success - Quality & Innovation

**General Electric**
- Reduced invoice defects and disputes with a key customer by 98%
- Improved a key call center performance measure from 76% to 99%
- Reduced vibrations in Power System rotors by 300%
- Developed breakthrough technology that reduced medical scan times from 3 minutes to 30 seconds

**Allied Signal (Honeywell)**
- Reduced defects by 68% in 4 months

**Texas Instruments**
- Improved yield from 84.3% to 99.8% since 1998
Industry Pursuing Six Sigma

- FedEx
- Sony
- Toshiba
- Nokia
- American Express
- Oracle
- Amazon.com
- Texas Instruments
- Hitachi
- Honda
- Raytheon
- Lockheed Martin
- Siemens
- Honeywell
- Kodak
- Dupont
- Bank of America
- IBM
- Bombardier
- Maytag
- Canon
Applying Six Sigma and Related Methods in Healthcare

Carolyn Plextton
GE Healthcare
Director of Communications,
Performance Solutions
How Safe is Healthcare?

44,000 to 98,000 Preventable Hospital Deaths

(IOM study, 1999)

In-Hospital Deaths from Medical Errors at 195,000 per Year. Patient Safety Incidents In Hospitals Account for $6 Billion per Year in Extra Costs

(HealthGrades - July, 2004)

Defects in healthcare are costly -- unlike manufacturing, you can’t simply shut down the line until you find and fix the problem.
Healthcare Fails to Deliver Six Sigma

Source: Chassin, Milbank Quarterly, 11/4/98.
Healthcare Project Examples

Improving process/safety for medication administration
Reduction in Blood Stream Infections in ICU
Reducing ventilator acquired pneumonia
Stroke Patient Length of Stay
Reduced Number of Inpatient Transfers
Emergency Department Patient Wait Time
Improved Patient Throughput in Radiology
Reduction in Lost Films
MR Exam Scheduling Improvement
Staff Recruitment and Retention
Operating Room Case Cart Accuracy
Physician (Professional Fee) Billing Accuracy
Appointment Backlog for Hospital-Based Orthopedic Clinic
Quality of Care and Satisfaction of Families in Newborn ICU
Mitigating risk in clinical care

- Improve medication administration
- Increase compliance with care protocols
- Remove conflict in coordinating care
- Reduce post-surgical infections

Focus areas include:
- Clinical outcomes
- Infection control
- Case management
- Patient safety
The Big “Why”

Achieving 35% higher “take home baby” rate with increase in successful implantation at Women & Infant’s Hospital, RI.

Better patient safety with 91% improvement in post-surgery antibiotic use, delivering annual savings over $1 million at Charleston Area Medical Center, WV.

Shorter ED wait times allow 28 more patients per day to be seen, with potential financial impact over $13 million annually at Verdugo Hills Hospital, CA.
Supporting Major Initiatives

IHI’s 100k Campaign

Projects to improve patient safety in key areas:

- Deployment of Rapid Response Teams
- Delivery of Reliable, Evidence-Based Care for Acute Myocardial Infarction
- Prevention of Adverse Drug Events
- Prevention of Central Line Infections
- Prevention of Surgical Site Infections
- Prevention of Ventilator-Associated Pneumonia

Six Sigma helps to identify the right opportunities, target critical underlying factors and maintain measurable improvement

Table: Baldrige Award Judging Criteria and Point Values

<table>
<thead>
<tr>
<th>Categories and Sub-Categories</th>
<th>Max. Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Leadership</td>
<td></td>
</tr>
<tr>
<td>1.1. Organizational Leadership</td>
<td>120</td>
</tr>
<tr>
<td>1.2. Social Responsibility</td>
<td>75</td>
</tr>
<tr>
<td>1.3. Social Responsibility</td>
<td>50</td>
</tr>
<tr>
<td>2. Strategic Planning</td>
<td></td>
</tr>
<tr>
<td>2.1. Strategy Development</td>
<td>85</td>
</tr>
<tr>
<td>2.2. Strategy Deployment</td>
<td>40</td>
</tr>
<tr>
<td>2.3. Strategy Deployment</td>
<td>45</td>
</tr>
<tr>
<td>3. Focus on Patients, Other Customers and Markets</td>
<td></td>
</tr>
<tr>
<td>3.1. Patient, Other Customer and Market Knowledge</td>
<td>85</td>
</tr>
<tr>
<td>3.2. Patient and Other Customer Relationships and Satisfaction</td>
<td>45</td>
</tr>
<tr>
<td>4.1. Measurement and Analysis of Organizational Performance</td>
<td>45</td>
</tr>
<tr>
<td>4.2. Information and Knowledge Management</td>
<td>45</td>
</tr>
<tr>
<td>5. Staff Focus</td>
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</tr>
<tr>
<td>5.1. Work Systems</td>
<td>85</td>
</tr>
<tr>
<td>5.2. Staff Learning and Motivation</td>
<td>25</td>
</tr>
<tr>
<td>5.3. Staff Well-Being and Satisfaction</td>
<td>25</td>
</tr>
<tr>
<td>6. Process Management</td>
<td></td>
</tr>
<tr>
<td>6.1. Health Care Processes</td>
<td>85</td>
</tr>
<tr>
<td>6.2. Support Processes</td>
<td>35</td>
</tr>
<tr>
<td>7. Business Results</td>
<td></td>
</tr>
<tr>
<td>7.1. Health Care Results</td>
<td>450</td>
</tr>
<tr>
<td>7.2. Patient and Other Customer Focused Results</td>
<td>75</td>
</tr>
<tr>
<td>7.3. Financial and Market Results</td>
<td>75</td>
</tr>
<tr>
<td>7.4. Staff and Work System Results</td>
<td>75</td>
</tr>
<tr>
<td>7.5. Organizational Effectiveness Results</td>
<td>75</td>
</tr>
<tr>
<td>7.6. Governance and Social Responsibility Results</td>
<td>75</td>
</tr>
<tr>
<td>Total Points Possible</td>
<td>1,000</td>
</tr>
</tbody>
</table>
Key Success Factors

- CEO must own it and must have a clear vision for the initiative
- Invest in resources and make a long term commitment
- Dedicate “best and brightest”
- Measure and hold people accountable
- Change the systems and structures to support the effort
- Establish early, ongoing and clear communications
- Be flexible and patient
- Select and scope projects carefully: Focus on critical issues tied to business priorities, with measurable and manageable parameters
- Use change management tools to identify cultural barriers, gain acceptance and build momentum
- Establish shared need, values and vision
- Recognize, reward and celebrate successes
A journey rather than a destination

Over 60% of quality efforts fail. To be among the successful 40%, pay attention to the people side of change.

The Effectiveness ($E$) of the result is equal to the Quality ($Q$) of the solution times the Acceptance ($A$) of the idea.

Six Sigma is a solid approach, but not a “magic bullet” -- Transforming healthcare will also likely require changes in technology, legislation/regulation, transparency and culture.
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Additional Resources


International Society of Six Sigma Professionals – [www.isssp.com](http://www.isssp.com)

Inside Quality – [www.insidequality.com](http://www.insidequality.com)


Expectations and Questions?