Building an Integrated Approach to Improvement with Lean, Six Sigma and the Model for Improvement

Asian Pacific Forum on Quality in Health Care
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Discussion Topics

• The foundation for improvement

• Compare and contrast Lean, Six Sigma and the Model for Improvement

• Case Studies on integrating various models

• Assessing where you are in the journey

CAUTION

One approach will not solve all your challenges!

Oh no...you mean I’m going to have to think?
The Scientific Method provides the foundation for all improvement


Deductive Phase
( general to specific )

Information for Decision Making

Interpretation of the Results
( asking why? )

Theoretical Concepts
( ideas & hypotheses )

Select & Define Indicators

Data Collection
( plans & methods )

Data Analysis and Output

Inductive Phase
( specific to general )

The Scientific Method provides the foundation for all improvement

Understanding the Timeline is Critical

Evolution of the scientific method and PDSA cycle

Father of modern science
Galileo (1543-1643)

Inductive learning
Francis Bacon (1620)

Pragmatism
Charles Peirce (1839-1914)

Integration of pragmatism
and empiricism
C. L. Lewis (1929)

Shewhart cycle
Walter Shewhart (1939)

Deming wheel
W. Edwards Deming (1950)

Shewhart cycle
Deming (1966)

PDSA
Deming (1993)

PDSA = plan-do-check-act
PDCA = plan-do-study-act
TQC = total quality control
QC = quality control

19th century *Pragmatism* played a major role in building knowledge for improvement

- Darwinian notions of variation, population, and selection infiltrated a wide range of disciplines:
  - Epistemology – C.S. Pierce
  - Psychology – William James, Edward Thorndike
  - Sociology and education – George Mead, John Dewey
  - Development – J.Baldwin, J.Piaget
  - Law – Oliver Wendell Holmes
  - Philosophy – B. Russell, K. Popper, L. Wittgenstein

- **Some key notions**
  - Belief is observable only through action
  - Action is inherently a ‘bet’ on its results
  - Routinely successful action = ‘habit’ = ‘knowledge’

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**Classical Pragmatists (1850-1950)**

**Charles S. Peirce** (1839–1914)
The founder of American pragmatism. He wrote on a wide range of topics, from mathematics, to logic, semiotics and psychology.

**William James** (1842–1910)
An influential psychologist and theorist of religion, as well as philosopher and a physician. First to be widely associated with the term “pragmatism” due mainly to Charles Peirce’s difficult personality.

“As a rule we disbelieve all the facts and theories for which we have no use.”

William James
Classical Pragmatists (1850-1950)

John Dewey (1859–1952)
Prominent philosopher of education, referred to his brand of pragmatism as “instrumentalism.”

C. I. Lewis (1883-1964)
Perhaps the most important American academic philosopher active in the 1930s and 1940s. He was the founder of conceptual pragmatism and made major contributions in epistemology and logic, and, to a lesser degree, ethics. Lewis was also a key figure in the rise of analytic philosophy in the US. He also had a profound impact on Walter Shewhart and subsequently Edwards Deming.

Understanding the Timeline is Critical

Evolution of the scientific method and PDSA cycle

The Deming Wheel
1. Design the product (with appropriate tests).
2. Make it; test it in the production line and in the laboratory.
3. Sell the product.
4. Test the product in service, through market research. Find out what user think about it and why the nonusers have not bought it.


The Shewhart Cycle for Learning and Improvement

Act – Adopt the change, abandon it or run through the cycle again.

Study – Examine the results. What did we learn? What went wrong?

Plan – plan a change or test aimed at improvement.

Do – Carry out the change or test (preferably on a small scale).

(Deming, 1993)
Knowledge for Improvement Continues to Evolve

In the spring of 2010 the BMJ sponsored the Vin McLoughlin Symposium on the Epistemology of Improving Health Care. The papers that grew out of this symposium are freely available online under the BMJ journal’s unlock scheme: http://qualitysafety.bmj.com/site/about/unlocked.xhtml

Epistemology (from Greek epistēmē), meaning “knowledge, science”, and (logos), meaning “study of” is the branch of philosophy concerned with the nature and scope (limitations) of knowledge.

It addresses the questions:

• What is knowledge?
• How is knowledge acquired?
• How do we know what we know?

History of Six Sigma & Lean

![Evolution of the scientific method and PDSA cycle](image)

- Father of modern science: Galileo (1610)
- Inductive learning: Francis Bacon (1620)
- Pragmatism: Charles Pierce, William James (1872)
- How we think: John Dewey (1910)
- Integration of pragmatism and empiricism: C.I. Lewis (1913)
- Shewhart cycle: Walter Shewhart (1939)
- Shewhart cycle: W. Edwards Deming (1950)
- Deming wheel: W. Edwards Deming (1950)
- PDCA: Japanese QC (1950)
- PDCA: Total Quality Control (TQC) (1950)
- PDCA: Kaoru Ishikawa (TQC) (1962)
- PDSA: Deming (1953)
History of Six Sigma & Lean

F. Taylor - *The Principles of Scientific Method* (1911)

Toyota Family

Taiichi Ohno - 1950-1980 Toyota Production System

Womack & Jones

Bill Smith (1986) Motorola

Mikel Harry (1988) Motorola - MAIC

Forrest Breyfogle III (1992) Integration

Michael George (1991) Integration

Variations on a Theme

- Baldrige Performance Excellence Program
- European Foundation for Quality Management (EFQM)
- International Organization for Standardization (ISO)
- Lean Enterprise (Toyota Production System, TPS)
- Six Sigma Methodologies (Design for Six Sigma, DFSS)
- Model for Improvement (MFI)

Reference: Wortman 2001
Six Sigma, Lean, MFI

**Six Sigma**
- Define
- Measure
- Analyze
- Improve
- Control

**Lean**
- Identify Value
- Understand Value Stream
- Eliminate Waste
- Establish Flow
- Enable Pull
- Pursue Perfection

**Model for Improvement**
- What are we trying to accomplish?
- How will we know that a change is an improvement?
- What change can we make that will result in improvement?

**Similarities**
- Have disciplined processes and approaches
- Rely heavily on detailed measures
  - Lean – process steps, value
  - Six Sigma – Defects per 1,000,000 opportunities
  - MFI – Process, outcome measures
- Have a specific language and tools
- Have a long history in the field
  - Lean – Japanese production -Toyota-healthcare
  - Six Sigma – Japanese – Motorola, GE-healthcare
  - MFI – Shewhart, Deming, Japanese Union of Scientists and Engineers (JUSE)

Source: The Improvement Guide, API
**Six Sigma Steps**

- **Define**
  - Establish problem statement, governance and team, Voice of customer, scope, stakeholders

- **Measure**
  - Identify current performance baseline, validate measurement system, define capability and stability

- **Analyse**
  - Identify root causes validate with data, hypothesis testing

- **Improve**
  - Identify improvements based on analyse phase, pilot run PDSA cycles, implement solutions, confirm improvement

- **Control**
  - Ensure systems and process are in place to sustain new performance

Tools: Project charter, process maps, cause and effect, SPC, hypothesis testing, FMEA, PDSA

**Lean Specifics**

- **Identify Value**
- **Understand Value Stream**
- **Eliminate Waste**
- **Establish Flow**
- **Enable Pull**
- **Pursue Perfection**

- What is “Value” from the customer’s point of view
- Develop “Value Stream (VS)” to determine steps, value added, identify waste
- Improve flow, cycle time and value
- Establish process controls and high reliability
Model for Improvement (MFI)

- What are you trying to solve?
- How will you know?
- What changes will you make?
- Predict-Test-Observe
- Shewart cycle
- Reach your “aim”
- Hold the gain

Why, when and what?

<table>
<thead>
<tr>
<th>Approach</th>
<th>What’s the problem</th>
<th>Focus and strengths</th>
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</thead>
<tbody>
<tr>
<td>Lean</td>
<td>• Waste, rework, redundancies, Poor flow, Multiple process steps, Non Value added activities</td>
<td>• Elimination of waste, Improvement of flow, Simplifying and mistake proofing processes</td>
</tr>
<tr>
<td>Six Sigma</td>
<td>• Poor quality and variation, Complex and multiple system interactions</td>
<td>• Minimises variation, Based on facts and data, Robust sustain controls</td>
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<tr>
<td>Model for Improvement</td>
<td>• Quality or flow issues, Localised problems, Few improvement resources but skilled local staff and leaders</td>
<td>• Aim, tests, multiple cycles, learning, Works in multiple situations – including large and small scale projects</td>
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Wow…I have actually found organization’s that have integrated the various approaches!

KP Healthcare
Performance Improvement
We Lead with a Principles and Systems Approach based on the Attributes of a High Performing Organization

KP needs to build capability in these six areas in order to achieve breakthrough performance

- Leadership
- Learning
- Systems
- Capacity
- Measurement
- Culture

Best quality
Best service
Most affordable
Best place to work

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Kaiser Permanente Performance Improvement Model

- What are we trying to accomplish?
- How will we know that change is an improvement?
- What change can we make that will result in improvement?

Assess
- Process map
- Baseline data
- Charter project
- Create portfolio
- Data collection plan

Develop/Identify Change
- Standardize and simplify
- Reduce waste
- 5S
- Reduce defects
- Apply evidence-based practices

Test
- Training
- Policy & procedures
- Feedback loops
- Error proofing
- Control charts
- Spread plan

Implement/Control
Rapid Improvement Events

- **Employee involvement** in developing and implementing recommendations
- **Solutions** will be generated via front line knowledge
- Root causes are known
- Simple tools used (fishbone, process map, Pareto)
- Data analysis, statistical tools not required
- Often involve Lean 6S & mistake proofing projects in workplace – Set, Sort, Shine, Standardize, Sustain, Safety
- Management commits to quickly making decisions on team recommendations (yes / no / further study required)
- 1-3 days of team meetings required w/ facilitator
- Less than 30 days to implement recommendations
- Little or no capital required

**Improve Transport Response**

**Radiology Patient Flow**

Lean

- **Solution not known** or obvious
- Typically end-to-end process issues
- Extensive data & statistical analysis not required
- Reduce obvious waste: scrap, inventory, waiting, motion, etc.
- Often involves mistake proofing, and 6S – Set, Sort, Shine, Standardize, Sustain, Safety
- **Improve product flow / path**
  - Reduce process lead time / inventory
  - Eliminate non-value added steps
  - Reduce set up or change over time
  - Reduce push versus pull scheduling
- Goal is to achieve “Future State Value Stream”

**Operating Room Utilization**

**Testing Turnaround Time**
Six Sigma

- Solution unknown
- Long standing, complex problem, existing process
- New data & statistical analysis required
- Project types: defect reduction, reduced consumption,
- Process performance/savings measurable & directly tied to project
- 3-6 months or more to project completion

Reduce Billing Errors
Reduce Never Events
Reduce Inventory Obsolescence

What are our first steps?

- **Assessment:** problem statement, identification of root causes or flow charts and levers for improvement with drivers, prioritization of projects, scoping and resourcing using a charter

- **Select/plan:** defining what the focus will be – flow, defect reduction, redesign?

- **Test:** changes and application in real time before implementation

- **Implement/control:** Apply to processes locally to make part of core work and macro process standardization (ie. training, procedures)
Title: Building an Integrated approach to improvement at ADHB

Greg Balla
Director Performance & Innovation
Auckland District Health Board

better for patients, better for staff
We lead with a values and systems approach based on the characteristics of high performing organisations.

We need to continue to build organisation capability in these six areas to achieve sustainably superior results because our patients and staff deserve this.

**Leadership**  
**Strategy & Planning**  
**Engaged Workforce**  
**Measurement & Analysis**  
**Patients & Community**  
**Improved Processes**

**Results:**  
- Patient Safety  
- Quality care  
- Healthy Community  
- Economic sustainability  
- Best place to work

Based on the Baldrige Performance Excellence Framework

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**The problem**

It was taking too long for patients to get from the Emergency Department onto the ward after the decision to admit had been made.
So which model do we use

It was taking too long for patients to get from the Emergency Department onto the ward after the decision to admit had been made.

??so which model do we use:
Lean – Six Sigma - Model for Improvement??

The problem

It was taking too long for patients to get from the Emergency Department onto the ward after the decision to admit had been made.

- It Impacts 35,000 patients each year
- It involves multiple specialties
- There are multiple steps in the process
- The time it takes was an average of 8 hours
- The time we wanted to do this in was less than 1 hour
So which model do we use?

The problem: It was taking too long for patients to get from the Emergency Department onto the ward after the decision to admit had been made.

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So which model do we use? Lean Six Sigma or MFI

Answer: All of them

Multiple Improvement Projects Implemented using lean, six sigma & MFI

Rapid Improvement Event
ADHB Continuous Improvement Methodologies

**Levels**
- System re-think
- Service improvement or re-design
- Focused Improvement
- In team problem solving

**Environment**
- Current process completely broken/ not available
- Multiple end-to-end value streams
- Breakthrough focus – larger scope
- Tactical or operational

**Structure**
- Steering Group
- Programme
- Collaboratives
- Steering Group
- Multiple project teams
- Project Sponsor
- Project Team
- Team Leader
- Team members

**Tools for Continuous Improvement**

- Collaboratives
- IDEO
- 3Ps
- Change management
- DFSS
- Service improvement framework
- Co-design
- Change management
- DMAIC
- RIE
- Change management
- PDSA
- Basic Lean
- Change management

**Better for patients, better for staff**
Our Improvement approach encompasses, Lean, Six Sigma, MFI, TOC

- Develop a common language for improvement
- The problem type defines the tools required not the tools a consultant sells
- Very few problem types are just lean, six sigma or model for improvement

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<th>R</th>
<th>Q</th>
<th>A</th>
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<tbody>
<tr>
<td>Results</td>
<td>Quality of solution</td>
<td>Acceptance of solution</td>
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**ADKAR  Kotters Change Model**

**Change Acceleration Process**

- Create Urgency
- Form a powerful coalition
- Create a vision for change
- Communicate for buy in
- Empower others to act
- Create short term wins
- Build on the change
- Anchor the change in your culture

better for patients, better for staff
Integrating Quality & Change Mgmt Tool

- Anchor the change in your culture
- Build on the change
- Increase urgency
- Build the guiding team
- Develop the change vision
- Deliver short term wins
- Communicate for buy-in
- Deliver short term wins
- Empower others to act
- Deliver short term wins
- Don’t let up
- Anchor the change in your culture
- Build on the change

5 day Rapid Improvement Event

Aim: Reduce the time from bed allocated to patient transferred while improving patient safety from an average of 66 min to 9 min

Pre Event Tools Used:
- Project charter completed
- Stakeholder analysis
- Team selection
- Extensive communication
- Analysis of current performance: distribution, Control Charts, Box Plots
- Cross functional process map
- Walk the process
- Team & Sponsor training
- Implemented a Quick Win
Rapid Improvement Event: Example

- **Day One:** cross-functional process map - Failure Modes Effects Analysis (FMEA).
  - Failure Modes Effects Analysis (FMEA).
  - Data analysis - VA/NVA analysis.

- **Day Two:** MFI - Lean: prototyping and piloting improvements - PDSA cycles

- **Day Three:** MFI (PDSA cycles)

- **Day Four:** Preparing communication plans and completing implementation

- **Day Five:** Documenting improved processes and completing action plans for next 30, 60 and 90 days

Rapid Improvement Event: Results

**AED to Ward - Patient Transfer Times**

*From Ward Bed Ready to ED Discharge*

- **Our Goal = 30 Min**
- **Low Is Good**

**Admit Week Beginning Monday**

**better for patients, better for staff**
**A case study: blood is a gift**

**The problem:** Over-transfusion was occurring due to an inappropriately high transfusion trigger and the use of multiple units of red cells without rechecking the patient's Hb.

![Graph showing Hb Prior to Transfusion: Data audit 18/5/10 - 1/6/10](image)

- 30.8% with Hb > 99 g/ltr
- 47.75% with Hb > 79 < 100 g/ltr
- 19.82% with Hb < 80 g/ltr

80% of RBC transfusion levels were at Hb levels > 80 g/L.

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**What we did**

- We used DMAIC process aligned to clinical method of Planning, trial, analysis and correction.
- Social marketing concepts were put into place using a tag line strong enough to engage Clinicians to change behaviour.
A case study: blood is a gift

**The Results:** In 18 months we saved:

- 5,406 units of Red Blood Cells
- 21,624 hours of patients time
- 4,055 hours of nursing time
- approximately $2.9 million
Summary

- Ensure you are working on something important
- Develop a common language for improvement
- Skill development is required
- Expert help in partnership with Clinical Champions
- Quality improvement skills are not enough
- No problem is pure lean, six sigma or MFI
“It should be fairly obvious that no single quality system, set of quality criteria or even quality philosophy is ever going to be the solution by itself to a firm’s quality problems.”


Suggested Reading


Where are you headed?

“The greatest thing in the world is not so much where you stand, as in what direction we are moving.”

~Oliver Wendell Holmes

Thanks for joining us!

Please let us know if you have any questions.

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