Introduction to Quality and Process Improvement

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Josie King’s Story

- In January of 2001 Josie (18 months old) was admitted to Johns Hopkins after suffering first and second degree burns from climbing into a hot bath.

- She healed well and within weeks was scheduled for release.

- Two days before she was to return home she died of severe dehydration and misused narcotics.

From Sorrel King’s speech to the IHI Conference in 2002.
http://www.josieking.org/whathappened#sthash.GkB9vt2H.dp
Overview

• Quality: definition, current and future states

• Quality improvement tools and methodologies
  ➢ Lean: value stream mapping, 5S, pull systems, and error proofing
  ➢ Six sigma
  ➢ 7 Quality improvement tools & more …
“The balance between health benefits and harm is the essential core of a definition of quality”.

Donebadian 1980
Quality: Definitions

“Quality of care is the degree to which health services for individuals increase the likelihood of desired health outcomes and are consistent with current professional knowledge.”

IOM, Lohr 1990
Quality and Safety in Healthcare

Future state

Gap

Current state
QI Methodologies

- Lean
- Six Sigma
Lean - Definition

• An improvement approach to improve flow and eliminate waste (MUDA) that was developed by Toyota

➤ Philosophy

➤ Methodologies

• = Toyota Production System
5 Generic Elements in Lean Organizations

1) Specify value
2) Identify and visualize **value stream**
3) Making the value steps flow
4) **Pulling** patients along their journey
5) Perfection

Lean: Management Principles

- Relentless elimination of waste and non-value-adding activities
7 Wastes

- Transportation
- Inventory
- Motion
- Waiting
- Oversupply
- Overprocessing
- Defects

- An 8th waste is the wasted potential of people
Lean Methodologies

- Value stream mapping
- Visual Management: Five S
- Pull systems: Kanban, just-in-time
- Error-proofing
What Is Value?

• A capability provided to a customer
  – of the highest quality
  – at the right time
  – at an appropriate price

as defined by the customer

• "Value" is what the customer is buying
Value Stream Mapping

- A special type of flowchart
- A visual map for analyzing the “current state” and designing a “future state” for the series of steps in a patient’s pathway
- A tool that allows you to see waste, and plan to eliminate it
Visual Management: 5S

• A technique that results in a well-organized workplace complete with visual controls and order

• It’s an environment that has “a place for everything and everything in its place, when you need it”
Visual Management: 5S

• Sort (Seiri)
• Set in order (Seiton)
• Shine (Seiso)
• Standardize (Seiketsu)
• Sustain (Shitsuke)
Pull System

• A system which will produce or process an item only when the customer needs it or has requested it

• A method of controlling resources by replacing only what has been consumed
Pull System: Examples

- Using a *signal* to alert the MD to visit their patient in the exam room following receipt of the signal that the x-ray is ready for review

- 2-bin Kanban system to replenish medical supplies
Pull System Signal: Kanban

- A signal for communication that allows the customer to say, “I am ready for more” or “I need more”
- Signal can be a card, bin, empty space, cart, etc.
- Authorizes work to begin or supplies/equipment to be moved
Just in time

• A production strategy that strives to improve a business' return on investment by reducing in-process inventory and associated carrying costs

• To meet JIT objectives, the process relies on signals (Kanban) between different process points, which tell production when to make the next part
Levels of Quality System

Level 5: Eliminate opportunities for errors

Level 4: Self inspection

Level 3: Work unit inspects

Level 2: Company inspects

Level 1: Customer inspects

Prevent Errors

Detect Errors

Check for Errors
“Swiss Cheese Model” of System Failure

- System analogous to a stack of Swiss cheese slices -> each a defensive layer
- For an error to occur, the holes need to align

Error Proofing (Poka Yoke)

• Designing or modifying equipment or processes so that defects cannot occur

• Look-alike packages for eye medications include those for three different types of antibiotics and an antiviral drug for the herpes virus →

• Provide packaging that helps health care providers and patients differentiate one drug from another
Lean & Six Sigma

- Lean -> NO WASTE
- Six Sigma -> NO VARIANCE
Six Sigma: DMAIC

Incremental process improvement methodology based on Deming’s PDCA cycle using Six Sigma methodology

- **Define** – Define the project goals and customer (internal and external) deliverables
- **Measure** – Measure the process to determine current performance
- **Analyze** – Analyze and determine the root cause(s) of the defects.
- **Improve** – Improve the process by eliminating defects
- **Control** – Control future process performance
Kaizen & Kaizen Event

**Kaizen** – small, continuous improvements

**Kaizen event** - focused three to five day breakthrough events that generally include the following activities:

- Training
- Defining the problem/goals
- Documenting the current state
- Brainstorming and developing a future state
- Implementation
- Developing a follow-up plan
- Presenting results
- Celebrating successes
QI Tools –
American Society for Quality

- Cause analysis
- Evaluation and decision making
- Process analysis
- Data collection and analysis
- Idea creation
- Project planning and implementation
When to Use Each Tool Set?

- Cause analysis – discover cause of a problem or solution
- Evaluation and decision making – narrow a group of choices to best one OR evaluate the results
- Process analysis – understand a process
- Data collection and analysis – collect and analyze data
- Idea creation – come up with new ideas OR organize many ideas
- Project planning and implementation – manage improvement project
Cause analysis
- Fishbone diagram
- Pareto chart
- Scatter diagram
- Stratification
- 5 Why’s

Idea creation
- Brainstorming
- Benchmarking
- Affinity diagram

Eval. & decision making
- Multivoting
- Nominal group technique
- Prioritization matrix

Process analysis
- Benchmarking
- Flowchart

Data collection & analysis
- Balanced scorecard
- Benchmarking
- Run chart
- Control chart
- Histogram
- Pareto chart
- Scatter diagram
- Stratification

Project planning & implementation
- Checklist
- Flowchart
- PDSA cycle
- Project charter – A3 form

Project planning & implementation
PDSA cycle & Model for Improvement

7 Basic QI Tools

- cause-and-effect (fishbone) diagram
- check sheet
- control chart
- histogram
- Pareto chart
- scatter diagram
- stratification ↔ run chart
- flow chart
| **Cause-and-effect (fishbone) diagram** | A diagram structured similar to a fish skeleton that sort ideas into categories. To structure a brainstorming session and identify the potential causes of a problem. |
| **Check sheet** | An organized form for collecting and analyzing data. To record data so that patterns can be recognized. |
| **Flowchart** | A diagram depicting the sequential steps in a process using connecting lines and a set of conventional symbols. To identify the actual or target sequence of steps in a process. |
| **Histogram** | A bar graph used to show frequency distribution of numerical data. To determine distribution of data and whether or not it is normally distributed. |
| **Pareto chart** | A descending bar graph arranged with the tallest bar at the far left and the shortest bar at the far right. The length of each bar represents the frequency (or percentage) of each category. To focus on the most significant factors causing a problem. |
| **Scatter diagram** | A graphical display of pairs of numerical data typically with the independent variable on the x-axis and the dependent variable on the y-axis. To identify potential relationships between pairs of numerical data. |
| **Stratification** | A technique used in combination with other tools. When data from a variety of sources are grouped together the patterns in the data may be obscured. In stratification, the data from different sources are separated. To separate the data from different sources so that patterns may be discerned. |
| **Run chart** | A line graph with a performance measurement on the vertical axis and time on the horizontal axis. To study variation in data over time and determine the effects of changes. |
| **Control chart** | A run chart with statistically based upper and lower control limits. To recognize special and common causes of variation. |
Cause-and-effect Diagram

A diagram structured similar to a fish skeleton that sorts ideas into categories. To structure a brainstorming session and identify the potential causes of a problem.

A descending bar graph arranged with the tallest bar at the far left and the shortest bar at the far right. The length of each bar represents the frequency (or percentage) of each category. To focus on the most significant factors causing a problem.
Flow Chart

Examine patient → Order radiograph → Expose radiograph → Interpret radiograph → Manage patient

A diagram depicting the sequential steps in a process using connecting lines and a set of conventional symbols to identify the actual or target sequence of steps in a process.
5 Why’s

- Helps to identify the root causes of a problem
- Simply ask “Why?” and write down the answer(s). Continue to ask “Why?” for each new statement until
  - “Why?” has been asked ≥ 5 times OR
  - A root cause is reached