Introduction to Quality improvement (QI) in Healthcare.

A Physician’s guide.

Outline

• Start with its importance and relevance to our work
• Define QI
• QI in healthcare
  – Historical back ground
  – QI goals
• Common tools and strategies to systematically assess and improve Quality.
• Leave familiar with QI basics

QI variously defined

IOM Definition

The process in which knowledge of emerging and existing evidence allows for identification of desired health outcomes and is consistent with current professional and organizational priorities. It refers to a systematic, creative, and collaborative effort that is intended to improve the quality and safety of health care and to reduce variability in the provision of health care services across settings, including to the extent possible, variation between health care provider organizations and providers within and across settings.

HCFA Definition

Quality improvement is the deliberate and defined process, such as a Plan-Do-Check-Act cycle, which is focused on activities that improve the performance of an organization or its personnel and is associated with measurable improvements in the efficiency, effectiveness, performance, accountability, and other indicators of quality services or processes which deliver real and improve the health of the community.

HRSA Definition

Clinical quality improvement is an interdisciplinary process designed to identify the dimensions of the delivery of health care services or processes, to monitor, measure, and improve health care outcomes for individuals and populations.

ASQ Definition

The deliberate and defined process, such as the Plan-Do-Check-Act cycle, which is focused on activities that improve the performance of an organization or its personnel and is associated with measurable improvements in the efficiency, effectiveness, performance, accountability, and other indicators of quality services or processes which deliver real and improve the health of the community.

Other Definitions

• Fitness of use
• Conformance to requirements

Definition of QI for our purpose

A broad range of activities of varying degrees of complexity and methodological and statistical rigor through which healthcare providers develop, implement and assess small-scale interventions, identify those that work well and implement them more broadly in order to improve clinical practice and meet certain QI goals.

Donabedian: Studying quality in healthcare

- Structure/Inputs
- Process
- Outcome

Donabedian: Studying quality in healthcare (contd.)

- Source: Donabedian (1980)

Figure 1.1: Inputs, Processes and Outputs/Outcomes

QI goals

- Avoid Sentinel events
- Minimize waste
- Improve outcomes
  - Meet bench marks
  - Comply with standard of care
  - Real world results = Clinical trial results
- Satisfy patients
- Eliminate disparity

IOM Definition

The degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge.

The IOM also identified six dimensions through which quality is expressed: safe, effective, patient centered, timely, efficient and equitable.

- Safe: Avoiding injury from care that is intended to help, e.g. medication, surgery, medical equipment. This includes healthcare associated infection (HCAI) as well as other harm resulting from healthcare.

- Effective: Avoiding over or under use of services e.g. unnecessary tests, adherence to guidelines.

- Patient [service user] centered: Providing respectful, responsive, individualized care, e.g. partnering with patients [service users] to design care pathways.

- Timely: Reducing waits and harmful delays in care, including safe transition into and out of the hospital system.

- Efficient: Providing care that makes best use of resources for optimal benefit and focuses on eliminating waste such as unnecessary movement of hospital patients or staff.

- Equitable: Providing equal care regardless of characteristics e.g. gender, ethnicity, geographical location and socio-economic status.
Kaoru Ishikawa  
Japanese organizational theorist noted for his quality management innovations.

Tools

- Ishikawa contended that 95% of a company’s problems can be addressed using the following 7 tools:
  1. Process analysis
  2. Flow Charts
  3. Fishbone charts aka Ishikawa diagram
  4. Check lists
  5. Pareto charts
  6. Scatter diagrams
  7. Control charts aka Run diagrams

Strategies

- PDSA
- FEMA
- Lean
- Six Sigma
Tools

Fishbone chart
Used to determine cause and effect:
• 4 Ps: (People; Procedures; Place; Policies)

Pareto Chart
Used to prioritize problems
• Large proportion of problems are caused by small number of causes
• Vertical bar charts are used to prioritize them

Process Analysis
Spaghetti diagram
• Traces movement of persons through free space
Flow chart
• Step by step work flow

1. PMCID: PMC3856720
Run diagram

Run chart:
• Plots data over time
• Example is studying re-admission rates through the year.
• Do VTE rates drop after prophylaxis?

[Image: Diagram showing a run chart with data points and trend lines.]

Strategies

PDSA

PDSA: The trial and learning approach

What is PDSA?
• Complex systems have complex problems.
• These problems are multiple mostly small scale and unevenly distributed system wide.
• A single silver bullet cannot address these multiple small scale problems.
• PDSA offers a scientific method to develop complex multi-factorial interventions which are first suggested, then tested on a small scale.
• A trial and learning approach is fundamental to PDSA as it changes the intervention to small-scale localized context. (What works in surgery may not work in orthopedics.)
• Interventions successful in improving quality are later implemented system wide.

* PMID: 17550754
PDSA (contd.)

Suggested interventions:

- Five Key features of the PDSA method:
  1. **Iterative trials:** Must have repetitive cycles. PDSA wheel is spun multiple times.
  2. **Prediction based test of change:** Crunching numbers from each PDSA cycle to determine results, followed by comparing results with predictions.
  3. **Small scale testing:** Starting small makes changing to feedback easy.
  4. **Use of data over time:** The “S/study” Stage: Must be data driven which is studied using known statistical methods.
  5. **Documentation:** Thorough documentation of each stage of PDSA cycle.

PDSA (Clinical use)

- Improving patients’ recall of medical information provided.
- Mayo Clinic Endocrinology Clinic.
- After 3 weeks of several PDSA cycles, understanding of the reasons for testing (64% to 80%), management plans (61% to 81%), and follow-up plans (64% to 86%) all improved.

http://relwest.wested.org/alliances

* PMID: 24025320
FADE

Focus
• Mission statement
REDUCE VIOLENCE IN A FORENSIC PSYCHIATRIC HOSPITAL.

Analyze
• Retrospective review of violent incidents.
• Most frequent during mealtime due to the following reasons:
  1. Cutting in lines
  2. Denying extra portions
  3. Limit setting by staff
  4. Not given option to eat in their cell.

Evaluate
• 40% reduction in violent incidents after 1 year.
• 24% reduction in nursing staff injury.

Develop
• Developing an action plan to reduce violence.
  1. Replace silverware with plastic utensils.
  2. Play therapeutic music during mealtimes.
  3. Allow certain patients to take food to their cells to reduce dining room crowding.
  4. Food workers trained to improve patient-staff communication.

Lean
• Evaluate 40% reduction in violent incidents after 1 year.
Lean

• Used to reduce waste.
• Studies all processes in a task\(^1\)
• Ranks the processes according to importance\(^1\)
• Eliminates the least important processes\(^1\)
• Least important processes (Non-value adding) generate waste. They include (not limited to)
  – Waiting
  – Overproduction
  – Excessive inventory storage
  – Un-needed movements / transportations
  – Doing more work than valued\(^2\)

1. PMID: 24411657
2. PMID: 24985110

Lean (Contd)

Separating value adding from waste.

Lean (Contd)

• Used to
  – Reduce pre-op delays
  – Improve ED throughput
  – Number of patients see in a given time
  – Reduce door to balloon time in ACS\(^1,2\)

1. PMID: 24411657
2. PMID: 24985110

Six Sigma
Six Sigma

- Theory in a nutshell
  - Variation in processes leads to defects / errors in service aka (DPMO / Defects per million opportunities)
  - For e.g
    - Variation in transfer time to ICU increases in-hospital complications.
    - Variation in operative technique increases peri-op complications, etc.
    - Variation in hospitalist-subspecialist communication time causes patient dissatisfaction.
  - Six sigma uses DMAIC to reduce variation
- DMAIC vs. DMADV (Impl. Distinction)
  - DMAIC (define, measure, analyze, improve, control) is an improvement system for existing processes falling below specification and looking for incremental improvement.
  - DMADV (define, measure, analyze, design, verify) is an improvement system used to develop new process or products at Six Sigma quality levels.

* PMID: 12835644

Six Sigma for improving patient satisfaction

- Define
  - Patient’s / family dissatisfied with hospitalist-sub-specialist communication.
  - Define the improvement goal.
    - e.g 50 – 60% reduction
- Measure
  - (Catalog all tasks & Calculate descriptive statistic of all tasks)
    - Process analysis done
      - High variability in billing to attending staffing time.
      - High variability in resident sub-specialist turn over.
      - High variability in attending selection entry time.
  - All intervals measured; means and std-dev. Calculated
  - Results show that std-dev are very high and have clear room for reduction.

Six Sigma for improving patient satisfaction

- Analyze
  - Use the std-dev from the “M” stage to calculate the pre-improvement Sigma (µ)
  - Calculated µ determines extent of improvement needed to meet the goal in “I”
  - Run additional tests to determine which root causes are causing the most variation.

<table>
<thead>
<tr>
<th>Sigma</th>
<th>DPMO (Defects per million opportunities)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1σ</td>
<td>317,400 DPMO</td>
</tr>
<tr>
<td>2σ</td>
<td>45,000 DPMO</td>
</tr>
<tr>
<td>3σ</td>
<td>6,700 DPMO</td>
</tr>
<tr>
<td>4σ</td>
<td>920 DPMO</td>
</tr>
<tr>
<td>5σ</td>
<td>3.4 DPMO</td>
</tr>
</tbody>
</table>

* PMID: 17179259

Six Sigma (Contd.): What is DMAIC?

- Define (what is the process/problem?)
- Measure (what is the root cause of the problem and how can it be measured?)
- Analyze (how can I understand the root cause [data driven]?)
- Improve (how can I make it better [remove the root cause]?)
- Control (how can I ensure that the problem will not recur?)

* PMID: 17179259

Six Sigma for improving patient satisfaction

- Analyze: (Lots of statistics and has many steps)
  - Use the std-dev from the “M” stage to calculate the pre-improvement Sigma (µ)
  - Calculated µ determines extent of improvement needed to meet the goal in “I”
  - Run additional tests to determine which root causes are causing the most variation.
  - Process running at <1σ before improvement ≥ 3.17K out of a million patients are dissatisfied.
  - Goal is to bring it to 2σ ≈ 45,000 patients will be dissatisfied.

  * PMID: 16125067
Six Sigma for improving patient satisfaction

**Improve:**
- Improve process performance by addressing and eliminating root causes of variation (which bring down the ∑).

Root causes of variation eliminated

Process running at 0.5 ∑

**Control:**
- Control the improved process and future process performance.
- Keep the ∑ at goal.

Example of Six sigma in Healthcare
- Surgical Site infections.
  - Medical ctr in Charleston WV used six sigma to reduce colon and vascular surgical site infections.
  - ∑ = 0 at the start of the project.
  - Multifaceted intervention was proposed.
  - Post intervention ∑ increased to 2.86 translating in potential annual savings in excess of $1 million.
  - Maximize the diagnostic yield of biopsy procedures

QI vs. Research

- QI is not research
  - QI applies research into practice, while research develops new interventions
  - Risk to participants is not present in quality improvement, while research could pose risk to participants
  - The primary audience for quality improvement is the organization, and the information from analyses may be applicable only to that organization, while research is intended to be generalizable to all similar organizations
  - Data from quality improvement is organization-specific, while research data are derived from multiple organizations

Important websites

- [www.ihi.org](http://www.ihi.org)
- [www.asq.org](http://www.asq.org)
- [www.acmq.org](http://www.acmq.org)
- [www.ahrq.gov](http://www.ahrq.gov)
This website provides information on some of the more widely used quality improvement (QI) methods or tools that a QUERI researcher, practitioner, or institution may consider using in their work. These methods are listed in alphabetical order by the most common name used in healthcare. Unique aspects of each method are provided, and throughout the description a number (1-43) is added to help the reader find the method in this website. The intent here is to give the reader the basic data and description common to each of these methods. The exact approach for using the method varies by the practitioner and their or the institution where they are used.

Click here for an example of how 3 of these methods can be used in a QUERI project.

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- www.queri.research.va.gov/implementation/quality_improvement/all_methods.cfm