ACMQ Annual Meeting 2010

Introduction to Quality Improvement

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Abstract and Learning Objectives

Abstract:

The American College of Medical Quality is committed to furthering a basic understanding of how to advance the quality of medicine using well established tools and techniques for continuous quality improvement. In this lecture, we will present an overview of basic tools used in the field, including an overview of the history of continuous quality improvement, basic techniques piloted by Deming, and some more advanced tools and their use in a medical management setting. The presentation would be a good introduction for students, medical directors new to QI analysis and similar individuals.

Learning Objectives:

- The listener will develop an appreciation for the unfolding history of the field of medical quality management.
- The listener will become familiar with basic tools used in creating an approach to continuous quality improvement.
- The group will collectively consider application of more advanced tools in the medical management setting.
- The group will generally discuss common issues and experiences in the use of these tools and lessons learned.
Outline

- Introduction
- Historical perspective
- Designing a Framework for Strategies for Quality Management
- Making the business case for medical quality
- References
Historical Perspective
The Evolution -- Definitions of Medical Quality

- Many writers borrowed heavily from concurrent activities in business, engineering and statistical quality control programs in manufacturing.
- Shewhart - Bell Labs 1920’s & 30’s
- Deming/Juran - Industrial Quality Management Systems - CQI/TQM and the movement from QA to QI.
- Crosby -- Conformance to requirements
- Donabedian – Early basic thinking in medical QI
- Couch – Quality = The attribute of a product, service, or outcome that is the extent to which achievable value is actually achieved. Value is usually defined in terms of consumer expectations, whether explicit (i.e. wants), or implicit (i.e. needs)
- Eddy – Attributes of quality indicators and HEDIS
- Berwick – Institute for Healthcare Improvement (IHI) Provider participation, continuous improvement. The IOM report.
- Six Sigma, Toyota Production System, ISO9000 and others
- ACMQ – Core Curriculum for Medical Quality Management
Historical Perspective

- Quality has had an evolutionary course that has paralleled similar developments in the business world. The relationship to the business world and business thinking is important:

- Stage 1: Quality Assurance, The Era of Inspection
  - CPCs, sentinel event monitoring, outlier review, inspection

- Stage 2: Statistical Quality Control and CQI
  - Deming tools, control charts, multivariate normal distributions

- Stage 3: Outcomes Focused Analysis
  - Prevention, functional status, patients perceptions,

- Stage 4: Big Management
  - Rise of the QI bureaucracy: NCQA, JCAHO, URAC, CMS

- Stage 5: Fluid Change, a Cacophony of Quality
First Generation CQI

The Era of Inspection

- Physician Credentialing
- Institutional Credentialing
- Procedure Specific Credentialing
- UM/QI Process Adequacy
- Technology Assessment Process Adequacy
- Adverse Occurrence Monitoring
- Sentinel Event Monitoring
- External Accreditation

Questions answered:
Did the horse get out of the barn?
Who left the barn door open?
"QA" Approach

Focus
Second Generation CQI

The Era of Statistical Quality Control

- Diagnosis-Specific Admissions Variations
- Targeted Surgical Variations
- Targeted Ambulatory Surgery Variations
- Physician Statistical cost/mortality profiling
- Pharmaceutical Profiling

Questions Answered:
- How many horses get out per year?
- Can we make repeated door structural changes to reduce the number of escapes over time?
"QI" Approach

"Good" Scores

"Bad" Scores
Third Generation CQI

The Era of True Outcomes Measures

- Selected Claims-Based Outcomes
- Member Satisfaction/Perception of Health
- Clinical Outcomes Measures
- Disease Specific Patient Perceptions
- Linkage to Disability/Absenteeism
- Life Event Risk Intervention Analysis
- Conventional Medical Outcomes
- Social - small area analysis Dartmouth Study
- Functional Status and Well Being
- Health Risk Appraisal
- Cost Effectiveness Analysis (CEA)

Questions Answered:
Can we reduce the reasons why the horse would want to leave the barn and instead want to stay and work for me?
Fourth Generation CQI

The Era of Big Management

- Big Systems
  - Integrated Care Management Delivery Systems
  - Multispecialty Group Practice
  - PHO, PHCO, IPA, CHIN, and Others

- New Methods, Tools, and Concepts
  - “Data Driven” Information Systems
  - Statistical Quality Control - Shifting the Bell Curve

- Comparing Across Plans, Hospitals, Companies and Individuals
  - Best Practice Analysis

Questions Answered:
If we hire consultants and build big farm coops, will fewer horses escape?
Can data mining and predictive modeling reduce the number of horse escapes?
Fifth Generation CQI

The Era of Confusion and Cacophony

- Government Agency Participation
  - CMS, AHRQ, State DOH, State DOI
- Pseudo-governmental Participation
  - NQF, IOM, PROs, QIOs
- Accreditation Bureaucracies
  - JCAHO, URAC, NCQA, AAAHC
- Integrated Care Management Delivery Systems
  - PHO, PHCO, IPA, CHIN, and Others
  - Health plans, HMOs, Group practice.
- Other Players
  - Consultants
- Accenturisms -- Buzzwords and Buzzwords for The Next Big Thing
  - P4P, Transparency, Accountable Networks, EMR, Medical Home

Question: Our system of evaluation for accountable providers transparently creates acceptable deliverables to reduce equine elopement.
External Organizations Concerned about Health Care Quality

**Governmental**
- Centers for Medicare and Medicaid Services (CMS)
- Peer review organizations (“PROs”)
- Quality Improvement Organizations (“QIOs”)
- State departments of health and insurance
- State health care cost control councils
- Centers for Disease Control

**Accreditation**
- National Committee for Quality Assurance (NCQA); includes use of Health Plan Employer Data Information Set (HEDIS) and Consumer Assessment of Health Plans Survey (CAHPS) tools
- Joint Commission for the Accreditation of Healthcare Organizations (JCAHO)
- American Accreditation Healthcare Commission (“URAC”)
- Accreditation Association for Ambulatory Health Care (AAAHC)

**Business**
- Business Health Care and Purchasing Coalitions
- Washington Business Group on Health
- Pacific Business Group on Health
- Leapfrog Group
- Local business groups and councils
- Regional employer coalitions
- Tech councils
- National Business Coalition on Health
- Drug companies and their spin off organizations

**Others**
- Americas Health Insurance Plans (AHIP)
- Blue/Cross Blue Shield Association (BCBSA) and the TEC
- American Board of XYZ
- Council for Affordable Quality Healthcare (CAQH)
- Doctors Office Quality Project (DOQ)
- Institute of Medicine (IOM)
- National Quality Forum (NQF)
- Organized medical associations (e.g. AMA)
- Professional organizations (e.g., American Heart Association) and Specialty societies
- The BIG UNIVERSITY “experts”
- Benefit management consultant “experts”

Question: How much money is being spent on the development and delivery of the medical quality initiatives that are present or being planned for the future? How much will you need to know about business in quality?
Theories and Ideas Too!

- CQI
- Six Sigma
- Hoshin Planning
- ISO 9000
- Toyota Production System
- The Intergalactic Business Group on Health’s RFP

Analytic Quality Statistic

Takeaway point: The language of business is pervasive in the language of medical quality.
GAAAAH!
Basic Tools in QI Management
Shewhart Cycle

- Plan
- Do
- Check/Study
- Act

Continuous Improvement
## Selection Grid

- **Affinity Charts**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Brainstorming**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Cause-and-Effect Analysis**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Checksheet**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Control Charts**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Cost-benefit Analysis**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Criteria Matrix/Problem Selection**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Data Collection**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Flowcharts**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Focus groups**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Force Field Analysis**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Gantt Chart**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Goal Statements/Performance Measures**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Histograms**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Implementation Checklist**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Interviewing**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Know-Don't Know**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Management Presentations**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Multivoting**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Nominal Group Technique**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Operational Definitions/Problem Statements**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Pareto Charts**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Questionnaire**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Responsibility Charting**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Run Chart**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Scatter Diagram**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Structure Tree**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Value Added Analysis**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely
- **Storyboard**: 
  - Often Used
  - Used More Often
  - Used Occasionally
  - Used Rarely

Reference: Morgenstern, p.3-3
Seven Helpful Charts

- Flow Chart
- Histograms
- Pareto Charts
- Run (Trend) Charts
- Control Charts
- Scatter Diagrams
- Cause and Effect Diagrams

Reference: Walton
Histograms
“Bar Graphs”
- Show relative amounts of things in a group
- Can show trends over time
- Special forms: Pareto charts
Histogram

Reference: Core Curriculum
Histogram

Reference: Core Curriculum
Results of the Study
Pareto Charts
**Pareto Charts**

- Pareto charts are a type of histogram that arranges the bars on the chart from highest to lowest value.
- The focus then in QI processes is to concentrate on the highest sources of an issue first and eliminate them as problems.
- A concurrent line often shows an accumulated total for each subsequent bar in the graph, reflecting total cumulative impact.
Pareto Analysis

Figure 1–4: Pareto Chart to Examine Reasons for Delayed Discharge from a Hospital

<table>
<thead>
<tr>
<th>Defect</th>
<th>Procedure delay</th>
<th>No step down unit</th>
<th>Physician on call does rounds</th>
<th>Lack of PM rounding</th>
<th>Patient refuses discharge</th>
<th>Family does not showup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>10</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Percent</td>
<td>33.3</td>
<td>20.0</td>
<td>16.7</td>
<td>13.3</td>
<td>10.0</td>
<td>6.7</td>
</tr>
<tr>
<td>Cum. %</td>
<td>33.3</td>
<td>53.3</td>
<td>70.0</td>
<td>83.3</td>
<td>93.3</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Reference: Core Curriculum
Pareto Chart

Customer Complaints Received

Rosingdales Department Store
Categories of Complaints

Reference: Morgenstern
Process Flowcharts
Flow Charts

- Clarify the process
- Identify observation points
- Address
  - logical inconsistencies
  - redundancy
  - timing
Process Flowchart
Types of Flowcharts

- Process Flowchart
- Interrelationship Diagraphs
- CPM/PERT Charts
- Affinity Diagrams
- Activity Network Diagram
- Process Decision Program Chart
- Others

Reference: Brassard, and others
Interrelationship Diagraph - Missed Promised Delivery Dates

Reference: Brassard
Clean up the Mess!

- Look for redundant functions; create simpler models to do the task.
- Measure each step for efficiency improvement and possible error reduction.
- Redesign the program to reduce the number of nodes and handoffs.
CPM/PERT Charts
(Critical Path Method/Program Evaluation Review Technique)
Run Charts and Control Charts
Run Charts

- “Line charts”
- Used to measure relative changes in a value over time
- Specialized forms for more sophisticated analyses
Run Chart
Radar Chart
Shewhart:

A phenomenon will be said to be controlled when, through the use of past experience, we can predict, at least within limits, how the phenomenon may be expected to vary in the future. Here it is understood that prediction within limits means that we can state, at least approximately, the probability that the observed phenomenon will fall with the given limits…”

Reference: Montgomery
Control Chart
**Dynamic Chart Terms**

- **Median position** = average; horizontal line showing the average value
- **Run** = two or more consecutive data points on the same side of the median
- **Upper control limit, lower control limit** = limiting horizontal lines drawn above and below the median, which show the limits of where the system is “in control” or “out of control”
Types of Control Charts

- **X-R**  Average and Range
- **XmR**  Average/Moving Range
  - Control = \(x \pm 2.66R\)
- **p-Chart**  Control = \(p \pm 3 \sqrt{p(1-p)/n}\)
  - \(p = \text{defects/total occurrences}\)
- **c-Chart**  Control = \(c \pm 3 \sqrt{c}\)
  - \(c = \text{number of defects/total observations}\)
- **u-Chart**  Control = \(u \pm 3 \sqrt{u/n}\)
  - \(u = \text{defects for all subgroups/total observations in all subgroups}\)

Reference: Carey and Lloyd
Control Chart Concerns

- Number of data points in a run
  - Up to 8/5; 9 to 20/6; 21 to 100 /7

- Too few or too many runs?
  - Run = 2+ data points on one side of median

- Trends
- Zig Zag or “sawtooth” patterns
- Normal vs special cause variations
- Bell curve on the side
- Divide control chart into zones of concern - action limits vs warning limits

Reference: Carey and Lloyd.
Time Series Analysis Techniques

- **Run Chart** (Shewhart Model)
- **Running Average** (>6 mo)
- **CUSUM Plot** (sensitive to small changes in $\sigma$)
- **Exponentially Weighted Moving Average** (EWMA) Current items weighted more.
- **Autoregressive integrated moving average** model (ARIMA), when series are autocorrelated.
A Cusum plot allows you to evaluate an important result before it reaches statistical significance!
CUSUM Plot

- Calculate the target mean
- Create running sum of differences of each variable from the mean

- Note upper and lower control limit formulas exist

\[ C = \sum (x_i - \text{avg}) \]
Scatter Diagrams
Scatter Plots

- Plot two or more variables simultaneously (up to six!)
- Two by two plots usually
- Association testing
- Correlation coefficient calculations
Analysis of Variation

CV of Paid vs LOS for 90% Impact DRGs

Reference: ACPM Presentation 2/2003
Linear Regression

- Creates a line from a series of data in a scatter plot.
- The sum of the squared differences of each data point from the line is minimized.
- It is possible to have more than two variables (multiple regression)
- It is also possible not to be linear (nonlinear regression)
Other Regression Things

- **Correlation** -- $R^2$ or R value or Pearson Correlation Coefficient. $R^2$ close to 1 shows high correlation.

- **Autocorrelation** -- Durbin Watson Statistic -- 0 - 2 - 4 scale

- **Forecasting** by extrapolation
  - lagged variables, cycles, etc.
  - exponential smoothing
  - software Forecast Pro for Windows
Cause and Effect Diagrams
Ishikawa ("Fishbone") Cause and Effect Diagram: PT Referral Costs

Environment
- High Profit
- Low prior control
- Benefit design
- Medical policy

Equipment
- Equipment costs
- In house expenses

Staff do referrals
- Open ended referrals
- No guidelines
- No feedback

Specialists
- Physical therapists
- PCPs

Greed, personal gain

Procedures

Reference: Carey and Lloyd
Wishbone Diagram

Figure 1–3  Fish Bone Diagram Illustrating Late Discharge from a Hospital

- Member:
  - Refuses discharge
  - No suitable step down
  - Late discharge planning
  - Staffing problems
  - Unable to coordinate care

- Provider:
  - Makes late rounds
  - Different provider rounding
  - Appeals discharge
  - Does not follow guidelines
  - Does not answer calls
  - Delayed consult
  - Delayed testing

- Facility:
  - Lack of communication with provider and patient
  - Unable to finish test in timely manner

- Insurance Company:
  - Lack of communication
  - No 24-hour member/provider services
  - Lack of contract for lower level of care
  - Lack of interface with hospital discharge planning

- Delay in Discharge

Reference: Core Curriculum
CQI: Closing the Loop
Is That Really All There is to It?

- Formal programs for organizing the use of quality tools exist.
  - “Continuous Quality Improvement”
  - Six Sigma
  - Lean Six Sigma
  - Toyota Production System
  - ISO 9000; ISO 9001
DMAIC Problem-Solving Model

DMAIC equals Define, Measure, Analyze, Improve and Control.

- Step 1 - Define the problem.
- Step 2 - Measure.
- Step 3 - Analyze.
- Step 4 - Improve.
- Step 5 - Control.
Clinical Study Format

- Problem identification
- Determine the guidelines
- Establish the criteria
- Design the study
  - (population, sample, data collection techniques)
- Data analysis
- Identify deficiencies
- Develop recommendations for problem resolution
- Feedback to appropriate providers, depts, committees, individuals
- Reevaluate problem to determine if corrective actions have been implemented/problem resolution occurred

Thanks to: NCQA
**Six Sigma**

- **Six Sigma** is a business management strategy, initially implemented by Motorola, that today enjoys widespread application in many sectors of industry.

- Six Sigma seeks to improve the quality of process outputs by identifying and removing the causes of defects (errors) and variation in manufacturing and business processes.\(^1\) It uses a set of quality management methods, including statistical methods, and creates a special infrastructure of people within the organization ("Black Belts", "Green Belts", etc.) who are experts in these methods.\(^1\) Each Six Sigma project carried out within an organization follows a defined sequence of steps and has quantified financial targets (cost reduction or profit increase).\(^1\)

Lean manufacturing or lean production, which is often known simply as "Lean", is a production practice that considers the expenditure of resources for any goal other than the creation of value for the end customer to be wasteful, and thus a target for elimination. Working from the perspective of the customer who consumes a product or service, "value" is defined as any action or process that a customer would be willing to pay for. Basically, lean is centered around creating more value with less work. Lean manufacturing is a generic process management philosophy derived mostly from the Toyota Production System (TPS) (hence the term Toyotism is also prevalent) and identified as "Lean" only in the 1990s.¹

MAKING THE BUSINESS CASE FOR HEALTHCARE QUALITY IMPROVEMENT
The Issue: Making the Business Case

- Making the business case to someone or some entity that you should be paid for your valuable services is difficult for anyone. Money is tight everywhere.

- You were trained as a clinician, not a business person. So, how do you put a price on quality or clinical improvement? What is the strategy to convince a potential nonclinical payer of diabetic education services that they are worth it?

- Do your services create a “value proposition” for your services? How do you construct the approach and the arguments for the government, health plans and clinics that create a compelling case in your favor in the mind of a business person?
Introduction: Case Study

The CEO of your company has made friends with the Vice President of marketing of a national company that claims that it can provide [what your area does] effectively using a cool web based tool his company has designed. The two have gone golfing, have had dinner together, and have had several “high-level” discussions about having the vendor replace your program staff with the vendor's web site. Two of your organization’s senior vice presidents, in totally unrelated areas and who have no knowledge of clinical issues, think the proposal might be a viable option. The vendor claims that he can give your company an “8 to 1 return on investment,” and will “guarantee” it.

You are now approached by the CEO, who admits that he might dissolve your area, but offers to give you 20 minutes to talk him out of it. He is interested in the value/return that you get now.

What do you tell him? Your answer should address both an analytic approach and recognition of the various political factors that may influence your choices.

Paraphrased and restated from Fetterolf, AJMQ Jan/Feb 2003.
Wisdom from CMO’s:
Stay Focused on the Important Stuff

- Lower/maintain PMPM costs for your clients
- Reduce administrative overhead
- Generate more revenue
- Measurably improve patient care quality
- Improve relationships with business contacts – “co-opetition”
- Have real impact, not inconsequential activities
The Business Case for Medical Quality
Components of the Business Case for a QI Unit

- Government mandates
  - Basically, you have to…
- Demands by the payer/business/consultant community
- Financial effect
  - Lower quality is more expensive
- Logical requirements for quality oversight
- Demands of business partners
- Trade off between value of accreditation and lower costs
- Estimated economic impact from econometric attempts
  - NCQA Quality dividend calculator
- Social goals
Conclusions and Summary

- The basic ingredients of a good quality program have not changed much over 20 years.
- People still need to use them however.
- From simple charts to complex analyses, QI will continue to make things better wherever it is applied.
Questions?

References on Next Slides
References
Basic References on Medical Quality

- American Journal of Medical Quality
- McLaughlin, C. and Kaluzny, A. "Continuous Quality Improvement in Healthcare." 1999. This is a college type textbook.
Bibliography – Additional Reading

--Corrigan, J.; Greiner, A.; and Erickson, S.  "Fostering Rapid Advances in Health Care: Learning from System Demonstrations."  2002.
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Bibliography

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