The Cost of Poor Quality

It’s Understanding and Application in the Dental Practice

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Master Black Belt Lean Six Sigma
In Healthcare
November 11, 2013
Understanding, Managing, and Improving Complex Health Systems through Many Disciplines

### Traditional Management Approach

- **Resources**
  - Brainstormed: For Patient Convenience and to reduce wait times, the Centrally Located Clinic will be Separated into 2 Clinics

- **Results Based on Assumption:**
  - Patients will chose the more conveniently located clinic and patient arrival rate is equal between the 2 clinics

- **Outcome**
  - 54 Minute Wait Times!

### Queueing Analytic Theory Application

- **Resources**
  - Applied Systems/Operations Management Methodology to Evaluate Quantitatively the Effect of Clinic Separation

- **Results Based on Calculation:**
  - Random Patient Arrival Based on Poisson Statistical Process Analysis, Calculation of Final Steady-State Probability and Little’s Formula

- **Outcome**
  - 25.5 Minute Wait Times!!!
Systems Thinking and Engineering

Who are these guys?

Orville and Wilbur Wright
Samuel Pierpont Langley
Systems Thinking and Engineering

“The Winner”
$0 in Government Funding (1903)
The Underdogs
12 hp Engine

“The Loser”
$70,000 in Government Funding (1903)
The Favored Guy to Win
50 hp Engine
Lecture Outline

- What is Quality Healthcare?
  - Defining the Meaning of Quality
- The Cost of Poor Quality (COPQ)
  - Conformance Costs
  - Non-Conformance Costs
- Calculating the Cost of Poor Quality (COPQ)
- Quantifying Practice Quality Improvement
- Overview
Learning Objectives

- Examine the Definition of Quality
- Understanding the Cost of Poor Quality
- Define How to Calculate the Cost of Poor Quality
- Understand How to Use the Cost of Poor Quality Flow Chart
- Understand How to Quantify Quality Practice Improvement
What is Quality Healthcare?
What is Quality Healthcare?

“Quality is “fitness for use”” - Juran

“Quality is “conformance to requirements”” - Cosby

“Quality is “improvement of the process not inspections”” - Deming
What is Quality Healthcare?

Institute of Medicine Applied to Dental Radiographs

- **Safety**
  - Do We Over-Expose the Patient?
  - Are Patients Provided Appropriate Shielding?

- **Effectiveness**
  - Are Significant Findings Placed into Treatment Plans?
  - How Often are Films Retaken?

- **Patient Centeredness**
  - Do We Advise Patients Why Dental Films are Being Taken?

- **Timeliness**
  - Are the Correct Pre-Treatment Films Taken Prior to Treatment?
  - Are Referral Films Provided to Specialists in a Timely Manner

- **Efficiency**
  - Are Periodic Films Done Correctly and Have the Quality Needed to Be Read

- **Equitable**
  - Do Un-insured Patients Receive the Same Radiographic Films as Insured Patients?
What is Quality Healthcare?

A Framework for Quality

Meaning of Quality

Producer’s Perspective

Quality of Conformance
- Conformance to specifications
- Cost

Consumer’s Perspective

Quality of Design
- Quality characteristics
- Price

Consumer Satisfaction and Use by People

Production

Marketing
Quality of Design- refers to the features to characteristics of a product that differentiate functionally similar products.

- *Compare a Porsche to VW. The Porsche has many high-end features: speed, cutting-end engineering, advanced technology, luxury, and brand appeal.*

Quality of Conformance

is a measure of how well the product meets its requirements or specifications. How well it is built.

- *The VW is designed to drive and it does because quality exists within its requirements and specifications.*
- *For example, if the care is designed to be economical, robust, and reliable as designed, the desired quality exists within the brand perception as seen by the consumer*
Meaning of Quality

Consumer’s Perspective

- Quality of Design
  - Designing quality characteristics into a product or service

A Porsche and VW are equally “fit for use,” but with different design dimensions
Quality of Conformance

Making Sure a Product or Service is Produced According to Its Use

- New tires do not conform to specifications if they wobble
- The hotel is not functioning according to specifications of its design if it is not clean when a guest checks in.
What’s the Ultimate Measure of Quality?

What’s Your Patient Satisfaction Score?

**Example: New Customer Research Survey**

*How Did You Hear About Us?*

- Magazine
- Blog
- Trade show
- Referred by a friend
- Search engine (Google, Yahoo, Bing, etc.)
- Other (please specify)

Survey:
- Excellent:
- Good:
- Fair:
- Poor:

**Patient Satisfaction = Perceptions – Expectations**

\[ \text{Patient Satisfaction} = \text{Value Experience} + \text{Timeliness} - \text{Wait Times} \]
We all feel, see, and experience poor quality.
Picture This!

- 40% of Dental Practice Waste is Internal and External Quality Cost
- This Practice Waste Negatively Impacts Practice Delivery
What I Observe in...

- Poor Esthetic or General Appearance
- Lack of Standard Practice Manuals or Work Responsibilities
- No Provider Leadership
- Poor Scheduling
- Patient Not Being Told or Aware What Procedure Will Be Done
- Poor, Incorrect and/or Non-Existent Chart Writing and Treatment Planning
- Fees are Discussed Chair-side
- Dentist Doing Hygiene

... Most Non-Profitable Practices!
Seven Quality Tools

- Check Sheet
- Pareto Analysis and Graph
- Histograms
- Cause and Effect Diagrams
- Scatter Diagram
- Statistical Process Control (SPC) Chart
A Check Sheet

Elements Missing from the Operatory
June to July 2013

Chair Master Control Off
No Saliva Injector
No High Speed Handpiece
Patient w/o Patient Bib
Extraction Setup Not Complete
Consent Forms Not Signed
No Slow-Speed
Topical Applied to Wrong Tooth
Pareto Analysis

Chart Review 4thQ 2009

- 6 Month Recall: 27.5% (27.5% Cumulative)
- Next Procedure Visit Written: 22.5% (50.0% Cumulative)
- Patient Perio Chart Completed: 20.0% (70.0% Cumulative)
- Radiographs in Order: 17.5% (87.5% Cumulative)
- Progress Notes Written: 10.0% (97.5% Cumulative)
- Documentation of Medical Conditions: 2.5% (100% Cumulative)
- Completed Patient Demographics: 0.0% (100% Cumulative)
- Patient Medical History: 0.0% (100% Cumulative)
- Super Bill Correlates with Progress Notes: 0.0% (100% Cumulative)
- Completed Tooth Charting: 0.0% (100% Cumulative)
- Total: 40 (100% Cumulative)

Number of Errors vs Ranking of Errors

- 11 - 27.5%
- 9 - 50.0%
- 8 - 70.0%
- 7 - 87.5%
- 4
- 1
Voice of the Process

Is ‘Our Practice Delivery’
Patient Expectations = Voice of the Customer

Voice of the Process

Mean

3-Sigma

USL

LSL
Under Performing Practice

- No Chart Reviews
- Incomplete Charts
- Poor Patient Scheduling
- No Practice Standard Metrics
- Lacks Practice Metrics
- Shortage of Dentists
- Poorly Trained

- Old and Outdated Dental Chairs
- Not the Right Equipment
- Shortage of Small Equipment
- Need Small Instruments
- Poor Quality
- Outdate Materials

- Cramp Operatories
- Aging Infrastructure

- Fishbone or Ishikawa Chart
Scatter Diagram

Customer Satisfaction (1-10) vs Wait Time (minutes)

$y = -0.0201x + 9.6968$

$R^2 = 0.8713$
Control Chart

Monday

Patient #1  12 minutes
Patient #2  9 minutes
Patient #3  17 minutes
Patient #4  7 minutes
Patient #5  9 minutes
Patient #6  13 minutes
Patient #7  21 minutes
Patient #8  11 minutes
Patient #9  7 minutes
Patient #10 8 minutes

Average wait in reception area
Average wait to see care provider

Minutes

Mon. a.m.    Mon. p.m.    Tues. a.m.    Tues. p.m.    Wed. a.m.     Wed. p.m.     Thu. a.m.     Thu. p.m.     Fri. a.m.     Fri. p.m.
The Cost of Poor Quality

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries</td>
<td>$391,567</td>
<td>50%</td>
</tr>
<tr>
<td>Fringe Benefits</td>
<td>$97,892</td>
<td>12%</td>
</tr>
<tr>
<td>Depreciation</td>
<td>$64,200</td>
<td>8%</td>
</tr>
<tr>
<td>Clinical Supplies</td>
<td>$42,600</td>
<td>5%</td>
</tr>
<tr>
<td>Lab Fees</td>
<td>$40,000</td>
<td>5%</td>
</tr>
<tr>
<td>Bad Debt</td>
<td>$33,000</td>
<td>4%</td>
</tr>
<tr>
<td>Rent/Mortgage</td>
<td>$28,200</td>
<td>4%</td>
</tr>
<tr>
<td>Contracts</td>
<td>$20,800</td>
<td>3%</td>
</tr>
<tr>
<td>Insurance</td>
<td>$17,500</td>
<td>2%</td>
</tr>
<tr>
<td>Equipment Maintenance</td>
<td>$13,800</td>
<td>2%</td>
</tr>
<tr>
<td>Utilities</td>
<td>$9,568</td>
<td>1%</td>
</tr>
<tr>
<td>Housekeeping</td>
<td>$6,600</td>
<td>1%</td>
</tr>
<tr>
<td>Communications</td>
<td>$5,500</td>
<td>1%</td>
</tr>
<tr>
<td>Staff Training</td>
<td>$4,7000</td>
<td>1%</td>
</tr>
<tr>
<td>Laundry</td>
<td>$3,7000</td>
<td>0.5%</td>
</tr>
<tr>
<td>Office Supplies</td>
<td>$2,968</td>
<td>0.4%</td>
</tr>
<tr>
<td>Payroll Service</td>
<td>$2,100</td>
<td>0.3%</td>
</tr>
</tbody>
</table>

Total Expenses = $784,695

Average Dental Practice Costs in $ and %
We See, Experience and Capture only about 5% of Poor Quality

The More Complete Definition of Poor Quality is Defined as the Hidden Portion of the “Poor Quality” Iceberg

The Visual Portion is More Apparent because the Hidden Portion is Unseen

We See, Experience and Capture only about 5% of Poor Quality
The Cost of Poor Quality

The Hidden and Seen Cost of Poor Quality (COPQ) are Non-Conformance Components of No-or-Low Quality
The Cost of Poor Quality

Prevention Costs to Prevent Poor Quality (0-5%)

Appraisal Costs to Test, Measure, and Audit for Quality (10-50%)

Total Cost Of Poor Quality
(John Harrington, 1970)

Internal Failures Occur Prior to Delivery (20-40%)

External Failures Occur Prior to Delivery (20-40%)

Conformance

Non-Conformance

Conformance

Non-Conformance

Joseph Juran, 1951

Philip Crosby

Armand Feigenbaum, 1956

The Cost of Poor Quality

(Philip Crosby)

(Joseph Juran, 1951)

(Armand Feigenbaum, 1956)
# The Cost of Poor Quality

<table>
<thead>
<tr>
<th>Quality Measure</th>
<th>Financial Measure</th>
<th>Non-Financial Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer-Based</td>
<td>External failure cost.</td>
<td>Results of customer satisfaction survey.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On-time delivery.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of customer complaints.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Complaints, No-Shows.</td>
</tr>
<tr>
<td>Internal Processes Within Your Practice</td>
<td>Appraisal cost.</td>
<td>Defect rates, Yields.</td>
</tr>
<tr>
<td></td>
<td>Internal failure cost.</td>
<td>Lead times, Idle capacity.</td>
</tr>
<tr>
<td></td>
<td>Prevention cost.</td>
<td>Unscheduled machine and/or Practice downtime.</td>
</tr>
</tbody>
</table>
The Cost of Poor Quality

**Total Quality Costs** are the sum of prevention costs, appraisal costs, and internal and external failure costs.

Cost of Quality follows a 1: 10 :100 Rule

Difference between Non-Conformance and Conformance Cost
- Non-Conformance Cost - Doing Things Wrong Accounts for 20 to 35% of Practice Revenues
- Conformance Cost - Doing Things Right Accounts for 3 to 4% of Practice Revenues
The Cost of Poor Quality

![Quality Costs vs. Defect Graph](image-url)

- **High Quality Cost**
- **Low Quality Cost**
- **Percent Defects** (0% to 100%)
- **Quality Costs** (High to Low)

Graph illustrates the relationship between quality costs and percent defects, showing how reducing defects decreases quality costs.
The Cost of Poor Quality

Costs of Quality

Cost of Failures
(Non-Conformance Quality)

Cost of Control
(Conformance Quality)

Percent Defects

High

Cost

Low

100%

0%
The Cost of Poor Quality

Cost of Appraisal plus Prevention

External and Internal Failure Costs

Total Quality Costs

Cost per Good Unit of Product/Service

High

Low

Quality

0%

100%
The Cost of Poor Quality

Start

Year 1

Year 2

Year 3

Year 4

Year 5

Realized Quality Improvement

Conformance Costs (Appraisal and Prevention)

Non-Conformance Costs (Internal and External Failure)

Decrease Non-Conformance Costs
The Cost of Poor Quality

**Prevention Costs**

- Staff Planning and Educational Training
- Equipment Maintenance Training
- Office Training Manuals
- Radiography Training
- Preventive Maintenance
- Housekeeping
- OSHA and Infection Control Training
- Computer Training
- Practice Manuals
- Implementing Practice Quality Management Programs

- Prevention costs are the costs of trying to prevent poor-quality products from occurring and not escalating to the customer.
- Prevention reflects the quality philosophy of "do it right the first time," the ultimate goal of a quality management program.
The Cost of Poor Quality

**Appraisal Costs**
- Inspection of Equipment, Supplies, and Office Space
- Insurance Accounting Audits
- Scheduling and Chart Audits
- Dental Equipment License Fees
- X-Ray Calibration and Fees
- Dental Staff Inspection
- CDC, OSHA, Joint Commission Accreditation
- Testing of Equipment, Supplies, and Office Space
- Staff Survey Audits
- Product Expirations
- Training of Quality Teams

- It is the Cost Associated Catching or Preventing Defects from Occurring in the Dental Office.
- It is a Proactive Approach and is About Prevention of Parts and Product Failure that Affects Dental Delivery.
- Operator costs the time spent to gather data for testing product quality, equipment adjustments and to stop work to assess quality
- Unfortunately Performing Appraisal Activities Doesn't keep Defects from Happening. (MURPHY’S LAW)
The Cost of Poor Quality

Internal Failure Costs

- Dental Procedures Redos and Rework
- Incorrectly Ordered Supplies
- Equipment Repair
- Lost Sales (any cause)
- Accounting and Dental Insurance Errors
- Staff Accidents, Injuries
- Absenteeism
- No Shows
- Payroll Errors
- Supplier Problems
- Abandoned Programs – “Selling Merchandise from the Office”

Internal Failure Costs are Incurred when Poor-Quality Products are Discovered before they are Delivered to the Customer.

Internal Failure Costs Result from Products or Services not Conforming to Patient Expectations

The Goal is to Identify all Internal Failures and Resultant Costs, and then Systematically Identify and Eliminate Root Causes.
The Cost of Poor Quality

**External Failure Costs**

- Patient Defections, Complaints and Dissatisfaction
- Time and Cost Spent Resolving Insurance, Patient, or Supply Orders Problems
- Lawsuits or Legal Fees
- License Issues from the State Board
- Late Fees, Interest and Penalties
- Lawsuits
- Patient Injury
- Lost Market Share
- Patient Product Returns

- External Failure Costs Represent a Category in the Total Cost of Quality where the Quality Costs are related to Defects Found after Delivery of the Product to the Customer.

- External Failure Costs are Generally the Highest of the 4 Cost of Quality Categories Since the Full Value of Work and Processes had to be Performed to Get the Procedure Done by the Patient.
The Juran Trilogy
Quality Planning, Improvement, and Control

Calculating the Cost of Poor Quality

The Patient didn’t Pre-Medicate

Damn! We took out the Wrong Tooth…

Something Bad Always Happens! Here

The Lab Case is not Here!

CHRONIC WASTE
(An opportunity for improvement)

SPORADIC SPIKE

ORIGINAL ZONE OF QUALITY CONTROL

NEW ZONE OF QUALITY CONTROL
## Calculating Cost of Poor Quality

The Total Cost of Poor Quality is the Sum of all these Costs
## Calculating Cost of Poor Quality

<table>
<thead>
<tr>
<th>Item</th>
<th>Annual Amount</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSHA Training</td>
<td>$140</td>
<td>Prevention</td>
</tr>
<tr>
<td>Computer Training</td>
<td>$1,000</td>
<td>Prevention</td>
</tr>
<tr>
<td>Customer Satisfaction Survey</td>
<td>$100</td>
<td>Appraisal</td>
</tr>
<tr>
<td>Insurance and Accounting Audit</td>
<td>$1,000</td>
<td>Appraisal</td>
</tr>
<tr>
<td>Inspection of Equipment</td>
<td>$500</td>
<td>Appraisal</td>
</tr>
<tr>
<td>Staff Needle Stick and Hospital Fees</td>
<td>$45,000</td>
<td>Internal Failure</td>
</tr>
<tr>
<td>Returned Lab Work Before Patient Visits</td>
<td>$14,000</td>
<td>Internal Failure</td>
</tr>
<tr>
<td>Restorative Rework</td>
<td>$5,000</td>
<td>Internal Failure</td>
</tr>
<tr>
<td>Equipment Repair</td>
<td>$6,000</td>
<td>Internal Failure</td>
</tr>
<tr>
<td>Dental Supply Returns</td>
<td>$8,000</td>
<td>Internal Failure</td>
</tr>
<tr>
<td>No-Show</td>
<td>$82,000</td>
<td>Internal Failure</td>
</tr>
<tr>
<td>Patient Refunds</td>
<td>$48,000</td>
<td>External Failure</td>
</tr>
<tr>
<td>Returned Insurance Forms Due Errors</td>
<td>$3,200</td>
<td>External Failure</td>
</tr>
<tr>
<td>Lost Visits due to Equipment Failure</td>
<td>$14,000</td>
<td>External Failure</td>
</tr>
</tbody>
</table>
## Calculating Cost of Poor Quality

- Look at the Costs by Category:

<table>
<thead>
<tr>
<th>Category</th>
<th>Total</th>
<th>% of Total</th>
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<tr>
<td>Prevention</td>
<td>$1,140</td>
<td>0.53%</td>
</tr>
<tr>
<td>Appraisal</td>
<td>$1,600</td>
<td>0.75%</td>
</tr>
<tr>
<td>Internal Failure</td>
<td>$145,900</td>
<td>68.29%</td>
</tr>
<tr>
<td>External Failure</td>
<td>$65,000</td>
<td>30.42%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$213,640</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>

Clearly, Failure (Internal and External) Costs dominate the Cost of Poor Quality for this Practice. So, There are Lots of Opportunities to Drive Quality Improvement by Addressing these Failure Costs.
### Cost of Quality Improvement Cycle

- **Are our external failure costs acceptable?**
  - **NO**: Evaluate external failure data to determine priority (Pareto, etc.)
    - Increase appraisal in targeted areas (TEMPORARILY!)
    - Verify the effectiveness of the appraisal activities by a reduction of the targeted failures externally and an increase internally
    - Increase prevention activities - Initiate process improvement activities on targeted areas
    - Verify improvement through internal failure data
    - If the quality level for the targeted problem acceptable? **YES**: Reduce appraisal activities on targeted area
  - **YES**: Are internal failure costs acceptable?
    - YES: Are appraisal costs acceptable? **YES**: Reduce appraisal activities on targeted area
    - **NO**: Evaluate internal failure data to determine priority (Pareto, etc.)

### Table: Cost Breakdown

<table>
<thead>
<tr>
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<th>% of Total</th>
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<td><strong>$213,640</strong></td>
<td><strong>100.00%</strong></td>
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</table>
Calculating the Cost of Poor Quality

External and Internal Failure equals Increased Practice Costs and Use of Dental Supplies

“An Ounce of Prevention is Worth a Pound of Cure”
## Calculating the Cost of Poor Quality

<table>
<thead>
<tr>
<th></th>
<th>Quality Costs</th>
<th>% of Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prevention costs:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preventive Maintenance</td>
<td>$35,000</td>
<td></td>
</tr>
<tr>
<td>Staff and Quality Training</td>
<td>$80,000</td>
<td>$115,000</td>
</tr>
<tr>
<td><strong>Appraisal costs:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Materials Inspection</td>
<td>$20,000</td>
<td></td>
</tr>
<tr>
<td>Equipment Inspection</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>Process Improvement</td>
<td>$38,000</td>
<td>68,000</td>
</tr>
<tr>
<td><strong>Internal failure costs:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insurance Claims Re-Submission</td>
<td>$50,000</td>
<td></td>
</tr>
<tr>
<td>Expired Inventory</td>
<td>$35,000</td>
<td>85,000</td>
</tr>
<tr>
<td><strong>External failure costs:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer Complaints</td>
<td>$25,000</td>
<td></td>
</tr>
<tr>
<td>Customer Defection</td>
<td>25,000</td>
<td></td>
</tr>
<tr>
<td>Customer Lab Repair</td>
<td>$15,000</td>
<td>65,000</td>
</tr>
<tr>
<td><strong>Total quality costs</strong></td>
<td></td>
<td>$333,000</td>
</tr>
</tbody>
</table>
Are Your External Failure Costs Acceptable?

Evaluate External Failure data to determine priority (Pareto, etc)

Yes

Are Your Internal Failure Costs Acceptable?

Yes

Are Your Appraisal Costs Acceptable?

No

Increase Appraisal Activities in Targeted Areas (Temporarily)

Increase Prevention Activities: Initiate Process Improvement Activities in Target Areas

Verify Improvement through Internal Failure Data

Is the Quality Level for the Targeted Problem Acceptable?

Reduce Appraisal Activities on Targeted Areas

Unacceptable External Failure Costs

- Represent a Category in the Total Cost of Quality where the Quality Costs are related to Defects Found after Delivery of the Product to the Customer.
### Quantifying Practice Quality Improvement

<table>
<thead>
<tr>
<th>Year</th>
<th>Quality Costs</th>
<th>Revenue</th>
<th>% of Practice Revenue</th>
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</thead>
<tbody>
<tr>
<td>2001</td>
<td>$440,000</td>
<td>$2,200,000</td>
<td>20.0</td>
</tr>
<tr>
<td>2002</td>
<td>423,000</td>
<td>2,350,000</td>
<td>18.0</td>
</tr>
<tr>
<td>2003</td>
<td>412,500</td>
<td>2,750,000</td>
<td>15.0</td>
</tr>
<tr>
<td>2004</td>
<td>392,000</td>
<td>2,800,000</td>
<td>14.0</td>
</tr>
<tr>
<td>2005</td>
<td>280,000</td>
<td>2,800,000</td>
<td>10.0</td>
</tr>
</tbody>
</table>

### Multiple Period Trends Graph
Quantifying Practice Quality Improvement

Total Quality Costs are Decreasing Over Time and As a % or Sales

Multiple Period Trends Graph
Quantifying Practice Quality Improvement

<table>
<thead>
<tr>
<th>Practice Metrics</th>
<th>Feb. ‘09</th>
<th>April ‘09</th>
<th>Results</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly Revenues</td>
<td>$87,000</td>
<td>$135,000</td>
<td>$48,000</td>
<td>55%</td>
</tr>
<tr>
<td>Monthly Collections</td>
<td>$61,800</td>
<td>$73,300</td>
<td>$11,500</td>
<td>19%</td>
</tr>
<tr>
<td>Dental Patient Scheduled</td>
<td>907</td>
<td>1180</td>
<td>273</td>
<td>30%</td>
</tr>
<tr>
<td>Dental Patients Seen</td>
<td>550</td>
<td>865</td>
<td>315</td>
<td>57%</td>
</tr>
<tr>
<td>Cycle Time for 2-Surface Amalgam</td>
<td>60 min</td>
<td>40 min</td>
<td>(20 min)</td>
<td>(33%)</td>
</tr>
<tr>
<td>Patients Scheduled/Day/Dentist</td>
<td>8</td>
<td>12</td>
<td>4</td>
<td>50%</td>
</tr>
<tr>
<td>Chart Reviews (% Compliance)</td>
<td>30%</td>
<td>80%</td>
<td>50%</td>
<td>167%</td>
</tr>
<tr>
<td>Dental Patients Seen/Hour</td>
<td>0.8</td>
<td>1.2</td>
<td>0.4</td>
<td>50%</td>
</tr>
<tr>
<td>No-Show Rate</td>
<td>32%</td>
<td>27%</td>
<td>(5%)</td>
<td>(16%)</td>
</tr>
</tbody>
</table>

A Community-Based Dental Center (8-Chairs)
A 3-Month Lean Six-Sigma Project
### Quantifying Practice Quality Improvement

#### Quality Cost Category

<table>
<thead>
<tr>
<th>Quality Cost Category</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Failure</td>
<td>25 to 40</td>
</tr>
<tr>
<td>Internal Failure</td>
<td>25 to 40</td>
</tr>
<tr>
<td>Appraisal</td>
<td>10 to 50</td>
</tr>
<tr>
<td>Prevention</td>
<td>.05 to 5</td>
</tr>
</tbody>
</table>

The Ratio of the Individual Category Costs to Total Costs Varies. Many Practices Will Have Variation in these Ratios.

What Does Your Practice Reality Look Like?
## Quantifying Practice Quality Improvement

<table>
<thead>
<tr>
<th>COPQ</th>
<th>Sigma Level</th>
<th>DPMO</th>
<th>Capability</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 10% of Revenue</td>
<td>6 sigma</td>
<td>3.4</td>
<td>World Class</td>
</tr>
<tr>
<td>10 to 15% of Revenues</td>
<td>5 sigma</td>
<td>230</td>
<td>Superior Class</td>
</tr>
<tr>
<td>15 to 20% of Revenues</td>
<td>4 sigma</td>
<td>6200</td>
<td>Above Industry Average</td>
</tr>
<tr>
<td>20 to 30% of Revenues</td>
<td>3 sigma</td>
<td>67,000</td>
<td>Industry Average</td>
</tr>
<tr>
<td>30 to 40% of Revenues</td>
<td>2 sigma</td>
<td>310,000</td>
<td>Below Average</td>
</tr>
<tr>
<td>40% to 50% of Revenues</td>
<td>1 sigma</td>
<td>700,000</td>
<td>Poor</td>
</tr>
</tbody>
</table>

“Determines How Well Your Practice is Performing”
# Quantifying Practice Quality Improvement

<table>
<thead>
<tr>
<th>Dental Department</th>
<th>Totals as Percent</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Patient Demo</td>
<td>0 %</td>
<td>0</td>
</tr>
<tr>
<td>2) Med History</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>3) Med Condition</td>
<td>2.5%</td>
<td>1</td>
</tr>
<tr>
<td>4) X-Rays in Order</td>
<td>17.5%</td>
<td>7</td>
</tr>
<tr>
<td>5) Progress Notes</td>
<td>10%</td>
<td>4</td>
</tr>
<tr>
<td>6) Written Orders for Medicine</td>
<td>22.5%</td>
<td>9</td>
</tr>
<tr>
<td>Recorded</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7) 6 Month Recall</td>
<td>27.5%</td>
<td>11</td>
</tr>
<tr>
<td>8) Super Bill to Progress Notes</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9) Tooth Charting</td>
<td>0 %</td>
<td>0</td>
</tr>
<tr>
<td>10) Periodontal Charting</td>
<td>20%</td>
<td>8</td>
</tr>
<tr>
<td>Total Indicators in Non-Compliance</td>
<td>100%</td>
<td>40</td>
</tr>
</tbody>
</table>

**INDICATORS**

1. Completed patient demographics (Name, DOB, and Chart number) on medical and dental sheets.
2. Patient’s medical history form signed and dated; relevant medical status history documented in progress notes (BP, Murmur, VO2, etc.)
3. Documentation and labeling of medical conditions, such as AHA prophylaxis, allergies, etc. on the dental examination chart as required.
4. Radiographs order(s) logged, signed and dated appropriately.
5. Progress notes are logical, legible and the entries are appropriately written, signed, and dated.
6. Written orders for medicines are recorded appropriately in the medication list sheet and within the progress notes.
7. Dental Provider and Ancillary Dental Staff signatures and initials recorded on temporary medication sheet.
8. Super bill correlates with the Progress Notes
9. Completed tooth charting and treatment plans
10. Periodontal charting completed.

We Went from 1000 errors >110 Errors > 40: Want 0 Errors

Defects Per Million Opportunity (DPMO)
Quantifying Practice Quality Improvement

2,000 Charts Reviewed
10 Unique Opportunities or
20,000 Opportunities to Create
40 Errors were Observed
Defects per Opportunity (DPO) =
# of defects observed on a unit
# of opportunities on a unit
Therefore, the DPO is 40/20,000 or 0.002

Totals

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>7</th>
<th>4</th>
<th>9</th>
<th>11</th>
<th>0</th>
<th>8</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
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<td></td>
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<td>2</td>
<td>0</td>
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<td></td>
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<tr>
<td>10</td>
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<td>11</td>
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<td></td>
</tr>
</tbody>
</table>

By Multiplying our DPO of 0.002 by 1,000,000

We Get Our Defects per Million
Opportunities or (DPMO) of: 2,000.

40 errors out of 20,000 opportunities we get a Six Sigma Score of ~3.5

If 5 errors out of 20,000 opportunities were created we get a Six Sigma Score of ~5.0

1 error out of 20,000 opportunities were created we get a Six Sigma Score of ~5.4

Defects Per Million Opportunity (DPMO)
Quantifying Practice Quality Improvement

“When We Don’t Speak from Data, Practice Improvement Fails”
Quantifying Practice Quality Improvement

Measure As-Is Practice Delivery

Desired Measures of To-Be Process’s Performance

Performance Gap

Existing or As-Is Situation

Redesigned or To-Be Situation

Capabilities Gap

What does The Practice Do Now

What does The Practice Need for the Future

Identify and Eliminate Practice Delivery Gaps

Dental Office Accessibility

- No child care: 9%
- No appointment reminders: 15%
- Lack of parking: 28%
- Not open on Saturday: 24%
- Not on bus line: 26%
Quantifying Practice Quality Improvement

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Scale</th>
<th>Practice Problem A</th>
<th>Practice Problem B</th>
<th>Practice Problem C</th>
</tr>
</thead>
</table>
| Practice Goal                         | 5 = Most Supportive  
3 = Supportive  
1 = Least Supportive | 75                 | 125                | 25                 |
| Points = 25                           |                                            |                    |                    |                    |
| Return on Investment (ROI)            | 5 = Most Supportive  
3 = Supportive  
1 = Least Supportive | 25                 | 75                 | 25                 |
| Points = 25                           |                                            |                    |                    |                    |
| Frequency of Occurrence               | 5 = Most Acute  
3 = Acute  
1 = Least Acute | 25                 | 75                 | 25                 |
| Points = 25                           |                                            |                    |                    |                    |
| State of Urgency                      | 5 = Most Urgent  
3 = Urgent  
1 = Least Urgent | 45                 | 45                 | 15                 |
| Points = 15                           |                                            |                    |                    |                    |
| Potential Improvement Impact          | 5 = Most Impact  
3 = Impact  
1 = Least Impact | 30                 | 50                 | 10                 |
| Points = 10                           |                                            |                    |                    |                    |
| Risk Management                       | 5 = Least Risk  
3 = Risk  
1 = Most Risk | 5                  | 5                  | 25                 |
| Points = 5                            |                                            |                    |                    |                    |
| Project Size                          | 5 = Most Manageable  
3 = Manageable  
1 = Least Manageable | 5                  | 25                 | 5                  |
| Points = 5                            |                                            |                    |                    |                    |
| Change Management                     | 5 = Least Resistance  
3 = Resistance  
1 = Least Resistance | 5                  | 25                 | 5                  |
| Points = 5                            |                                            |                    |                    |                    |
| Total                                 | 215                                        | 425                | 135                |
Overview: Cost of Poor Quality

- COPQ can be Used in Pursuit of Quality Improvement, Customer Satisfaction and Basic Data for Continual Process Improvement
- High Internal and External Costs Defines Inefficient and Ineffective Dental Practice Delivery
- COPQ Defines Where the Need and Opportunities to Develop Quality Improvement Initiatives
- COPQ provides a Means to Correctly Distribute Controllable Quality Cost for Maximum Profits and Promotes the Effective Use of Resources
Overview: Cost of Poor Quality

- COPQ can Measure, Analyze and Monitor What Resource are Needed to Achieve Better Quality Products and Services and Customer Satisfaction
- COPQ Costs are not Incurred or Allocated, but Rather Caused
- COPQ Costs Information itself does not solve quality problems, nor does it suggest specific solutions. Problems are solved by tracing the cause of a quality deficiency
- COPQ can Measure, Program, and Analyze What Budget are needed to Achieve Better Quality Products and Services and Customer Satisfaction
- Reducing the cost of poor quality is one of the best ways to increase a company's profit.
Questions???

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p3Dental Solutions

www.p3dental.com

jpatsis@p3dental.com

10533 Tuckerman Heights Circle
North Bethesda, MD 20852

Resources:
Excellent Review Article on Cost of Quality