Seeking Zero Defects: Applying the Toyota Production System to Medicine

Pay For Performance Summit

March 9, 2010

Gary S. Kaplan, MD, Chairman and CEO
Virginia Mason Medical Center
Seattle, Washington
“If you are dreaming about it… you can do it.”

Sensei Chihiro Nakao
First, Some Background…
Virginia Mason Medical Center

- An integrated healthcare system
- 501(c)3 Not for Profit
- 336 bed hospital
- 9 locations (main campus and regional centers)
- 450 physicians
- 5000 employees
- Graduate Medical Education Program
- Research center
- Center for Health Care Solutions
- Virginia Mason Institute
Time for a Change

Year 2000

• Issues
  ▪ Survival
  ▪ Retention of the Best People
  ▪ Loss of Vision
  ▪ Build on a Strong Foundation

• Leadership Change

• A Defective Product
Why is Change So Hard?

• Culture
• Lack of Shared Vision
• Misaligned Expectations
• No Urgency
• Ineffective Leadership
An Embarrassingly Poor Product


The lead story is titled “The Biggest Mistake of Their Lives” and chronicles four survivors of medical errors.

The article goes on to say that in 2003, as many as 98,000 people in the United States will die as a result of medical errors.
Investigators: Medical mistake kills Everett woman

Hospital error caused death
Traditional Compact

- Despite the fact things weren’t working, most physicians clung to the fundamental “gets” they felt due them
  - Protection
  - Autonomy
  - Entitlement
- Physician-centered world view prevailed
Virginia Mason Medical Center Physician Compact

**Organization’s Responsibilities**

**Foster Excellence**
- Recruit and retain superior physicians and staff
- Support career development and professional satisfaction
- Acknowledge contributions to patient care and the organization
- Create opportunities to participate in or support research

**Listen and Communicate**
- Share information regarding strategic intent, organizational priorities and business decisions
- Offer opportunities for constructive dialogue
- Provide regular, written evaluation and feedback

**Educate**
- Support and facilitate teaching, GME and CME
- Provide information and tools necessary to improve practice

**Reward**
- Provide clear compensation with internal and market consistency, aligned with organizational goals
- Create an environment that supports teams and individuals

**Lead**
- Manage and lead organization with integrity and accountability

**Physician’s Responsibilities**

**Focus on Patients**
- Practice state of the art, quality medicine
- Encourage patient involvement in care and treatment decisions
- Achieve and maintain optimal patient access
- Insist on seamless service

**Collaborate on Care Delivery**
- Include staff, physicians, and management on team
- Treat all members with respect
- Demonstrate the highest levels of ethical and professional conduct
- Behave in a manner consistent with group goals
- Participate in or support teaching

**Listen and Communicate**
- Communicate clinical information in clear, timely manner
- Request information, resources needed to provide care consistent with VM goals
- Provide and accept feedback

**Take Ownership**
- Implement VM-accepted clinical standards of care
- Participate in and support group decisions
- Focus on the economic aspects of our practice

**Change**
- Embrace innovation and continuous improvement
- Participate in necessary organizational change
Our Strategic Plan

Patient

Vision
To be the Quality Leader and transform health care

Mission
To improve the health and well-being of the patients we serve

Values
Teamwork | Integrity | Excellence | Service

Strategies

People
We attract and develop the best team

Quality
We relentlessly pursue the highest quality outcomes of care

Service
We create an extraordinary patient experience

Innovation
We foster a culture of learning and innovation

Virginia Mason Team Medicine™ Foundational Elements

Strong Economics | Responsible Governance | Integrated Information Systems | Education | Research | Virginia Mason Foundation

Virginia Mason Production System
The VMMMC Quality Equation

\[ Q = A \times \frac{(O + S)}{W} \]

Q: Quality
A: Appropriateness
O: Outcomes
S: Service
W: Waste
New Management Method: The Virginia Mason Production System

We adopted the Toyota Production System philosophies and practices and applied them to health care because health care lacks an effective management approach that would produce:

- Customer first
- Highest quality
- Obsession with safety
- Highest staff satisfaction
- A successful economic enterprise
Relentless “War on Waste”: Key to Quality

7 Wastes:
- Waste of overproduction
- Waste of transportation
- Waste of over processing
- Waste of inventory
- Waste of motion
- Waste of making defective products or poor quality
- Waste of engineering

→ Lab tests
→ Patient transfers
→ Charge tickets
→ Drugs, supplies
→ Searching for charts
→ Professional liability
→ Large centralized machines
The Impact of Lean

• ½ the human effort
• ½ the space
• ½ the equipment
• ½ the inventory
• ½ the investment
• ½ the engineering hours
• ½ the new product development time
Seeing with our Eyes
Japan 2002
Hitachi Air Conditioning

Team Leader Kaplan reviewing the flow of the process with Drs. Jacobs and Glenn
Summary

How are air conditioners, cars, looms and airplanes like health care?

- Every manufacturing element is a production processes
- Health care is a combination of complex production processes: admitting a patient, having a clinic visit, going to surgery or a procedure and sending out a bill
- These products involve thousands of processes—many of them very complex
- All of these products involve the concepts of quality, safety, customer satisfaction, staff satisfaction and cost effectiveness
- These products, if they fail, can cause fatality
VMPS Tools in Action

• Value Stream Development
• **RPIW** (Rapid Process Improvement Workshop)
• **5S** (Sort, simplify, standardize, sweep, self-discipline)
• **3-P** (Production, Preparation, Process)
• Standard Work
• Daily Work Life
5S Anesthesia “Shadow Board” - After
Central Line Insertion Standard Work

Before

Dry:
- 30 sec scrub
- 30 sec dry

Wet:
- 2 min scrub
- 1 min dry

Maximum Barrier Protection
Thyroid
Angio Drapes

During

OR

AND

Transducer Method
Manometer Method

After

"Approved to use Date/Initial"

Yellow – top of cart

White – in chart progress notes

Complete Paperwork
Stopping the Line™

Virginia Mason’s Patient Safety Alert System™
Stopping the line
Patient Safety Alert Process™
Created August 2002

- Leadership from the top
- “Drop and run” commitment
- 24/7 policy, procedure, staffing
- Legal and reporting safeguards
Patient Safety Alert Results as of December 31, 2009

14,604 Patient Safety Alerts
- Diagnosis/Treatment 25%
- Medication Errors 21%
- Systems 36%
- Equipment/Facilities 4%
- Safety/Security/Conduct 14%

Average # of PSAs/month
- 2002 - 3/month
- 2003 - 10+/month
- 2004 - 17/month
- 2005 - 251/month
- 2006 - 276/month
- 2007 - 238/month
- 2008 - 226/month
- 2009 - 244/month
Primary Care – Flow Stations

VMPS Concepts of a Flow Station

- Waste of motion (walking)
- Continuous flow
- Visual control (Kanbans)
- External setup
- Water strider
- U-Shaped Cell

Creating MD Flow Reduces Patient Wait Times
“Nursing Cells” – Results > 90 days

RN time available for patient care = 90%!

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>• RN # of steps = 5,818</td>
<td>846</td>
</tr>
<tr>
<td>• PCT # of steps = 2,664</td>
<td>1256</td>
</tr>
<tr>
<td>• Time to the complete am cycle of work = 240’</td>
<td>126’</td>
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<tr>
<td>• Patients dissatisfaction = 21%</td>
<td>0%</td>
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<tr>
<td>• RN time spent in indirect care = 68%</td>
<td>10%</td>
</tr>
<tr>
<td>• PCT time spent in indirect care = 30%</td>
<td>16%</td>
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<tr>
<td>• Call light on from 7a-11a = 5.5%</td>
<td>0%</td>
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<tr>
<td>• Time spent gathering supplies = 20’</td>
<td>11’</td>
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</tbody>
</table>
Improving Quality and Access: Emergency Department

2008-2009 ED Divert Hours

Total 2008 Hours: 696.97
Total 2009 Hours: 113.92

<table>
<thead>
<tr>
<th></th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
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<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
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<tbody>
<tr>
<td>2008 Hrs.</td>
<td>191.25</td>
<td>95.55</td>
<td>130.5</td>
<td>68</td>
<td>64.9</td>
<td>59.25</td>
<td>18.75</td>
<td>13.55</td>
<td>6.37</td>
<td>9.55</td>
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<td>2009 Hrs.</td>
<td>7.5</td>
<td>11.07</td>
<td>16.97</td>
<td>8.4</td>
<td>18.78</td>
<td>6.1</td>
<td>14.68</td>
<td>14.02</td>
<td>16.4</td>
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<tr>
<td>Metric</td>
<td>Before</td>
<td>Today</td>
<td>% Change</td>
<td></td>
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<tr>
<td>Time Available (10 hr day)</td>
<td>600 min</td>
<td>600 min</td>
<td>0%</td>
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<tr>
<td>Total Case Time (cut to close plus set-up)</td>
<td>107 min</td>
<td>65.5 min</td>
<td>39%</td>
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<tr>
<td>Case Turnover Time (pt out to pt in)</td>
<td>30 min</td>
<td>15 min</td>
<td>50%</td>
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<tr>
<td>Cases/day</td>
<td>5 cases/OR</td>
<td>8 cases/OR</td>
<td>60%</td>
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<tr>
<td>Cases/4 ORs</td>
<td>20 cases</td>
<td>32 cases</td>
<td>60%</td>
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Patient & Staff Satisfaction Correlation

Year 2007:
- Staff Sat: 66.0
- Hosp Pt Sat: 82.7
- Clinic Pt Sat: 87.4

Year 2008:
- Staff Sat: 70.4
- Hosp Pt Sat: 84.4
- Clinic Pt Sat: 89.4
Hospital Acute LOS

Lead Time Reduction
Hospital Monthly Acute LOS

Palliative Care Program Started

Lead Time Reduction Declared as Divisional Goal

RN Cell Established

Focus on ELOS

ELOS RPIW #1 High Risk ID

Greater than

ELOS RPIW #2 SNF and

Nutrition RPIW

CCU ELOS KAIZEN

Target ELOS floors

On Line SNF Request

2 Bin System

CCU ELOS RPIW

RNPCT Skill Task Alignment

RN Bedside Handoff

2 Bin System

CNL/MSW Handoff

Target ELOS floors

Kaizen Plan and CNL

CNL Role Implemented

RPIW

Mobility RPIW

High Risk ID

ELOS RPIW

ELOS #3 Care Team

CCR ELOS KAIZEN

Target ELOS floors

On Line SNF Request
Requirements for Transformation

- Improvement Method Applied to ALL Processes
- Critical mass feels urgency for change
- Visible and committed leadership
- Executives address technical AND human dimensions of change
- New compact aligns expectations with vision
- Broad and deep commitment to shared vision
- Requirements for Transformation: Broad and deep commitment to shared vision
## Virginia Mason Medical Center
### Leadership Compact

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<thead>
<tr>
<th><strong>Foster Excellence</strong></th>
<th><strong>Focus on Patients</strong></th>
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<tbody>
<tr>
<td>Recruit and retain the best people</td>
<td>Promote a culture where the patient comes first in everything we do</td>
</tr>
<tr>
<td>Acknowledge and reward contributions to patient care and the organization</td>
<td>Continuously improve quality, safety and compliance</td>
</tr>
<tr>
<td>Provide opportunities for growth of leaders</td>
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<tr>
<td>Continuously strive to be the quality leader in health care</td>
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<tr>
<td>Create an environment of innovation and learning</td>
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</table>

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<thead>
<tr>
<th><strong>Lead and Align</strong></th>
<th><strong>Promote Team Medicine</strong></th>
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</thead>
<tbody>
<tr>
<td>Create alignment with clear and focused goals and strategies</td>
<td>Develop exceptional working-together relationships that achieve results</td>
</tr>
<tr>
<td>Continuously measure and improve our patient care, service and efficiency</td>
<td>Demonstrate the highest levels of ethical and professional conduct.</td>
</tr>
<tr>
<td>Manage and lead organization with integrity and accountability</td>
<td>Promote trust and accountability within the team</td>
</tr>
<tr>
<td>Resolve conflict with openness and empathy</td>
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<tr>
<td>Ensure safe and healthy environment and systems for patients and staff</td>
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<tr>
<td>Share information regarding strategic intent, organizational priorities, business decisions and business outcomes</td>
<td>Communicate VM values</td>
</tr>
<tr>
<td>Clarify expectations to each individual</td>
<td>Courageously give and receive feedback</td>
</tr>
<tr>
<td>Offer opportunities for constructive open dialogue</td>
<td>Actively request information and resources to support strategic intent, organizational priorities, business decisions and business outcomes</td>
</tr>
<tr>
<td>Ensure regular feedback and written evaluations are provided</td>
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<tr>
<td>Encourage balance between work life and life outside of work</td>
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<tr>
<th><strong>Educate</strong></th>
<th><strong>Take ownership</strong></th>
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<tr>
<td>Support and facilitate leadership training</td>
<td>Implement and monitor VM approved standard work</td>
</tr>
<tr>
<td>Provide information and tools necessary to improve individual and staff performance</td>
<td>Foster understanding of individual/team impact on VM economics</td>
</tr>
<tr>
<td></td>
<td>Continuously develop one’s ability to lead and implement the VM Production System</td>
</tr>
<tr>
<td></td>
<td>Participate in and actively support organization/group decisions</td>
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<tr>
<td></td>
<td>Maintain an organizational perspective when making decisions</td>
</tr>
<tr>
<td></td>
<td>Continually develop oneself as a VM leader</td>
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<tr>
<th><strong>Recognize and Reward</strong></th>
<th><strong>Foster Change and Develop Others</strong></th>
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<tbody>
<tr>
<td>Provide clear and equitable compensation aligned with organizational goals and performance</td>
<td>Promote innovation and continuous improvement</td>
</tr>
<tr>
<td>Create an environment that recognizes teams and individuals</td>
<td>Coach individuals and teams to effectively manage transitions</td>
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<tr>
<td></td>
<td>Demonstrate flexibility in accepting assignments and opportunities</td>
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<tr>
<td></td>
<td>Evaluate, develop and reward performance daily</td>
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<tr>
<td></td>
<td>Accept mistakes as part of learning</td>
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<tr>
<td></td>
<td>Be enthusiastic and energize others</td>
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</tbody>
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Leaders’ Role in Signal Generation

“Leaders are signal generators who reduce uncertainty and ambiguity about what is important and how to act”.

— Charles O’Reilly III
Tuesday “Stand Up”
“Distress” and Adaptive Work

Adaptive challenge

Limit of tolerance

Productive range of distress

Threshold of learning

Flu Vaccination “Fitness for Duty”

- Do we put patient first?
- Compelling science
- Staff resistance
- Staying the course
- Organizational Pride
Figure 1: Immunization Rates

- 2002: 38.00%
- 2003: 54.00%
- 2004: 29.50%
- 2005: 98.00%
- 2006: 98.50%
- 2007: 99.00%
- 2008: 99.25%
We are Eight Years into the Journey

2002 - 2004

2005 - 2006

GLOBAL PRODUCTION SYSTEM - Building the House

The Kaizen Path

Point Improvements

Point
(Point) (Eliminate waste at source - start at point closest to the customer - root out basic problems, make improvements, build a foundation)

5-10 Years

Line Improvements

Line
(Line)

Vertical development
(Link processes to create a cell. Flow production begins here. Flow paves the way for line improvements)

Critical Transition from Point to Line

5-10 Years

Spatial Improvements

Height
(3rd Dimensional)

(Link all elements from concept to customer. Raise improvement to the other planes: Finance, HR, Suppliers, etc.)

15-20 Years

Goal: Flow vs. Batch

Point
(Point)

Goal: Raise to Other Planes

Plane Improvements

Plane

(Link cells to produce a product. The model line is used as a reference and replicated across the plane.)

10-15 Years

Goal: A Model Line

Goal: Spread Across Plane

2007 - present

TEAM MEDICINE
Ongoing Challenges - Culture

- Patient First
- Belief in Zero Defects
- Professional Autonomy
- “Buy In”
- “People are Not Cars”

- Pace of Change
- Victimization
- Leadership Constancy
- Rigor, Alignment, Execution
- Drive for Results
First Challenge is Changing the Mind of Medicine

FROM
- Provider First
- Waiting is Good
- Errors are to be Expected
- Diffuse Accountability
- Add Resources
- Reduce Cost
- Retrospective Quality Assurance
- Management Oversight
- We Have Time

TO
- Patient First
- Waiting is Bad
- Defect-free Medicine
- Rigorous Accountability
- No New Resources
- Reduce Waste
- Real-time Quality Assurance
- Management On Site
- We Have No Time
LEADERSHIP MUST CHANGE ITS MENTALITY.

SCARCITY: You are not paying us enough.

ABUNDANCE: We have more than enough.
“Leaders are Dealers in Hope.”

Napoleon Bonaparte
“In times of change, learners inherit the earth, while the learned find themselves beautifully equipped to deal with a world that no longer exists.”

Eric Hoffer