Learning from Toyota and W. Edwards Deming

Virginia Mason Medical Center's Quality Journey

The Quality Colloquium
August 2004

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Chairman and CEO
Virginia Mason Medical Center

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)
- 400 physicians
- 5000 employees
- Graduate Medical Education Program
- Research center
- Foundation

Virginia Mason Medical Center

- Tertiary Referral Center
- Education and Research
- Primary and Specialty Care
- "Academic Half-Way House"
- Innovation
- 16,000 Admissions
- 1.2 Million Visits
- Greater than $1.2 Billion Gross Charges

Virginia Mason Medical Center

2000

- Leadership Change
- Issues
  - Survival
  - Retention of Best People
  - Need for Change
  - Build on a Strong Foundation

Mandate for Change

- Economics
- Simultaneous Growth and Contraction
- Business Principles and Discipline
- Governance Change – Role of the Board
- Open Communication and Shared Vision
- Trust

Organizational Transformation Physician Issues

- Clarity of Expectations
  - Compact
  - Job Descriptions
- Responsibility and Accountability
- Culture of Feedback
- Transparency
- Trust

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

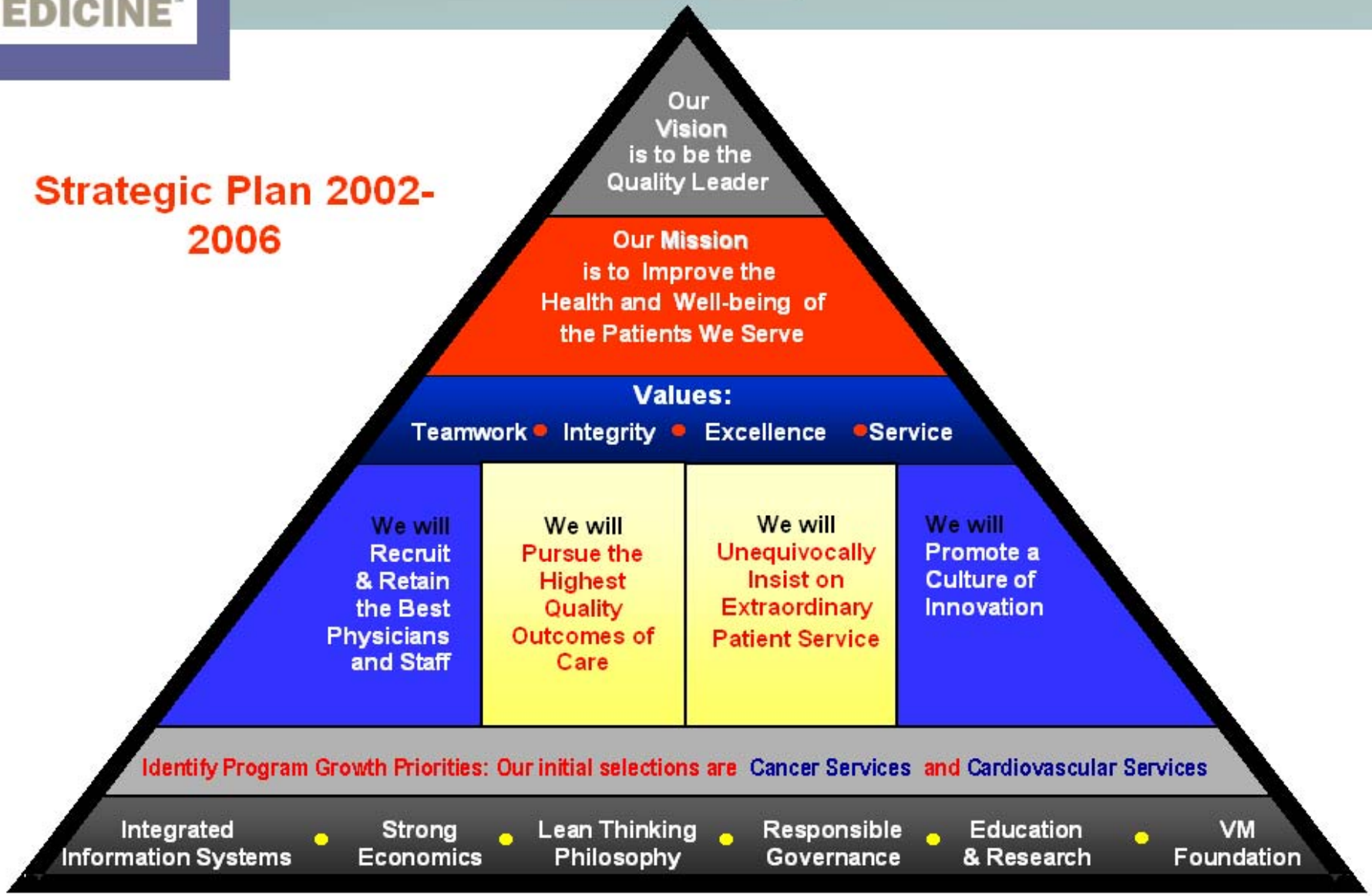
Listen and Communicate
- Communicate clinical information in clear, timely manner
- Request information, resources needed to provide care consistent with VM goals
- Provide and accept feedback

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

TEAM MEDICINE VIRGINIA MASON

Strategic Plan 2002-2006

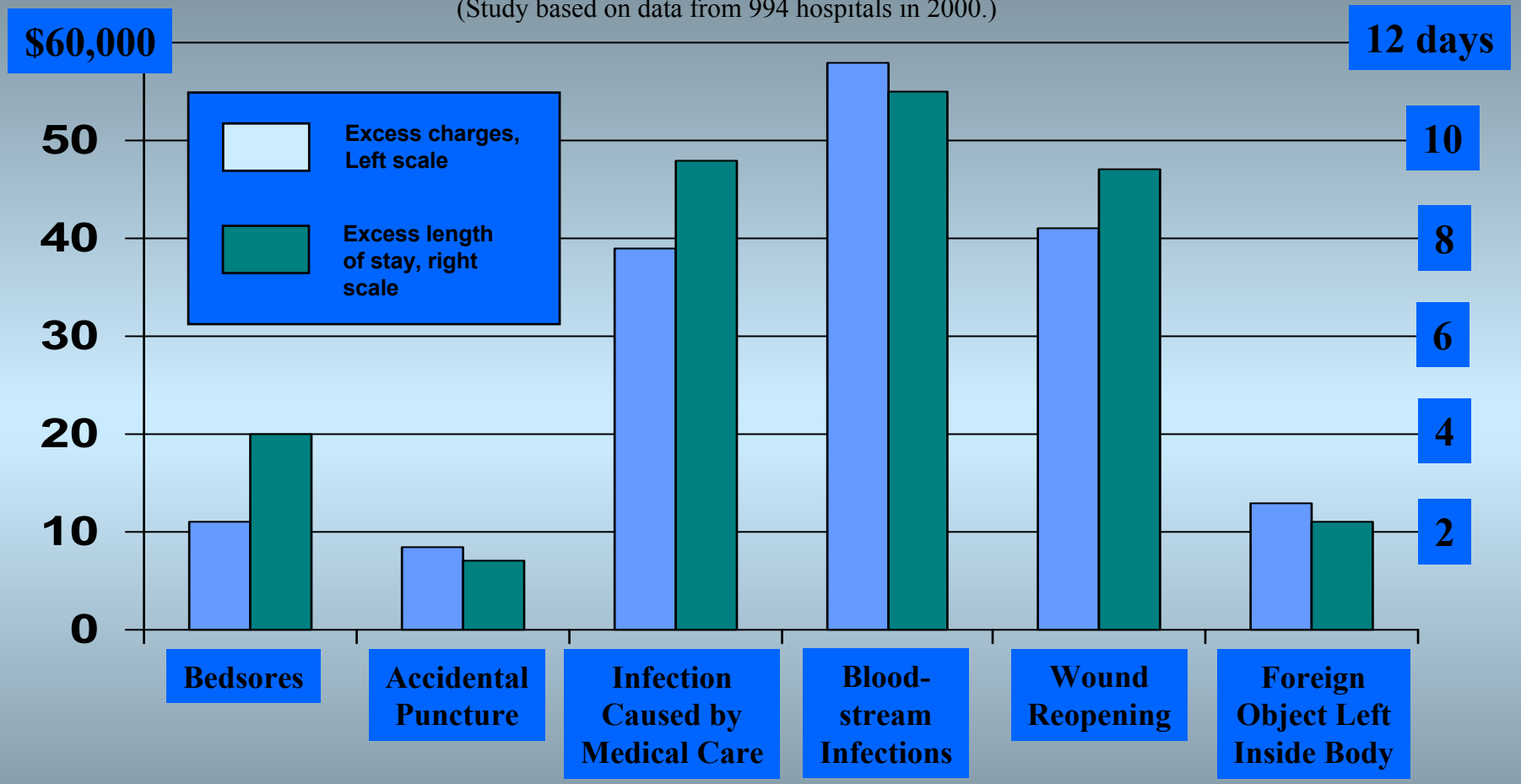


An Embarrassingly Poor Product

- The March 16, 2003 edition of The New York Times Magazine front cover reads, "Half of what doctors know is wrong."
- 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.

Hospital Complications Exceed $9 Billion

(Study based on data from 994 hospitals in 2000.)



	Bedsores	Accidental Puncture	Infection Caused by Medical Care	Blood-stream Infections	Wound Reopening	Foreign Object Left Inside Body
# Patients affected annually	*41,440*	*11,810*	*11,449*	*2,592*	*843*	*536*
Mortality rate	*7.23%*	*2.16%*	*4.31%*	*21.92%*	*9.63%*	*2.14%*

Source: Journal of the American Medical Association

Why Zero Defects is the Only Acceptable Standard?

- At 99.9% quality levels, here is what happens:
  - 22,000 checks are deducted from the wrong bank accounts every day
  - 16,000 pieces of mail are lost by the Postal Service every hour
  - 2,000 unsafe airplane landings are made every day
  - 500 incorrect surgeries are completed every week

Changing the Mind of Leadership

- At Virginia Mason our vision is to be the Quality Leader in healthcare.
- We are committed to producing a defect free product.
- We are pursuing that goal through the adoption of the Virginia Mason Production System.

The Virginia Mason Production System is the Toyota Production System based management method by which we will accomplish our vision to be the quality leader.

VMPS at Virginia Mason

We adopted the Toyota Production System philosophies and practices and applied them to healthcare because this industry and we were so lacking in an effective management approach that resulted in:

- Customer First,
- Highest Quality,
- Obsession with safety, and
- Highest staff satisfaction,
- A successful economic enterprise.

Relentless War on Waste

7 Wastes

- Waste of overproduction
- Waste of transportation
- Waste of overprocessing
- Waste of inventory
- Waste of motion
- Waste of making defective products or poor quality

Principles

- Define Value
- Identify Value Stream
- Continuous Flow
- Pull
- Pursuit of Perfection

7 Flows

Production	Medicine
• People	• Patients
• Raw Material	• Providers
• Parts	• Medication
• Production	• Supplies
• Equipment	• Information
• Information	• Equipment
• Engineering	• Process Engineering

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

TEAM MEDICINE VIRGINIA MASON

Seeing with our Eyes
Japan 2002

Overview

- Introduction
- Toyota Museum of Industry and Technology
- Hitachi Air Conditioning
- Toyota Motor Corporation
- Summary of Trip
- Our Plan
- Conclusion

Hitachi Air Conditioning

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

Hitachi Air Conditioning

- Dave recording the work flow and timing cycle time

What We Learned

TEAM MEDICINE VIRGINIA MASON

- Air conditioners, cars, looms, airplanes and forklifts…what do any of these products have to do with health care?
  - Health care, too, is full of production processes
  - These Japanese products, like our services, involve the concepts of quality, safety, customer satisfaction, staff satisfaction and cost effectiveness
  - The completion of a product involves thousands of processes—many of them very complex
  - Many products, if they fail, can cause fatality
  - They are in many ways, just like us

What We Learned

- Production processes have much in in common with admitting a patient, having a clinic visit, going to surgery or a procedure and sending out a bill
- To have smooth, high quality continuous flow of our patients is delightful when it happens
- Our vision is that this would happen always for our patients
- We are more convinced than ever that the principles and tools of the Toyota Production System may well become those of the Virginia Mason Production System, the system of management behind the achievement of becoming the Quality Leader

The Plan

The plan for translating what we learned into reality at Virginia Mason has seven areas of focus:

- "Patient First" will be the driver for all that we do

- Our brand of the Toyota Production System will be the "*Virginia Mason Production System*"

- Create an environment in which our people feel sate and free to engage in improvement – "No Layoff Policy"

The Plan

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- "Patient First" will be the driver for all that we do
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The Plan

(Continued)

- Implement a company-wide defect alert system called "The Patient Safety Alert System"
- Encourage innovation
- Create a prosperous economic organization. We will primarily reduce costs by eliminating waste
- Require leadership accountability

VMPS in Action

- 5-S (Sort, simplify, standardize, sweep, self-discipline)
- RPIW (Rapid Process Improvement Workshop)
- 3-P (Production, Preparation, Process)
- Super Flow
- Daily work life

What about Customers?

- Patient Satisfaction and Service
  - Always puts the patient first
  - Pre-surgery clinic
  - Standard educational materials
  - Standard work "scripts" at call center
  - Clean, clutter free environment
  - Less waiting
  - More about the patient
  - Better Flow

What about Staff?

- Staff satisfaction
  - Enthusiastic team participation from staff
  - Ensuring work at Virginia Mason – No Layoff Policy
  - Concern about jobs changing which tend to go away upon completion
  - Physicians are no different than staff
  - Cross Training becoming widespread
  - Certification of all Executives and Admin Directors
  - >99% of staff attended Introduction to Lean
  - Some leaders have a harder time ….
  - Skepticism is dwindling….

What about Quality?

- Quality
  - Reduction in variation with standard work
  - Reduction in handoffs by creating flow and eliminating non-value added work
  - Reduction in defects and errors

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Quality Plan

Standard Work = Evidence-Based + Best Practice

EXISTING EVIDENCE-BASED GUIDELINES (National, Regional, Local)

EMERGING EVIDENCE, GOOD GUESSES, LOCAL TALENT

LEAN / RPI
Value
Flow
Waste
Kaizen

STANDARD WORK

(Best Practices)

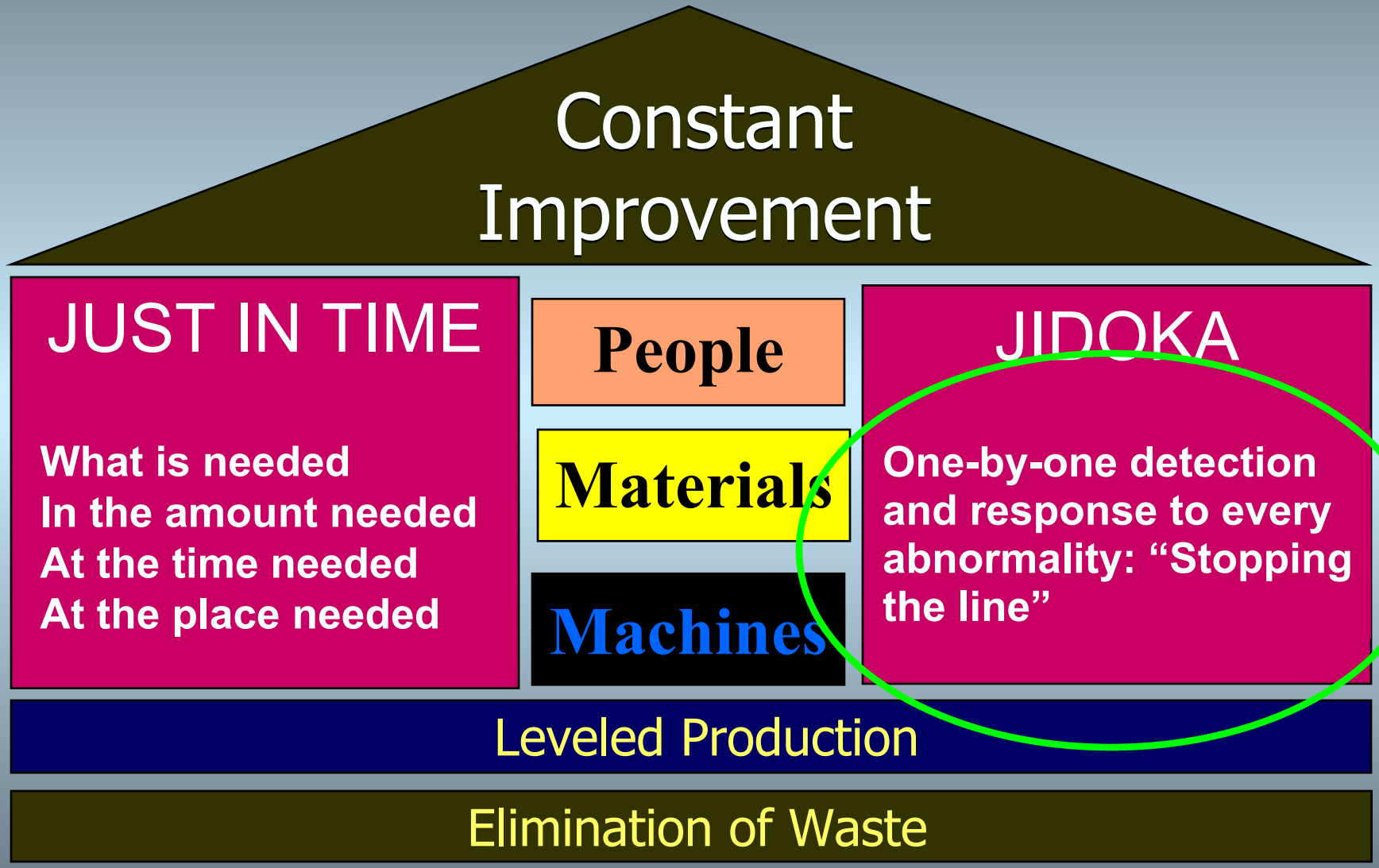
What about Safety?

- Safety
  - Reduction in clutter (environment)
  - Standard work ensures the best practices are consistently used (patient and staff safety)
  - Reduction in error – Mistake Proofing
  - "It Takes Two" patient safety initiative
  - Patient Safety Alert (PSA) in active use

Stopping the Line ™

Virginia Mason's Patient Safety Alert System™

Virginia Mason Production System (VMPS)



Patient Safety Alert ™ Process Overview

- Report if likely to cause significant harm
- 24/7 hotline, procedure, and staffing
- "Drop and run" commitment (code)
- Evaluate and fix immediately
- Or the stop process, do a root cause and restart when fixed (<29 days)

Patient Safety Alert Results as of 5/31/04

- 201 Patient Safety Alerts
  - Diagnosis/Treatment 16
  - Medication Errors 32
  - Systems 119
  - Equipment 21
  - Conduct 10
- Average # of PSAs/month appears to be leveling off
  - 2002- 3/month
  - 2003- 10+/month
  - 2004- 11+/month
- Average days to completion – 6.4
- Individuals taken off line – 15
- Processes take off line – 7

Patient Safety Alert (PSA Recap* (as of 5/31/04

*PSA Policy/Procedure Initiated 8/1/02

Year	2002 YTD (5 month)	2003 YTD (12 month)	2004 YTD (5 month)
Category:			
Clinical Dx/Tx	6	6	4
Medication	4	17	11
Systems	4	74	41
Facilities/Equipment	1	22	1
Conduct/Scope of Practice	3	6	1
Total PSAs	18	125	58
PSAs/Month	3.6	10.4	11.6
Average Days to Completion	18.4	13	6.4
Processes Taken Off-Line	1	4	2
Employees Taken Off-Line	6	5	4
Employees Terminated	2	3	2

RPIW Example Areas

- GI Ambulatory
- HR Business Partner
- PACU
- Radiology
- Hospital 3P
- Periop Induction Room
- Adult Ambulatory Visit Flow
- Dermatology 3P
- Ambulatory Specialty Scheduling
- Federal Way Specialty Clinic and ASC
- Disease State Management
- Supply Chain
- Skilled Nursing Placements
- Specimen Collection Mistake Proofing
- Rehab Medicine Patient Flow
- Inpatient Medication Integration
- Histology Slide Turn-out
- Inpatient Incomplete Chart Processing
- Lindeman Pavilion Pharmacy
- Human Resources Service and Processing
- Orthopedics/Sports Medicine
- Clinical Research
- PM & R
- Ambulatory Neurology
- Ambulatory Transplant
- Cardiology
- Emergency Department

Electrophysiology Workshop

An example of a Rapid Process Improvement Workshop

Improving the flow of patients through the cardiac procedures labs to the PCU was the focus of the latest Rapid Process Improvement Workshop. **The EP Cath Lab to PCU workshop team** completed their work on September 12, 2003

Here's the Team!

Team members from left to right: Gordon Kritzer, MD, Gary Kaplan, MD, Robert Mecklenburg, MD, Julie Legaros, RN, Chris Fellows, MD, Steven Piccolo, RN, Jackie Kubu, Janette Trube, Kellie Bradfield, Julie King, Melanie Winters, RN (Team members are holding a sign that reads, "We are Reinventing Healthcare")

Workshop Leader was: Gary Kaplan, MD

OPI Workshop Leader: Chris Backous
Team Leader was: Julie King
Sub-Team Leader was: Robert Mecklenburg, MD

Team Goals:
Reduce non-value added time in the value stream for patient and improve efficiency of performance for the Section of Cardiology, Cath and EP Labs, and PCU by:

- Level loading cardiac procedures across the days of the week and hours of the day, and
- Coordinating care between the Section of Cardiology, the cath lab and PCU.

Target Progress Report

Team Name: EP/Cath Lab to PCU Flow

Date: Sept8-12, 2003

Department: Heart

TAKT Time*: Cath: 60 minutes; EP: 134 minutes

Product/Process Summary:
Outpatient scheduling of a cardiac catheterization (cath) or electrophysiology (EP) procedure through patient discharge from the Procedure Care Unit (PCU)
Goals: Level Loading, Improved Coordination

Team Leader: Julie King/Bob Mecklenburg
Workshop Leader: Gary Kaplan

Metric	Baseline	Target	Day 5	% Change	Key Changes
Space (square feet) PCU weekly turnaway (alternate hospital beds occupied when PCU has been filled).Baseline represents an average of 7 patients turned away each week.	1, 334 sq feet	0	0	100%	Enhanced level loading of PCU patient flow eliminating need to use hospital beds for overflow
Inventory (dollars) Cath procedure packs; current state PAR level noted in baseline is 30 packs @$63.39 each	$1,901.70	$950	$950	50%	Work with supplier to increase frequency reducing need for stock on hand by 50%
Staff Walking Distance: Trips to/from Omnicell by PCU RNs during their day shift. Baseline is 12 trips per day	140 feet	70 feet	12 feet	91%	AM supermarket to avoid unnecessary walking-kanbans in place to restock as needed preventing pile-up of inventory in supermarket
Parts Travel Distance (feet)	NA	NA	NA	NA	
Lead Time (minutes): time from Cardiology Clinic CSR medical information collection/scheduling until patient discharge from the PCU	EP: 30, 078 minutes Cath: 3,116 minutes	EP: 15,039 Cath: 1,558	EP: 7,506 Cath: 2,798	EP: 75% Cath: 10%	EP/Cath:Schedule balancing allowing for consistent flow of procedures through lab resulting in more predictable PCU flow

Work In Process (WIP): Number of EP and Cath patients waiting for their procedure. WIP is determined by patients scheduled for procedures past current day	EP: 58 Cath: 24	EP: 29 Cath: 12	EP: 25 in 3 weeks) Cath: 24	EP: 56% Cath: 0%	Increaed flow reduces Que and WIP
Quality (defects)(%): a. Daily Procedure Delays (based on 3 days of data collection in the labs) b. Patients without a medical information packet at time of check-in to PCU. Baseline number represents one month of data collection	a. EP:17%; Cath: 35% b. 12%	a. EP: 0; Cath: 0 b. 0	TBD 0	Delay: 0% (TBD) Med Info: 100%	Exrternalilzing set-up for procedures and ensuring data collection done in cllinic at time of scheduling as well as developing standard work and clear MD expectations reduces defects ie patients should not arrive in PCU with incomplete information
Productivity Gain (FTE): 1. Average monthly overtime hours for Cath and EP staff (excluces call-back Overtime). Baseline based on 6 months of data.	EP: 65 hours (.37 FTE) Cath: 63 hours (.36 FTE)	EP: 0 Cath: 0	TBD	0% (TBD)	Scheduling level loading increases number of procedures within scheduled hours allows elimination of OT and increased capacity
Environmental, Health & Safety (5S): New EP Lab	3	4	4	100%	New EP lab
Set-up Reduction (minutes): Cardiology CSR information preparation (from medical information collection by CSR through authentication by physician and sending to PCU)	Cath: 255 minutes EP: 1,467 minutes	Cath: 9 minutes EP: 9 minutes	Cath and EP: 18 minutes	Cath: 97% EP: 99%	See above

Remarks:

*TAKT Time is based on the following information:

Cath: An average of 45 patients have procedures Monday-Friday of each week, 9 patients per day if procedures were level loaded. Available time for the lab is 9 hours per day (540 minutes). 540/9=60 minutes

EP: An average of 25 patients have procedures Monday-Friday of each week, 5 patients per day if procedures were level loaded. Available time for the lab is 56 hours per week (3, 360 minutes). 3360/25=134 minutes

3Ps Production, Preparation, Process

- Cancer
- Hospital
- Dermatology
- GI
- Hyperbarics

Commitment and Deployment

- Leadership and management
- Introduction to Lean
- Certification Track
- Lean Mastery
- Japan Gemba
- Kaizen Fellowship

The Returns: Cost Avoidance

- $1M Capital Savings for Hyperbaric Chamber for 3P
- $1-3M Endoscopy Suites now staying in current location
- $1.8M Breast Cancer mammography Suites 9200 sq to 5400 sq post 3P
- $6M Surgery Suites budgeted and planned – now not building
- New outpatient building

Target Progress Report

Team Name: Lean Leadership Team

Date: 4/30/04

Client: VMMC

Takt Time:

Product/Process Summary: 2003 34d-4th Q RPIW Target Sheet Rollup Team Leaders: G. Kaplan/M.Rona

Metric (units of measurement)	Baseline	Target	90-Day	Percent Change
Space (square feet)	11,541 sqft	5,770.5 sqft	6,323 sq ft	45.2%
Inventory	$1,957,186	$195,718.60	$971,661.50	50.4%
Staff Walking Distance (feet)	148,577 ft	74,288.5 ft	84,310 ft	43.3 %
Parts Travel Distance (feet)	17,876 ft	8,938 ft	2,517 ft	85.9%
Lead Time (minutes)	272,557’	136,278’	59,216’	78.3%
Work in Process (WIP) (units)	624,573	312,286	241,584	61.3%
Quality (defects) (%) (a)				20%
Productivity Gain (b)	83.4		57.2	31.4%
Environmental, Health & Safety (5S) (levels 1 thru 5)	5 units at 2 2 units at 3 5 units at 3 6 units at 4	All units at 4	3 units at 3 15 units at 4	
Set-up Reduction (minutes)	3,656’	1,828’	252’	93.1%

Remarks: Additional revenue gains:

$21,215 annually eliminated in nursing overtime costs / Chemo Delivery RPIW

$9,160 saved by reduced need for vendor services/Coding RPIW

Leapfrog

Leapfrog 2003 Survey Results

Leapfrog Standard	CPOE	ICU	Volumes						
			CABG	CABG Outcomes Rank	PCI	PCI Outcomes Rank	AAA	Esophagectomy	Pancreatic Resection
Virginia Mason	◕	●	●	**Above national average**	●	**Above national average**	●	●	●
Evergreen	◕	◑	n/a	n/a	◔	**Did not participate**	◔	n/a	◔
Northwest	◕	●	◕	**Above national average**	◑	**Did not participate**	◑	◔	◔
Overlake	◑	●	◕	**Did not participate**	◕	**Did not participate**	●	◔	◑
Swedish - 1st Hill	◑	●	◕	**Did not participate**	◕	**Did not participate**	●	◕	◑
Swedish - Prov	◑	◑	◑	**Did not participate**	◕	**Did not participate**	●	n/a	◕
UW	◕	●	◕	**Above national average**	◕	**Above national average**	◕	●	●
Valley Medical	◑	◑	n/a	n/a	n/a	n/a	◑	◔	◑

●	**~ Fully implemented Leapfrog's recommended safety practice**
◕	**~ Good progress in implementing Leapfrog's recommended safety practice**
◑	**~ Good early stage effort in implementing Leapfrog's recommended safety practice**
◔	**~ Willing to report publicly; did not yet meet Leapfrog's criteria for a good early stage effort**
N/A	**~ Not applicable (e.g., IPS standard does not apply because hospital does not have an ICU.)**

Performance of Virginia Mason

- Leapfrog
- Top 100 Hospitals - Solucient
- Healthgrades
- Economic
  - 2001 - $ 22,239,000
  - 2002 - $ 22,917,000
  - 2003 - $ 22,000,000
  - BBB+ to A-

To Change Medicine…..
Change Your Mind

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

- Patient First
- Waiting is Bad
- Defect-free Medicine
- Guaranteed Employment
- Explicit Training
- Rigorous Accountability
- No New Resources
- Reduce Waste
- Real-time Quality Assurance
- Management On Site
- We Have No Time

If you are dreaming about it…
You can do it.”

Chihiro Nakao