Using Production System Methods in Medical Practice: Improving Medical Costs and Outcomes

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Virginia Mason Medical Center

The Healthcare Imperative: Lowering Costs, Improving Outcomes
Roundtable on Evidence-Based Medicine
Institute of Medicine
July 2009
“People are Not Cars!”

Yet, everybody produces some “product” in medical care …

- Great access
- Great safety
- Great preventive care
- Great disease management
- Great patient experience
- Great jobs for team members
- Great margins
Work reveals mistakes (Patient Safety Alerts)

Manager stops line; immediate fix

Rapid Process Improvement team redesigns and mistake-proofs new standard work

Care teams follow standard work... PDSA as they go ...work is a continual experiment

Patient defines value

Executives fund kaizen pros to provide consistent rigor in analysis and redesign

Virginia Mason Production System
Three Big Defects Keep Us from Being Great

- Batching
- Mistakes
- Overproduction
Radical Redesign 2008

- Reduced supply costs ($1M) and space
- Reduced lab turnaround time 85%
- Reduced staff walking 60 miles per week
- Freed 25,000 square feet
- Saved $11M in capital

Virginia Mason Production System (VMPS)
Radical Redesign: No Waiting Room
### Radical Redesign: Incoming Phone Calls to 10 PCPs

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>2,772</td>
<td>1,973</td>
<td>1,530</td>
<td>1,576</td>
<td>-1,196 / week</td>
</tr>
<tr>
<td>Feb</td>
<td>2,718</td>
<td>1,989</td>
<td>1,617</td>
<td>1,642</td>
<td>-1,076 / week</td>
</tr>
<tr>
<td>Mar</td>
<td>2,847</td>
<td>1,620</td>
<td>1,644</td>
<td>1,612</td>
<td>-1,235 / week</td>
</tr>
<tr>
<td>Total</td>
<td>8,337</td>
<td>5,582</td>
<td>4,791</td>
<td>4,830</td>
<td>-3,507</td>
</tr>
</tbody>
</table>
Flow Production: Provider Standard Sequence at Flow Station

VMPS Concepts
- U-shaped cell
- Eliminate walking
- No batching
- Visual control
- Line of sight
- Side-by-side MD, MA
- External setup
- Water spider

Indirect Care: Batch Production abolished. Small lot production (1 to 3 phone messages per visit)
Radical Redesign
Results: Patient and Staff Satisfaction

Patients Are Satisfied

“Overall, I rate my level of satisfaction with my visit at Virginia Mason as”:

(%) excellent

Staff Are Satisfied

“Overall, I rate my level of satisfaction with my job at Virginia Mason as”:

(%) favorable
Unbatching: Kirkland Clinic Appointment and Mammography Access

70% of VM PCPs: Same day access

Same day screening

VM Kirkland Access Trend 2002 to 2006

Mammo Access FEB 06

Location: VM Kirkland (Family Practice/Internal Medicine)
Production System: Processes vs. Operations

Processes:
- Appointing
- Arrival
- Rooming
- Exam
- Discharge

Operations:
- Greet
- Patient ID
- Agenda
- Prev. Care
- Vitals
### Mistake-proofing Primary Care: Health Maintenance Module

#### Pending Expectations

**Present - April 2009**

<table>
<thead>
<tr>
<th>Expectation</th>
<th>Status</th>
<th>Satisfy Type</th>
<th>Administration Date</th>
<th>Satisfy Reason</th>
<th>Priority</th>
<th>Last Satisfied By</th>
<th>Approximate Due Date</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA Breast Cancer Screen High Risk (40-100yrs)</td>
<td>High Due</td>
<td>Manual</td>
<td>03/01/08</td>
<td></td>
<td></td>
<td>Ashley, Tiffany L</td>
<td>03/01/08</td>
<td></td>
</tr>
<tr>
<td>CV Lipids AT GOAL &lt;100 High Risk (18-100yrs)</td>
<td>High Refused</td>
<td>Manual</td>
<td>02/24/08</td>
<td></td>
<td></td>
<td>VMHC Downtown, Lab</td>
<td>02/25/08</td>
<td></td>
</tr>
<tr>
<td>CV Diabetes Monofilament Foot Exam (18-100yrs)</td>
<td>High Refused</td>
<td>Manual</td>
<td>01/17/08</td>
<td></td>
<td></td>
<td>VMHC Downtown, Lab</td>
<td>02/25/08</td>
<td></td>
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<tr>
<td>CA Cervical Cancer Screening (21-65yrs)</td>
<td>Overdue</td>
<td>Manual</td>
<td>06/07/08</td>
<td></td>
<td></td>
<td>CERNERFLAB</td>
<td>08/08/05</td>
<td></td>
</tr>
<tr>
<td>CV Diabetes Hba1c not at goal (10-100yrs)</td>
<td>Overdue</td>
<td>Manual</td>
<td>05/25/08</td>
<td>Pap Smear performed elsewhere</td>
<td></td>
<td>VMHC Downtown, Lab</td>
<td>02/25/08</td>
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</table>

#### Recently Satisfied Expectations

**July 2004 - Present**

<table>
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<tr>
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<th>Status</th>
<th>Satisfy Type</th>
<th>Administration Date</th>
<th>Satisfy Reason</th>
<th>Priority</th>
<th>Last Satisfied By</th>
<th>Approximate Due Date</th>
<th>Comments</th>
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<tr>
<td>CA Breast Cancer...</td>
<td>Satisfied</td>
<td>Manual</td>
<td>03/08/06</td>
<td></td>
<td>High</td>
<td>Ashley, Tiffany L</td>
<td>03/08/06</td>
<td>right sided mast...</td>
</tr>
<tr>
<td>CA Cervical Cancer...</td>
<td>Satisfied</td>
<td>Manual</td>
<td>09/02/08</td>
<td>Routine Screening</td>
<td>High</td>
<td>Peterson, Kev...</td>
<td>09/02/08</td>
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<tr>
<td>CV Diabetes Hba1c...</td>
<td>Satisfied</td>
<td>Result</td>
<td>02/25/08</td>
<td></td>
<td>High</td>
<td>VMHC Downtown, Lab</td>
<td>02/25/08</td>
<td></td>
</tr>
<tr>
<td>CV Diabetes Hba1c...</td>
<td>Satisfied</td>
<td>Result</td>
<td>02/26/07</td>
<td></td>
<td>High</td>
<td>VMHC Downtown, Lab</td>
<td>02/25/08</td>
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<td>08/05/06</td>
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</table>
Results: Kirkland % of High-risk Patients with LDL<130 and LDL<100
Boeing Intensive Outpatient Care Program

- 33% cost reduction
- Boeing’s “sickest” diabetics
- Patient-centered medical home model at Virginia Mason
- VMPS standard sequences: MA/RN/MD
- $25 pmpm support funded enhanced non-MD visit care/RN phone care
FP Margin 2003 to 2008
VM Kirkland: 4.3 FTE

-200,000 -100,000 0 100,000 200,000 300,000 400,000 500,000

-500,000 -400,000 -300,000 -200,000 -100,000 0 100,000 200,000 300,000 400,000 500,000

2003 2004 2005 2006 2007 2008

$301,696 $1,635 $113,692 $192,546 $425,377 $353,791

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Results: Net Margin Before Indirect Cost
Seattle General Internal Medicine and Kirkland General Internal Medicine and Family Practice

2005: ($716,391)
2006: ($332,983)
2007: $935,834
2008: $1,010,072

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Systematic kaizen
GI Services 2001 to 2008

- 12 RPIWs
- Net Margin Per Room +113%
- Net Margin Increase $5.6 Million
- Delayed Additional Procedure Room Until 2008 (Estimated Savings of $1 Million)
- GI Clinic Access Improved 50%
Results: Total Expense / Net Revenue

Primary Care Efficiency - 4 Year Trend

- Bellevue
- Federal Way
- Issaquah
- Kirkland
- Lynnwood
- Sandpoint
- Winslow

2004 2005 2006 2007 (YTD)
Systematic kaizen:

Emergency Department Divert Hours

Total 2007 Hours: 843.26
Total 2008 Hours: 696.97
2009 to Date Hours: 43.94
Using Production System Methods

Department-level Change: The Evidence

One-piece Flow
- Thyroid FNA accuracy increases, errors reduced
- Blood sample processing time decreases, 80% reporting of all tests within 1 hour sustained x 11 months

Standard Work
- Improved documentation of referral source, allergies and advanced directives
- Reduced MD documentation times
- Improved MD and MA satisfaction
- Improved BP control in Type II diabetics
- Sustained reduction of inpatient MRSA infections
Using Production System Methods

Transformational Change: The Evidence

New South Wales, Australia:

- Improved ER capacity
- Reduced hospital LOS
- Reduced ward outliers
- RN staff stabilization
- Level load ER’s
- Reduce procedural waiting lists
<table>
<thead>
<tr>
<th>Year</th>
<th>Improvements</th>
<th>Education</th>
<th>Activities</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>Point</td>
<td>Executives to Japan</td>
<td>395 Staff Involved 47 RPIWs 1 3Ps</td>
<td>18 Patient Safety Alerts</td>
</tr>
<tr>
<td>2003</td>
<td>Department</td>
<td>Certify Execs and Japan Training</td>
<td>833 Staff Involved 108 RPIWs 5 3Ps</td>
<td>125 Patient Safety Alerts 7 Staff in Single KPO Report Outs</td>
</tr>
<tr>
<td>2004</td>
<td>Cross-Dept.</td>
<td>Certify Directors</td>
<td>787 Staff Involved 110 RPIWs 4 3Ps</td>
<td>204 Patient Safety Alerts 7 Staff in Single KPO Comp-VMPS link</td>
</tr>
<tr>
<td>2005</td>
<td>Cross-Dept.</td>
<td>Kaizen Fellowship</td>
<td>573 Staff Involved 51 RPIWs</td>
<td>2,450 Patient Safety Alerts 22 Staff in 3 KPO Divisions Divisional Goals</td>
</tr>
<tr>
<td>2006</td>
<td>Collaboration w/ Outside Vendors</td>
<td>Manager Training</td>
<td>601 Staff Involved 44 RPIWs 1 3Ps 51 Kaizen Events</td>
<td>3,315 Patient Safety Alerts 22 Staff in 3 KPO Divisions Divisional Goals</td>
</tr>
<tr>
<td>2007</td>
<td>Model Line Work</td>
<td>Experiential Supv. Training</td>
<td>683 Staff Involved 46 RPIWs 5 3Ps 65 Kaizen Events</td>
<td>2,855 Safety Alerts 20 Staff in 3 KPO Divisions</td>
</tr>
<tr>
<td>2008</td>
<td>Large Integrated Value Streams</td>
<td>Dedicated Education Team</td>
<td>820 Staff Involved* 53 RPIWs 4 3Ps 64 Kaizen Events</td>
<td>2,710 Patient Safety Alerts 31 Staff in 4 KPO Divisions Central KPO and VM Inst.</td>
</tr>
</tbody>
</table>

*Final Data Not Yet Available, Projected
Approach to Estimating Cost Impact

VMPS has led to:

- 10% reduction in PCP cost/RVU in 2 years.
- Disease screening rates above those cited by Health Partners in IOM 5/09 report.
- Chronic disease management metrics that enable savings estimated by Dr. Pignone’s presentation to IOM 5/09. ($45B)
- Patient safety improvements that reduce costs
- Radical redesign of care processes for common conditions enable savings estimated in Dr. Kaplan’s IOM presentation 5/09. ($1.253B in imaging and $5.1B in visits yearly.)
Key Assumptions

- There is enough money in the system.
- Much of money is tied up in waste.
- Fee for service reimbursement enables some of the waste: visit-dependent reimbursement, redundant documentation, etc.
- Production system methods can reduce provider costs while improving safety and satisfaction, enabling national savings.