



Lean Thinking and Healthcare

Earl M. Murman

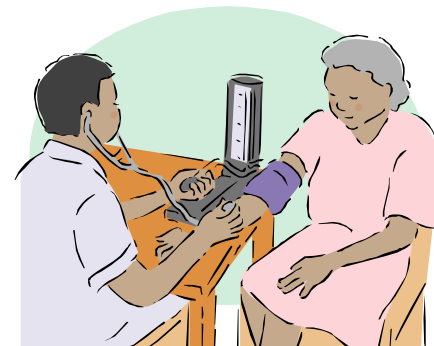
March 29, 2012

Simpósio Lean Enterprise & Lean Healthcare
UNICAMP, Campinas, Brazil

Lean Thinking in a Nutshell

“Lean Thinking is not about influencing the content of those moments when patients and staff are in contact. It is about giving more time for those moments, making them easier to perform and less prone to error, by simplifying sequences, making what has to be done more transparent, removing re-duplicative and unnecessary steps, and making hard to perform steps easier to get right.”

David I Ben-Tovim, et al, “Lean thinking across a hospital; redesigning care at the Flinders Medical Center”, Australian Health Rev, Feb 2007, Vol 31, No 1, pp10-15



Essence of Lean Thinking:

- Work to understand what your *customers value*
- *Remove waste* to reduce lead time and improve first time quality
 - Make problems visible
 - Break down functional silos
 - Eliminate root causes of problems
 - Standardize work processes
- Create a culture of *Continuous Improvement*
 - Own the process
- Make *data driven decisions*
 - Use easily understandable metrics
 - Track results



What Lean Does Not Do...

- **Eliminate jobs** – it eliminates unproductive activities and redeploys people on productive ones
- **Force people to work harder** – it creates sustainable standard work that is safe and less fatiguing
- **Just speed up the pace of work** – it eliminates waste and paces output to meet demand
- **Just apply to manufacturing processes** – it applies to all process involving patients, materials, services
- **Focus on disconnected improvement activities** – it is a systems way of thinking about every process, every person, and every patient

Lean Thinking Fundamentals

- Specify **value** – from the standpoint of the end customer (the patient)
- Identify the **value stream** – all value-added steps across departmental boundaries (the **value stream**), eliminating steps that do not create value
- Make value **flow** continuously – eliminate causes of delay, such as batches and quality problems
- Let customers **pull** value – avoid pushing work onto the next process or department; let work and supplies be pulled as needed
- Pursue **perfection** – through continuous process improvement

Value Added and Non Value Added

Value Added Activity

- Transforms or shapes material, information or people
- And it's done right the first time
- And the customer wants it

Emphasize

Non-Value Added Activity – Necessary Waste

- No value is created, but cannot be eliminated based on current technology, policy, or thinking
- Examples: project coordination, regulatory, company mandate, law

Minimize

Non-Value Added Activity - Pure Waste

- Consumes resources, but creates no value in the eyes of the customer
- Examples: idle/wait time, inventory, rework, excess checkoffs

Eliminate

Identify the *Value Stream*

- All the actions required to transform a good or service from an initial state to a outcome desired by the customer
 - Actions include: problem solving, physical transformation, information management
- Something “flows” in a value stream, e.g. in healthcare:

- Patient value streams



- Meds and materials value streams



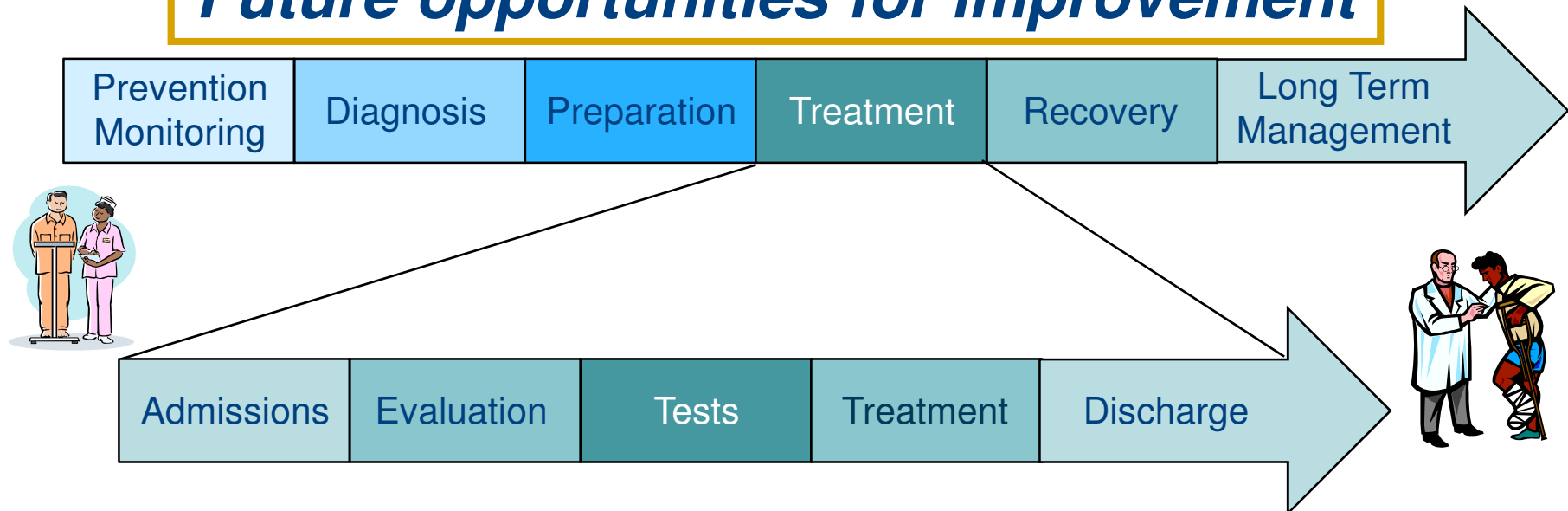
- Information (records) value streams



Patient Value Stream

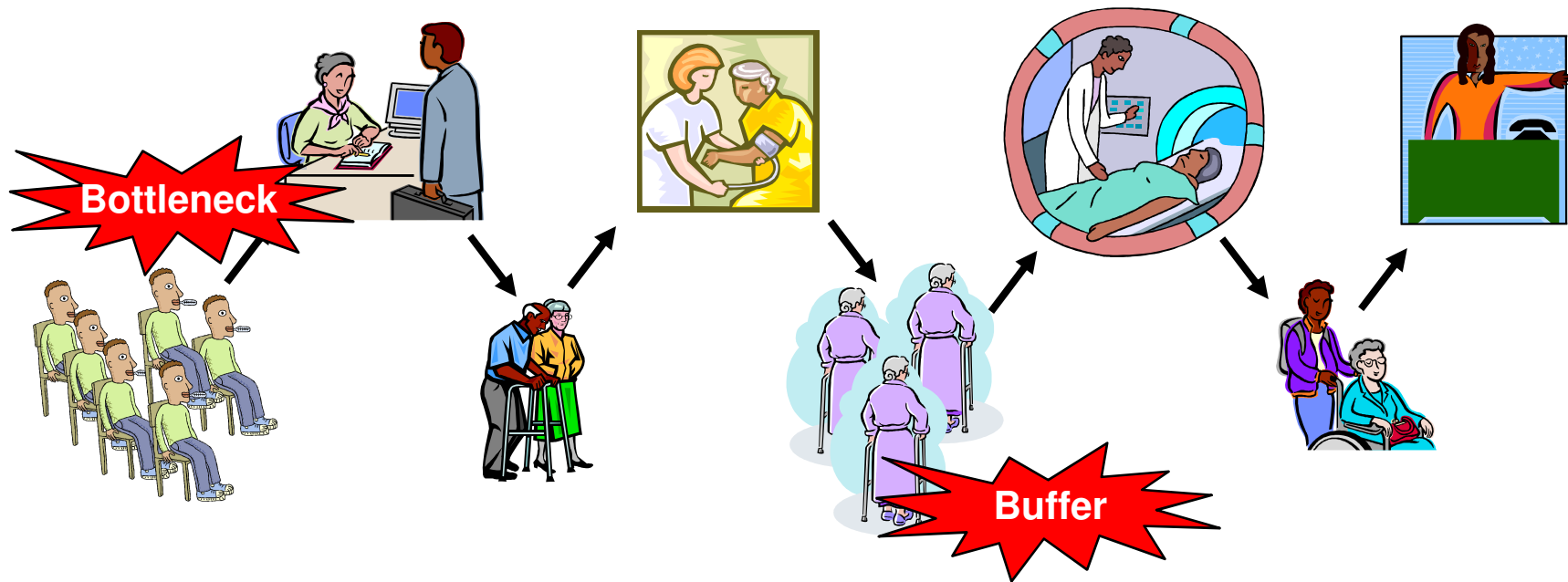
For a given medical condition, the patient value stream has many actions and is fragmented among numerous care givers

Future opportunities for improvement



The focus of most current lean applications

Make Value *Flow*



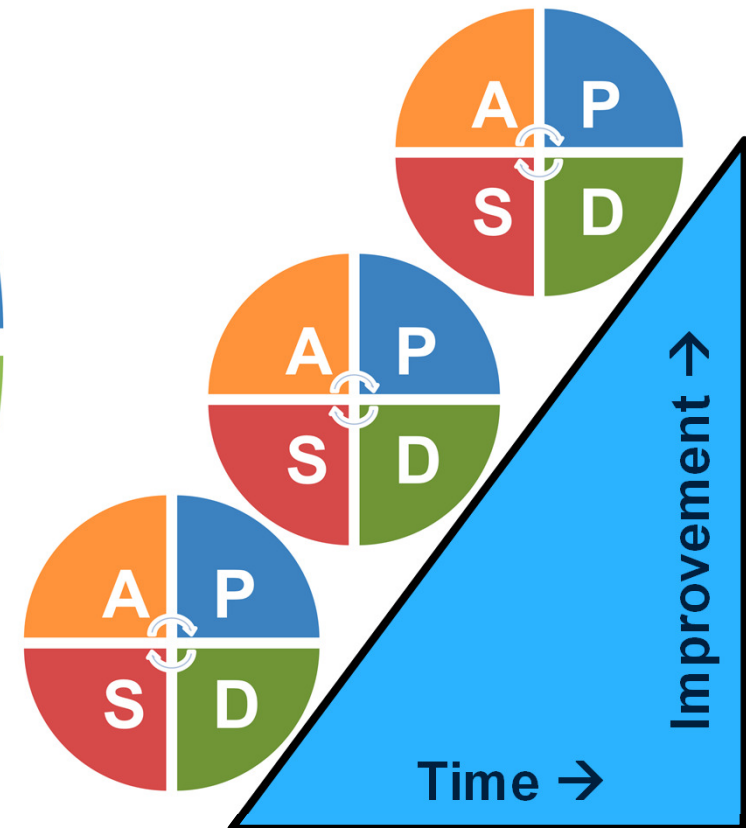
Creating flow:

- Focus on what is flowing through the process
- Eliminate bottlenecks, minimize buffers

Let Customers *Pull* Value

- In a **Push** system, each activity delivers its output when it is done
 - Results in build up of batches with lots of inventory; defective goods pile up
- In a **Pull** system every activity delivers its output just as the next activity needs its input
 - Triggered by the end customer
 - Results in smooth flow with no batches or voids
 - Minimizes inventory and rework due to defects
- **Pull** systems can be implemented in material flow using a Kanban approach
- Implementation for people flow can be challenging

Pursue *Perfection*



Lean is not a set of tools. It is a continuous improvement mindset using multiple PDCA cycles.

Lean Produces Results in Healthcare

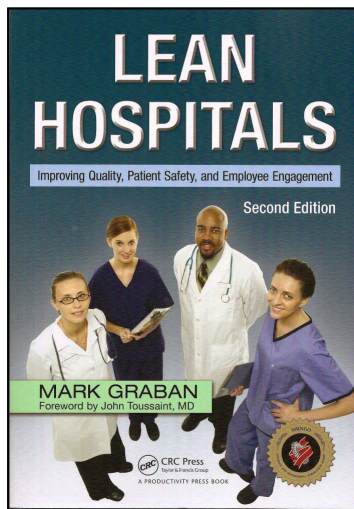
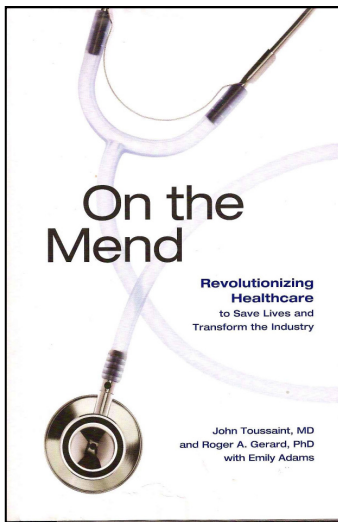
A few of many examples

Waiting time for orthopedic surgery reduced from 14 weeks to 31 hours (from first call to surgery) – *ThedaCare, WI*

48% readmission rate reduction for COPD patients - *UPMC St. Margaret Hospital, PA*

\$180M capital spending cost avoidance from lean improvements – *Children's Hospital, WA*

72% reduction in lab results turnaround time from 2004-2010 without addition of head count or instrumentation – *Alegent Health, NE*



Andon Systems Helped Toyota Prevent Mistakes



Employee has found a part that doesn't fit right.



The employee pulls on the line-stop cord overhead.

LINE STOPPED!



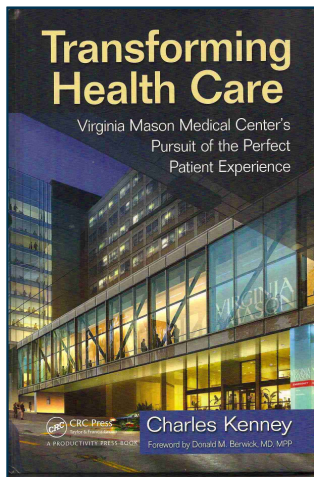
Team leader sees the lamp and comes to help.



The team leader discovers a ring that has slipped out of place. Problem is solved before the production line reaches the next fixed position. The line continues moving.

Virginia Mason Medical Center Patient Safety Alert™ System

- Inspired by Toyota “stop-the-line” andon system
- Implemented in 2002
- Every one of VMMC’s 5000 employees can “stop the line” whenever patient safety is threatened
- 15,000 Patient Safety Alerts, 2002 – 2010
- Data collected led to root cause analysis prevention of future incidents



From Toyota

4th International Conference on Production Research (Tokyo) , 1977

PRE-PRINT 3.12

Toyota production system and Kanban system

—materialization of just-in-time and
respect-for-human system

Y. SUGIMORI, K. KUSUNOKI, F. CHO and S. UCHIKAWA
Production Control Department, Toyota Motor Co., Ltd., Japan.

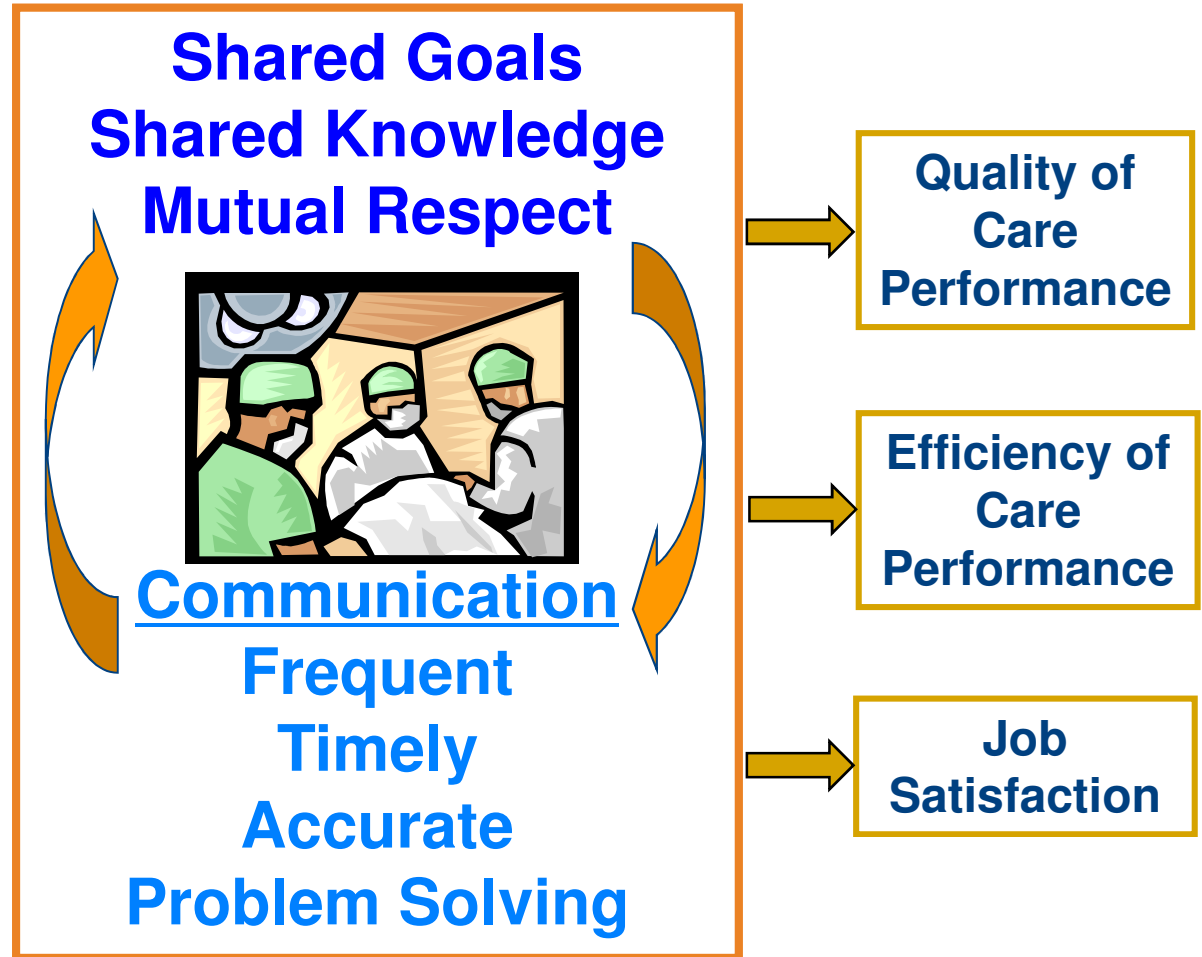
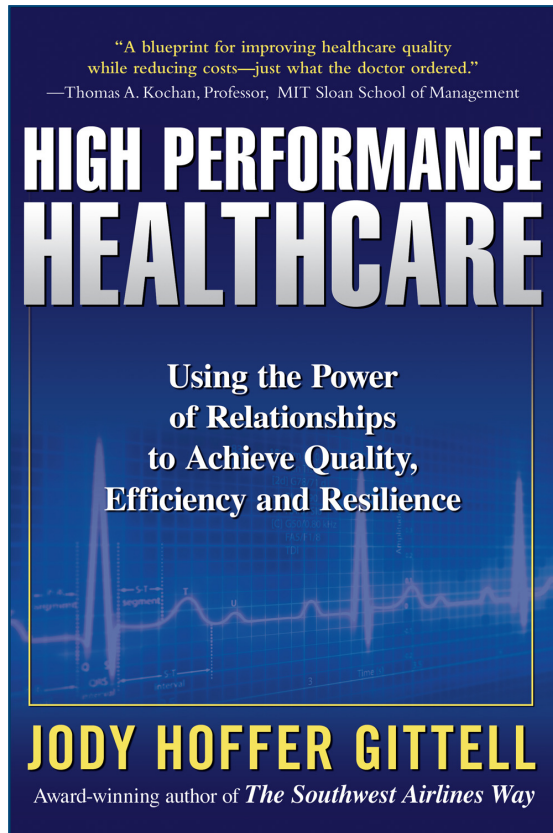
The 'Toyota Production System' and 'Kanban System' introduced in this paper was developed by the Vice-President of Toyota Motor Company, Mr. Taiichi Ohno, and it was under his guidance that these unique production systems have become deeply rooted in Toyota Motor Company in the past 20 years. There are two major distinctive features in these systems. One of these is the 'just-in-time production', a specially important factor in an assembly industry such as automotive manufacturing. In this type of production, 'only the necessary products, at the necessary time, in necessary quantity' are manufactured, and in addition, the stock on hand is held down to a minimum. Secondly the System is the respect-for-human system where the workers are allowed to display in full their capabilities through active participation in running and improving their own workshops.

“There are two major distinctive features of these [Toyota Production and Kanban] systems.

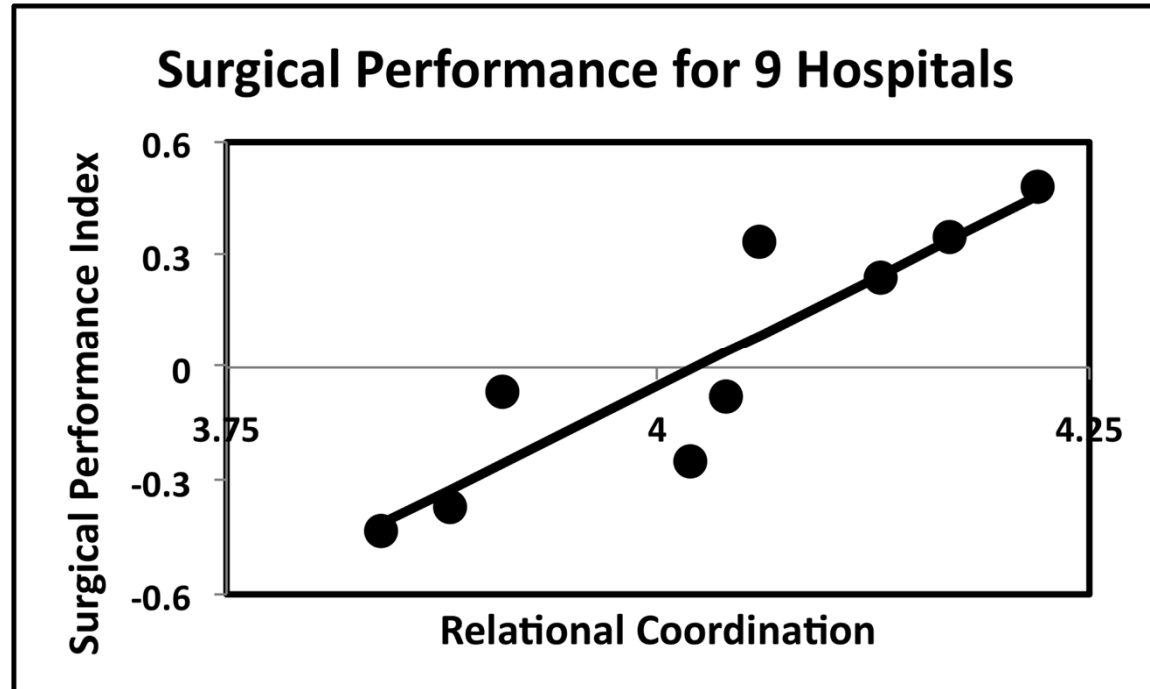
One of these is ‘just-in-time production’, an especially important factor in an assembly industry such as automotive manufacturing....

Second...is the ‘**respect-for-human**’ system where the workers are allowed to display in full their capabilities through active participation in running and improving their own workshops”

Relational Coordination Improves Quality, Efficiency, Job Satisfaction



Surgical Performance



- **Study for joint replacement surgery in 9 non-profit hospitals in Boston, NYC, Dallas**
- **Surgical performance measured by**
 - **Quality - post operative patient satisfaction, joint pain, mobility**
 - **Efficiency - days in acute care**

Lean Healthcare Enterprises

To achieve its full potential, lean needs to be implemented at the enterprise level

“A lean enterprise is an integrated entity that efficiently creates value for its multiple stakeholders by employing lean principles and practices.”

Murman et al., *Lean Enterprise Value*, Palgrave, 2002

**Value Expected
from the
Enterprise**



**Value
Contributed to
the Enterprise**

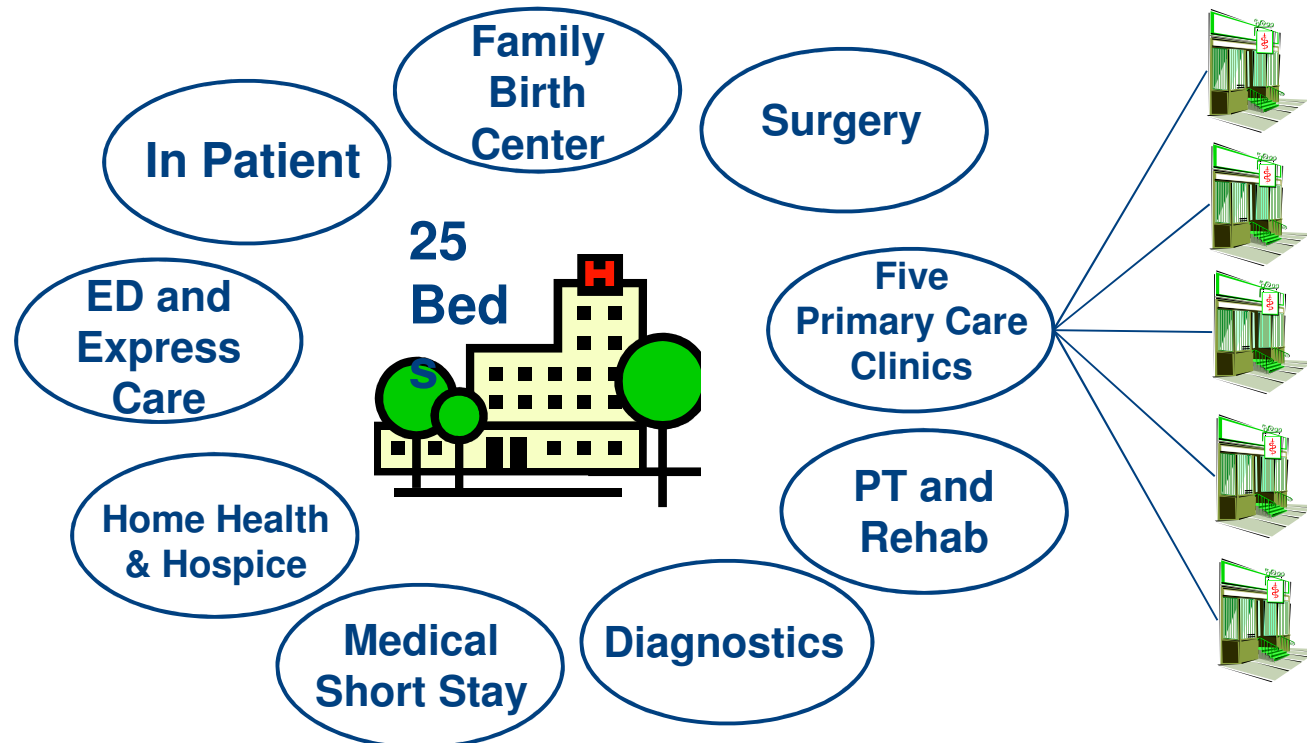
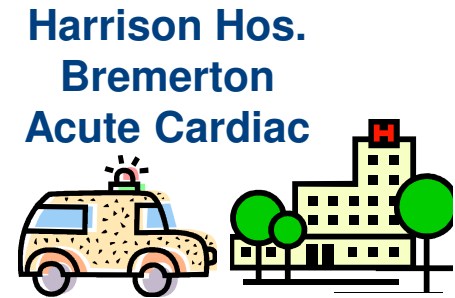
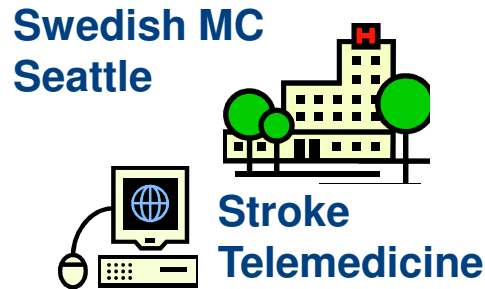
Rural Healthcare Case Study



Jefferson County, WA – Population 29,872 (2010 Census)



Jefferson Healthcare Enterprise



Annual budget about \$45M

JHC Drivers for Lean

Grow activity and contain costs while achieving:

Purpose – To assure appropriate healthcare services are available to support the health of all people of Eastern Jefferson County

Values – Jefferson Healthcare is:

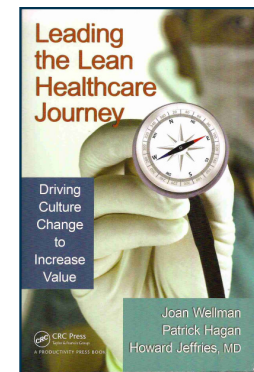
- Intentionally Patient Centered
- Committed to the highest possible quality healthcare for all
- An employer that recognizes the quality of its employees and helps them to reach their potential
- Committed to a health community that encourages individual responsibility
- A prudent steward of healthcare resources

Mission – Jefferson Healthcare ... excellence with compassion and innovation

Source: <http://207.56.191.254/web/AboutJeffersonHealthcare/PurposeValuesMission/tabid/89/Default.aspx>

JHC Lean History

- **Early 2000 – As one of 20 rural hospitals affiliated with Virginia Mason in Seattle, JHC CEO was aware of lean**
- **Exploratory: 2003 – 2006**
 - **Four staff attended Lean training – brought tools home**
 - **Conducted RPIW for patient registration**
 - **Difficult implementation but good results (45 → 5 min)**
 - **Island of success – no traction across JHC**
- **Enterprise commitment: 2006 – present**
 - **CEO and other directors received 1 week training**
 - **Strategic decision to make Lean the JHC Performance Improvement system**
 - **Contracted with Joan Wellman & Associates**
 - **Formed Lean Resource office**
 - **Budgeted \$1M annually for lean implementation**
 - **~ 200 improvement opportunities identified**



JHC Lean Events

Primary tools employed are 5S, RPIW, VSMA



2007
7 events

2008
30 events

2009
30 events

Examples: OP Clinic VS, ED VS, AMI RPIW, Stroke RPIW, Laundry RPIW, Safety Office 5S, Pt discharge

Rapid Process Improvement Workshop (RPIW)

- Focused on a specific improvement opportunity
- Chartered by a sponsor who gives improvement goals and organizational constraints, and provides resources
- Lean coaches & facilitators provided
- Event is up to a week in duration
- Several months preplanning
- Involves all important stakeholders
- Data driven process
- Ends with implementation
- Implemented outcomes measured

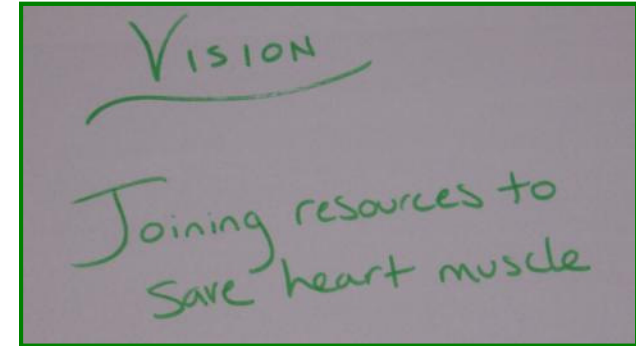


Photo by Earl Murman

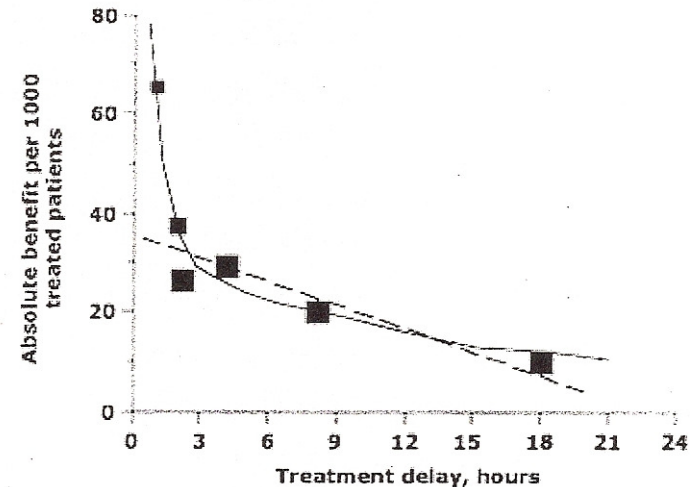
JHC AMI RPIW – Apr 2009

Improvement in a week instead of months or years!

Acute Myocardial Infarction RPIW

- Time is critical for treating major heart attacks.
 - Greatest loss of heart muscle is in first 2 hours
- Recommended treatment is catheter insertion of balloon within 90 min of “presentation”
- Alternate treatment “clot busting” thrombolytic drug

Time to thrombolysis and 35-day mortality

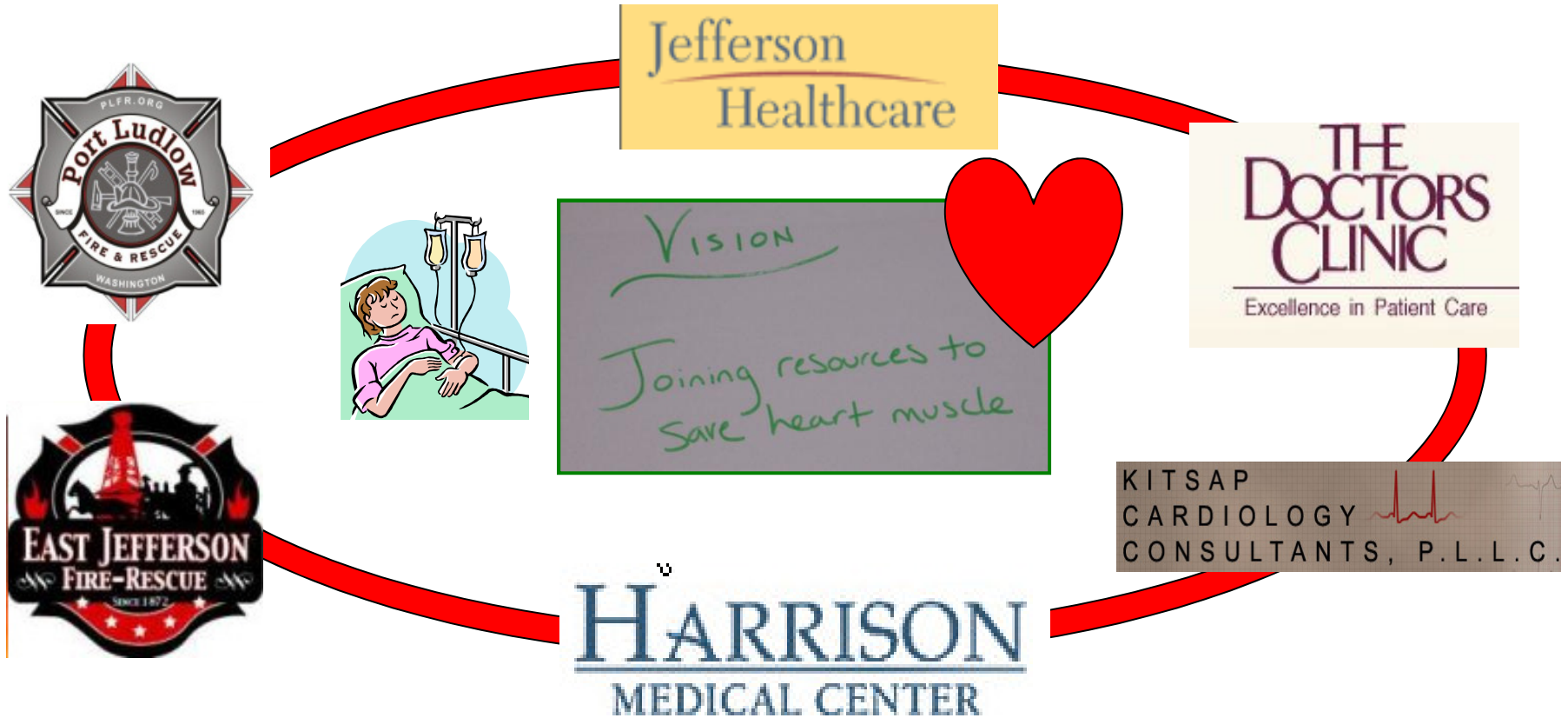


Situation

- Closest Cat Lab is in Bremerton – minimum 55 min drive time
- No clear boundary for when patients go to Bremerton or when they require thrombolytics at JHC
- Average “as is” treatment or process time at JHC is 165 min

RPIW Targets – Reduce Lead Times for AMI response

Pt Value Stream Intersects Multiple Organizations



Common process required for 6 different organizations

Images from STEMI RPIW



Ground Rules

- ① Begin & End on time
- ② No idea is bad
Keep an open mind
- ③ Understand we are different entities & figure out how to work them out
- ④ Everyone should participate
- ⑤ Keep an eye on goal
Better for Pt
- ⑥ Leave ego's behind
- ⑦ Realize it is possible

TO DO

- Checklist
- Call
- Transfer
- Reliable
- ...

DONE

- One call
- ...

TASK LIST

- ...

PARKING

- ...

STEMI Protocol Algorithm

BEFORE 165 min

AFTER 20 or 60 min

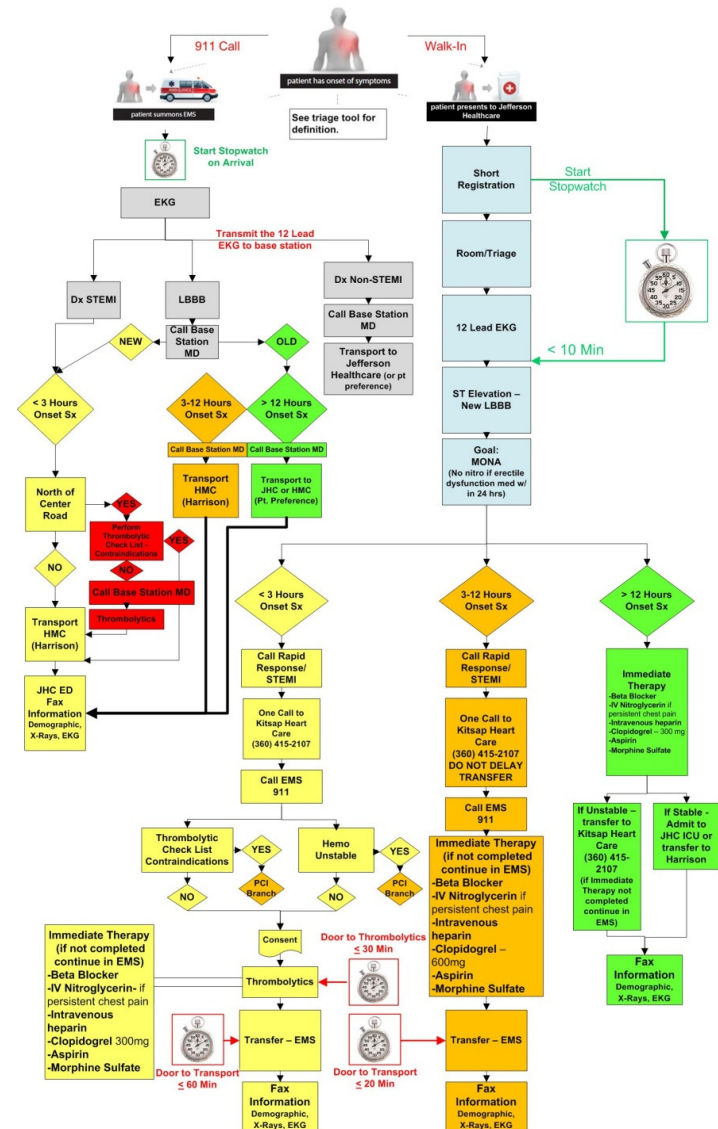
Roles: ED RN, Lean Fellow, Cardiologist, CNO, ED MD, House Coordinator, Process Owner

Future State AMI Algorithm

- Key to RPIW was the focus on Pt and Pt value stream
- Six different organizations working collaboratively to provide the best care possible given constraints
- Clear geographic boundaries delineate treatment pathway based on time-to-treatment constraints
- Process time measured by stopwatch strapped to Pt
- Medics certified to administer thrombolytic drugs in EMS van

The “hospital” is where the patient is.

STEMI Protocol Algorithm



Article published Jun 28, 2009

This 'will save lives': East Jefferson gains ability to use 'clot buster' drugs

By Erik Hidle
Peninsula Daily News

PORT TOWNSEND -- An 88-year-old man suffering a heart attack was the first to benefit from new protocols for paramedics in East Jefferson County.

The fire department, Jefferson Healthcare hospital, Port Ludlow Fire & Rescue, Harrison Medical Center, Kitsap Cardiology and the Poulsbo Doctors Clinic have created the protocols that allow paramedics to administer a host of drugs, including "clot busters" -- which can destroy a blood clot blocking blood and oxygen to the heart -- and provide immediate treatment during heart attacks.

The kits issued to paramedics beginning June 1 include blood thinners such as heparin, intravenous nitroglycerin and thrombolytics -- or clot busters -- that can lessen the long-term damage from a heart attack.

On Friday, East Pomeroy, assist Rescue.

EJFR saves two with STEMI

East Jefferson Fire Rescue (EJFR) firefighter/paramedics and EMTs recently used leading ST-elevation myocardial infarction (STEMI) technology to save the lives of two local residents in two days.

At 5:44 a.m. on Thursday, March 18, EJFR received a mutual-aid request from the Discovery Bay fire station, which was responding to a structure fire in the 1400 block of Dabob Road in Quilcene.

While firefighters worked to contain the fire in the five-stall garage, the property owner suffered a heart attack. The fire chief of Discovery Bay, who is also a

paramedic with EJFR, successfully treated the 85-year-old woman with the clot-busting drug tenecteplase before transferring her to Harrison Medical Center in Bremerton, where she is reportedly doing well.

STEMI medication is administered over five seconds in a single dose, offering physicians and medical professionals the fastest administration of a clot-busting drug to date in the treatment of heart attack.

The STEMI procedure also proved critical for a Port Townsend resident the following day.

Just after midnight on March 19, an

84-year-old male on Jackman Street in Port Townsend suffered a heart attack. EJFR paramedics responded and again delivered the STEMI life-saving drug before airlifting the patient to Harrison Medical Center.

He is also reportedly doing well.

After reviewing the related documents on the two patients, EJFR Chief Gordon Pomeroy and medical personnel from Jefferson Healthcare agreed that the STEMI process saved these two patients' lives in the field.

According to Pomeroy, paramedics in East Jefferson County have been administering these important medications since last June.

Value Stream Event for JHC Outpatient Clinics

- **Situation**
 - Five legacy outpatient clinics
 - Few standard processes
 - Little coordination between clinics and with other parts of JHC
 - Patients per day per doctor under national norms
 - Poor flow and facility layout
- **Primary Event Focus:**
 - Identify standard patient flow for clinic encounters; improve patient access and provider productivity

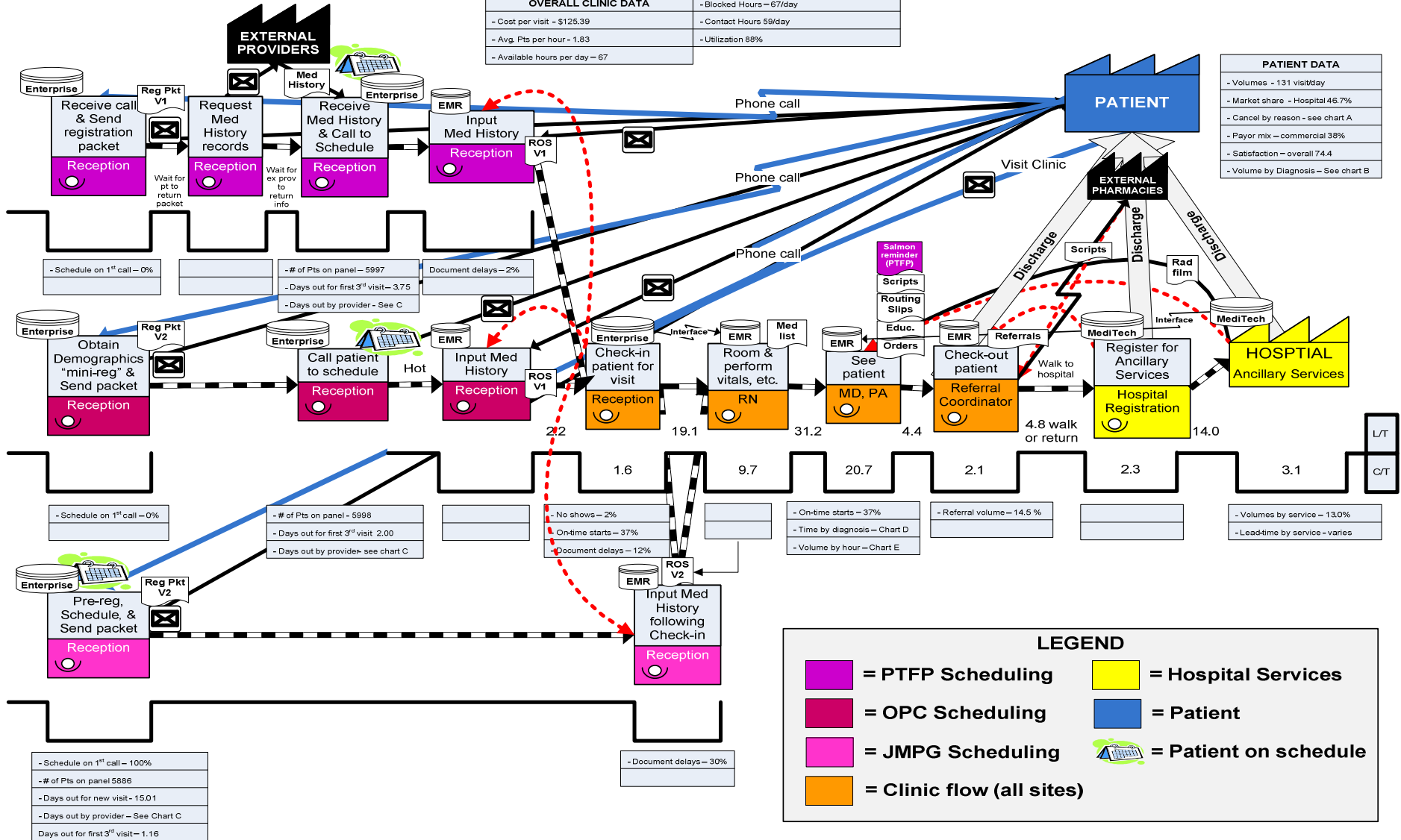


Photos by EarlI Murman

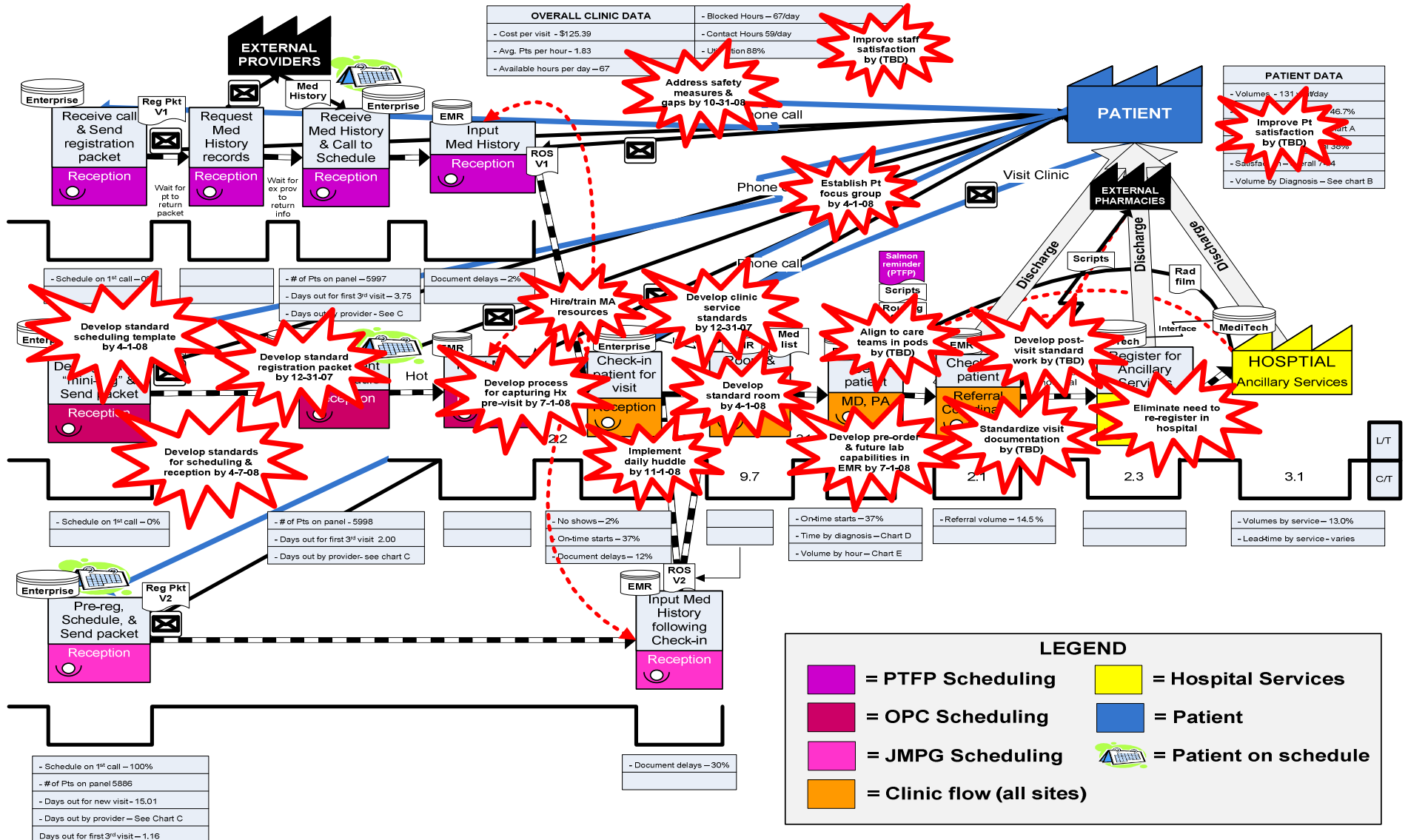
Jefferson Healthcare Clinic - Current State Map

OVERALL CLINIC DATA	
- Cost per visit - \$125.39	- Blocked Hours - 67/day
- Avg. Pts per hour - 1.83	- Contact Hours 59/day
- Available hours per day - 67	- Utilization 88%

PATIENT DATA	
- Volumes - 131 visit/day	
- Market share - Hospital 46.7%	
- Cancel by reason - see chart A	
- Payor mix - commercial 38%	
- Satisfaction - overall 74.4	
- Volume by Diagnosis - See chart B	

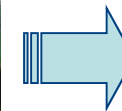
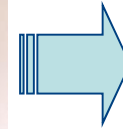


Jefferson Healthcare Clinic – Future State Focus (2008)



Standard Rooms and Central Supplies

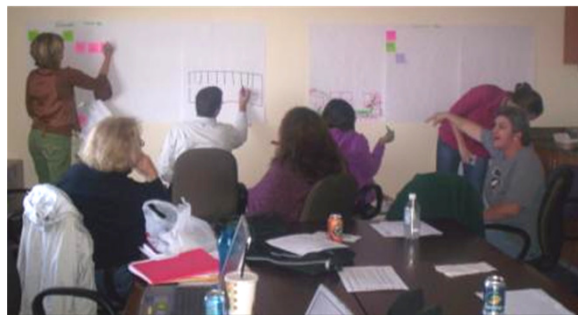
**5S Events in
each Clinic**



Lean Events Targeting Each Step in the Clinic Value Stream

Standard Work
creates a
foundation to
build on

FIW Dec 2007
FIW Mar 2008
FIW Mar 2009



RPI Jun 2008
RPI Mar 2009



RPI Sep 2008



FIW = Focused Improvement Workshop

Daily Management System

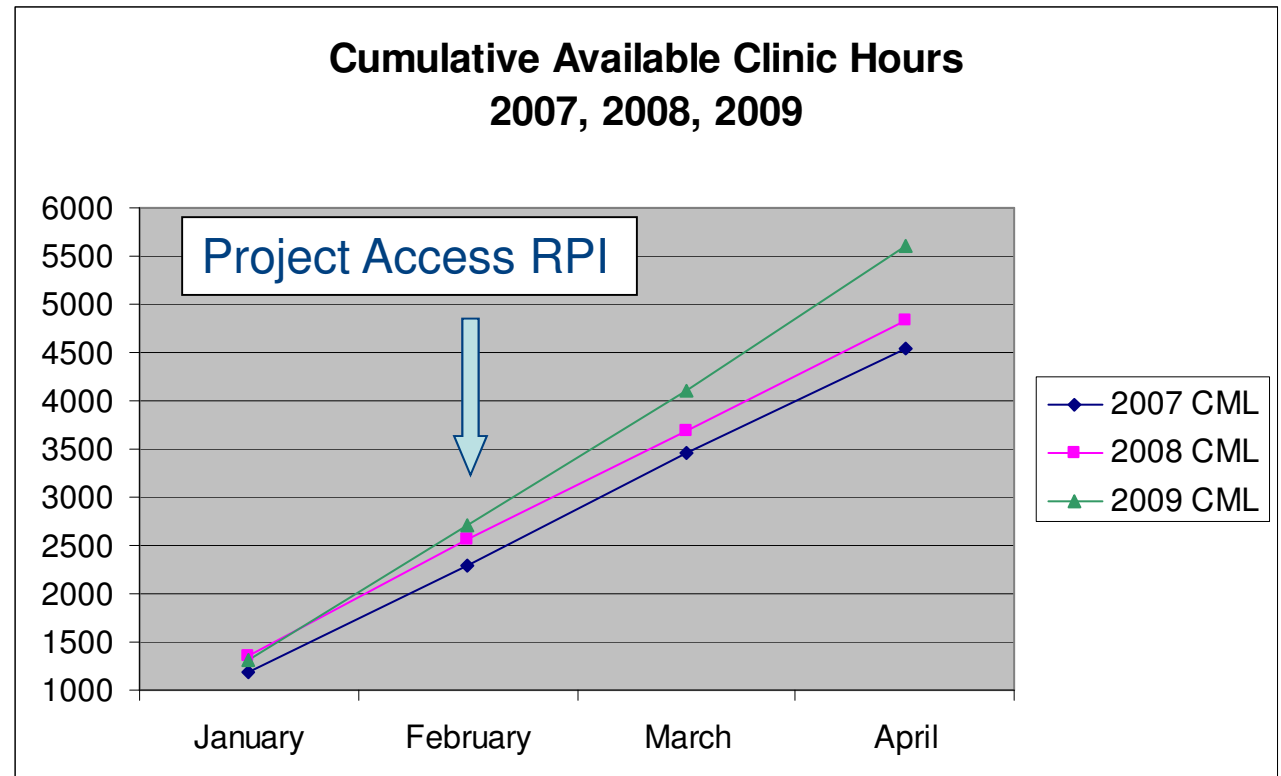
Implement daily huddle

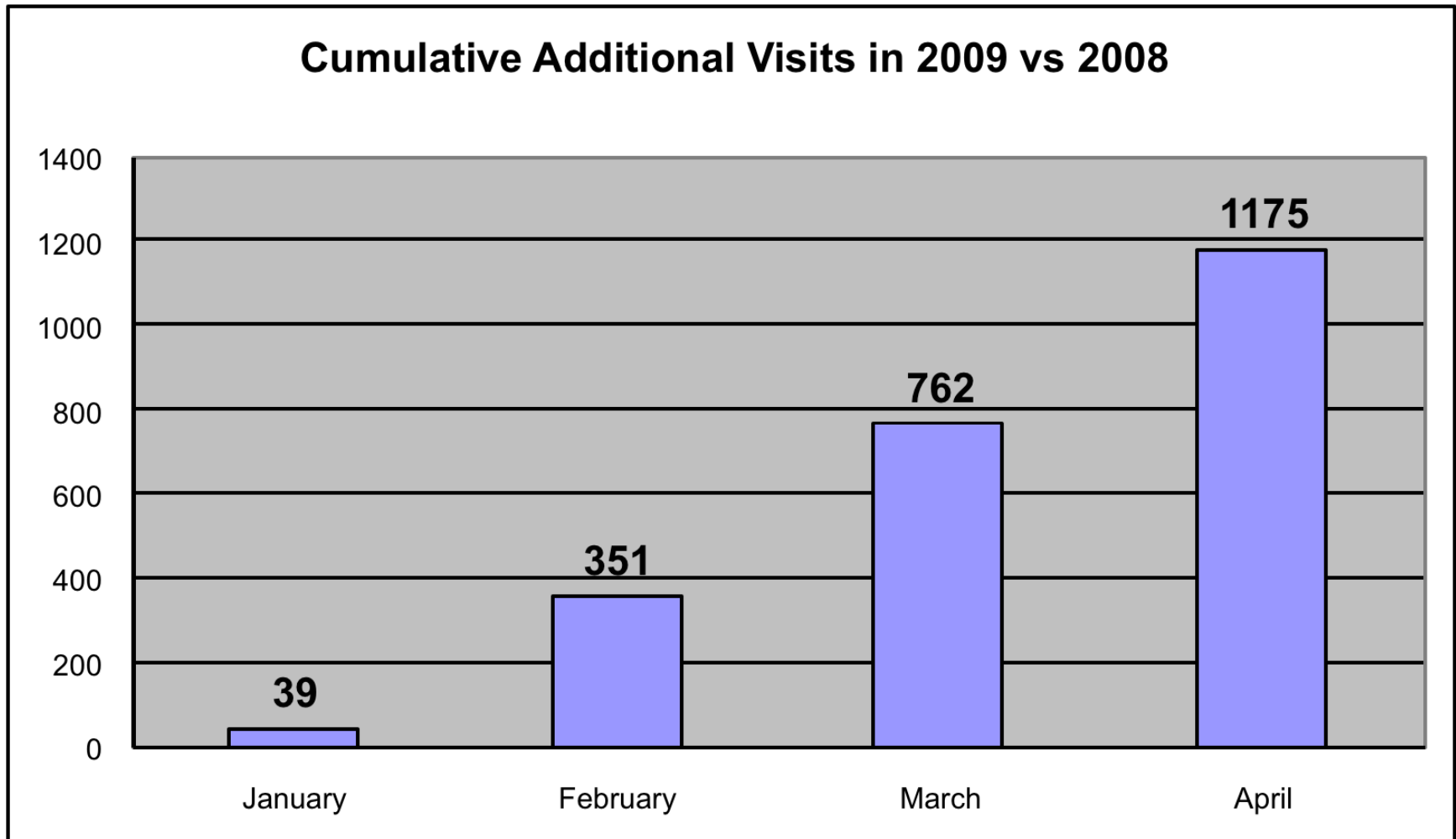


Project Access RPI

(Feb 2009):

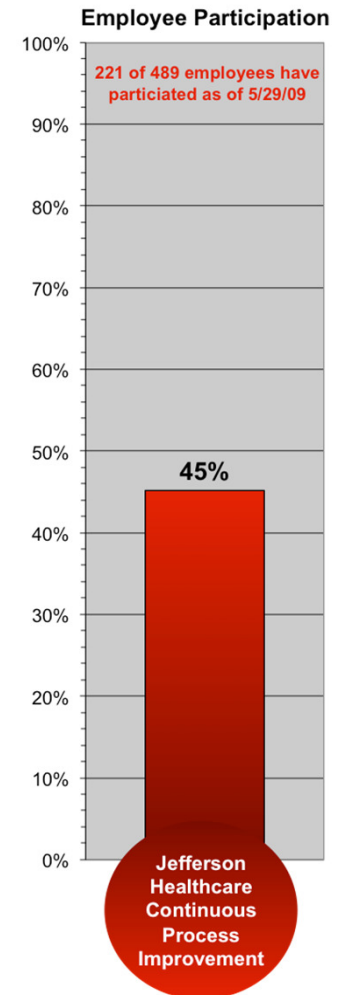
- Reorganized Medical Staff Structure
- Consolidate Provider meetings reducing meeting hours.
- Revise scheduling guidelines (20 min vs. 40 min vs. 60 min)
- Create schedule management strategies using daily huddle





JHC Accomplishments

- **Laundry RPIW was early success**
 - Saved laundry from being outsourced
 - Stabilized staff at 3 FTE from 4 FTE budgeted
 - Customer satisfaction went from 70% to 100%
- **Most MDs “get it”, are on board, and are driving process improvement**
 - Launching the Clinic VS was a tipping point
 - OR daily “on time start” went from 14% to 96%
- **Culture beginning to change**
- **Community now has excellent stroke and acute cardiac care response for rural hospital**
- **45% employee participation in at least one event**



Source: Jefferson Healthcare

Success Factors

- CEO leadership, commitment, engagement
- Enterprise-wide process improvement method
- Commitment of resources
 - Engaging consultant on long-term contract
 - Lean Resource office
 - Tiger teams from IT, EVS, facilities, materials mgmt support rapid change during RPIWs
- Getting MDs involved and on board
 - Active participants in process improvement
- No layoffs for productivity improvements

“The lesson learned by the MDs from the clinical value stream RPI was that lean focuses on what to do to make them, the patients, and the staff happy.” Vic Dirksen, CEO

Challenges and Opportunities

- **“Lean fatigue” – 30 events per year for 489 employees and 4 lean resource office staff is at capacity of organizational rate of change**
- **Changing culture opens opportunities for bottom-up implementation**
 - **Transferring Care at Bedside is an example**
 - **Making everyone a problem solver all the time**
- **“Biggest gains still to come”**

“Lean is an effective way for me to make systemic, not charismatic, change in process improvement at Jefferson Healthcare.” Vic Dirksen, CEO

Lean Is A Journey – Not An End State

- **Manufacturing and service examples**
 - **Toyota 1950s – now**
 - **Nucor Steel 1972 – now**
 - **Southwest Airlines 1985 – now**
 - **Rockwell Collins 1995 – now**
- **Healthcare examples**
 - **Virginia Mason Medical Center 2001 – now**
 - **ThedaCare 2002 – now**
 - **Park Nicollet Health Services 2003 – now**
 - **Jefferson Healthcare 2006 – now**

Take Aways

- **Lean Thinking provides a holistic framework for improving healthcare quality, cost and access**
- **Fundamental principles of lean thinking are: *value, value streams, flow, pull, perfection***
- ***Respect for People* is the other pillar of lean**
- **Lean is a way of thinking, not a set of tools**
- **“Early adopters” have demonstrated significant outcomes**
- **Lean is a “journey” not a “state”**

Additional Resources

<http://lean.mit.edu/products/lai-lean-healthcare-class.html>

The screenshot shows the LAI EdNet website interface. At the top left is the LAI logo with the tagline 'ENABLING ENTERPRISE EXCELLENCE'. At the top right is the EdNet logo with the tagline 'EDUCATE MOTIVATE INNOVATE'. Below the logos is a navigation menu with items: Home, About LAI, News, Events, Research, Products, EdNet (selected), Communities, Downloads, Contact Us, Search, and Sitemap. The main content area is titled 'Lean Healthcare Curriculum' under the 'EDNET > PRODUCTS >' breadcrumb. It includes a 'Video Modules' section with a description of Dr. Eric Dickson, a list of speakers (Eric Dickson, MD and Mark Graban), and a 'LAI SPOTLIGHT' section on the right with sub-sections for 'NEW LAI MEMBER BENEFITS', 'EDNET EVENTS', and 'EDNET NEWS'. A 'MEMBER LOGIN' section is visible on the left sidebar.

**Three day LAI Lean Academy course coming
summer 2012 on MIT's Open Courseware**

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Acknowledgements

- **Many slides are taken from the LAI Lean Academy v7.6 course which will be available on MIT's Open Courseware <http://ocw.mit.edu/> in summer 2012.**
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- **Paula Dowdle – Jefferson Healthcare**
- **John Nowak – Jefferson Healthcare**
- **Matt Ready – Jefferson Healthcare**