Lean Thinking and Healthcare
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“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.”

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 redeployes 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

**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

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

Pursue *Perfection*
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

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

2. The employee pulls on the line-stop cord overhead. LINE STOPPED!

3. Team leader sees the lamp and comes to help.

4. 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.

Source: http://www.toyota.co.jp
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

Ref: C Kenny, Transforming Health Care
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

Shared Goals
Shared Knowledge
Mutual Respect

Communication
Frequent
Timely
Accurate
Problem Solving

Quality of Care Performance
Efficiency of Care Performance
Job Satisfaction

Ref: Gittell, *High Performance Healthcare*
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

Ref: Gittell, *High Performance Healthcare*
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
Rural Healthcare Case Study

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

Photo by Earll Murman

Source: Google
Jefferson Healthcare Enterprise

Seattle Hospitals Medivac

Swedish MC
Seattle

Harrison Hos.
Bremerton
Acute Cardiac

Drive to

East Jefferson
Fire & Rescue

Port Ludlow
Fire & Rescue

Seattle Hospitals
Medivac

Stroke
Telemedicine

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

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

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

2007
7 events

2008
30 events

2009
30 events
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

Improvement in a week instead of months or years!
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

- 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
Pt Value Stream Intersects Multiple Organizations

Common process required for 6 different organizations
Before 165 min

Ed RN
Lean Fellow

Planning training

CNO
Cardiologist

Writing new protocols

House Coordinator
Lean Fellow

Process Owner
ED MD

After 20 or 60 min

Beep

Photos by Earl Murman

Images from STEMI RPIW
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.
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 Poulso 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 Jefferson Fire Rescue, assisted by Port Ludlow Fire & 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 Earl Murman

OVERALL CLINIC DATA
- Beds per visit: 15
- Bed hours: 25/40
- Occupied bed hours: 11.6
- Occupied bed days: 3.4
- Available hours per day: 8

Patient DATA
- Volume of visits: 10,435
- Compliance with procedures: 95%
- Patient satisfaction: 90%
- Length of stay: 2.5 days

LEGEND
- PTPF Scheduling
- Hospital Services
- OPC Scheduling
- Patient
- JMPG Scheduling
- Patient on schedule
- Clinic flow (all sites)

Source: Jefferson Healthcare, Port Townsend, WA
Standard Rooms and Central Supplies

5S Events in each Clinic

Source: Jefferson Healthcare
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

Source: Jefferson Healthcare
Daily Management System

Implement daily huddle

Photos by Earll Murman
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

Source: Jefferson Healthcare
Results

Cumulative Additional Visits in 2009 vs 2008

- January: 39
- February: 351
- March: 762
- April: 1175

Source: Jefferson Healthcare
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
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”
Three day LAI Lean Academy course coming summer 2012 on MIT’s Open Courseware
Selected References: Healthcare Improvement

Anon, *Crossing the Quality Chasm: A New Health System for the 21st Century*, Committee on Quality of Health Care in America, Institute of Medicine, 2001

Kohn, Linda T., Corrigan, James M. and Donaldson Molla S., Editors, *To Err is Human: Building a Safer Healthcare System*, Committee on Quality of Health Care in America, Institute of Medicine, 2000


Selected References: Lean Thinking Basics


Selected References: Lean Healthcare Implementation

Bahri, Sami, *Follow the Learner*, Lean Enterprise Institute, 2009


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