Improving Flow and Patient Throughput: Value Stream Mapping

David M. Paushter, M.D., FACR
Disclosures

David M. Paushter, M.D. is a member of an external advisory panel for AIM Specialty Health

This association has no relationship to this presentation
Lean Glossary

- **Muda**: Procreator with Fada
- **Kanban**: Outlawing of trash receptacles
- **Gemba**: The sound a sheep makes after eating your engagement ring
- **Gembutsu**: Jeweler’s martial arts
- **Baka-yoke**: Souffle step
- **Poka-yoke**: Testing the egg for donenessness
- **Takt Time**: The pause needed to avoid insulting someone
- **Heijunka**: Hoarder’s pile
- **Concrete Head**: Self-explanatory
Lean Applications to Healthcare: The Role of Value Stream Mapping

Lean Healthcare System

Patients and Families First

"Just In Time"
Right service in the right amount at the right time in the right place
Eliminate batches
Rapid Changeover

Level Load the Work

Standard Work

"Built In Quality"
Make problems visible
Never let a defect pass along to the next step
Error Proof
Stop when there is a quality problem

Continuous Flow: Pull vs. Push

5S and Visual Control

Value Stream Improvement Through Waste Reduction

The Foundation!
Value

*Value is the product or service we ultimately provide to our customers.*

- Defined by the Customer
- All activity is divided in two categories:
  - Value-add (Would the customer be willing to pay?)
  - or Non value-add (vast majority in unimproved state)
- Lean uses a strict definition of value
Value-Add Criteria

Value-add activities meet all three criteria!

- Customer is willing to pay for it
- Done right the 1st time
- Directly transforms
What is Waste?

Anything the customer does not perceive as value

- Defects
- Overproduction
- Waiting
- Neglect of Human Talent
- Transportation
- Inventory
- Motion
- Excess Processing

D.O.W.N.T.I.M.E.
The continuous delivery of value, without interruption.

Current: [Diagram]

Ideal: [Diagram] ← Flow!

Future: [Diagram]

Key terms:
- Just in time = pull
- Heijunka = level demand

Ask why 5 Times
The 7 Flows

- Flow of patients
- Flow of clinicians
- Flow of medications
- Flow of supplies
- Flow of equipment
- Flow of information
- Flow of process

*Everything Flows Continuously!*
Flow of Clinicians/Caregivers

Lack of Flow = Waste
Flow = Waste Reduction
Patient Flow
Value Stream

The set of all activities (value and waste) required to provide product or service for the customer.

Steps in identifying a Value Stream:
1. Identify the Customer
2. Define “the Value”
3. Observe the work yourself
4. Include your partners

Value Streams know no Departmental boundaries!
Solutions know no Departmental boundaries!
Value Stream Mapping

- Follow a “product” or “service” from beginning to end, and draw a visual representation of every process in the material & information flow
- Then, draw (using icons) a “future state” map of how value should flow
- The maps are not the point, only a tool to visualize flow and waste
- The process typically occurs during a Kaizen
  - Employee led continuous improvement
Value Stream Mapping

- Helps you visualize more than the single process level
- Links the material and information flows
- Provides a common language
- Provides a blueprint for implementation
- More useful than quantitative tools
- Ties together lean concepts and techniques
Using the Value Stream Mapping Tool

Product/Service “Family”

current state drawing

future state drawing

plan and implementation

Understanding how things currently operate (Baseline)

Designing a lean flow (Vision)

The Goal of Mapping

Process
Inventory
Production Control
Supplier and Customer
 Lean Value Stream Concepts

1. Strive to restructure the organization around the Value Streams
2. Always understand and operate to your actual demand
3. Develop and plan for continuous flow wherever possible
4. Reduce changeover or turnover time as much as possible
5. Continuously strive for single-piece flow by progressively moving to smaller batches of work
6. Where continuous flow cannot exist, develop and use supermarket pull systems and visual signaling where possible to control flow
7. Establish process measures
8. Provide continuous improvement leadership
Current State Mapping

- Typically completed in a day
- Performed by a cross functional team representing all facets of the process
- Responsible for implementing new ideas
- Often involves direct observation “on the floor” (Gemba)
- Results in a physical picture (and team observations) of what we “see” when following the product
Gemba Walk: Asking the Right Questions

**Cycle Time**
1. How long does the work take you?

**Defect %**
2. Is the work you get correct/accurate? How often?

**Batch**
3. How many do you normally work on, treat, pickup at one time?

**Inventory**
4. How many patients, trays, carts, instruments...etc are waiting for you to do when you get to work?

**Other questions**
5. Any issues or suggestions?

6. How do you know what work to do and what do you do with it after you are finished?

7. How do you know if you’ve finished the process on time, early or late?
Value Stream Map

- Patient Placement
  - Suppliers
    - Patients
    - Supplies
  - Admit
    - Data
    - Data
    - Data
  - Diagnose
    - Data
    - Data
    - Data
  - Treat
    - Data
    - Data
    - Data
  - Discharge
    - Data
    - Data
    - Data
  - Pharmacy
    - incomplete orders
  - Customers
    - Patients
    - Referring MD’s

- waiting for bed
- no ride home!

Cycle time:
- Admit: 10 min.
- Diagnose: 30 min.
- Treat: 60 min.
- Discharge: 10 min.

Wait time:
- Admit: 75 min.
- Diagnose: 90 min.
- Treat: 120 min.
- Discharge: 10 min.

Total: 395 min.

Customer Demand:
- Admit
- Treat
- Discharge

110 min.
285 min.
Total: 395 min.
Mapping Color Code Guideline

- Bright Yellow (Information Flow)
- Pink/Bright Pink (Problem Bursts)
- Yellow/Beige (Patient/Material Flow)
- Purple (Inventory)
- Light/Dark Blue (Process Data)
Future State Mapping

• Completed in a day with the same team
• Focused on:
  – Creating a flexible, reactive system that quickly adapts to changing customer needs
  – Eliminating waste
  – Creating flow
  – Producing on demand
Planning and Implementing

- *Don’t Wait!*
- You need a plan!
  - Tie it to your business objectives
  - Make a VS Plan: What to do by when
  - Apply CQI techniques: PDSA
  - Establish an appropriate review frequency
  - Conduct VS Reviews walking the flow
Critical Success Factors

- Management must understand, embrace, and lead the organization into lean thinking to challenge the status quo.
- Lean and VSM must fit well with an organization’s strategic plan.
- Value stream managers must be empowered and enabled to manage implementations.
- All involved share information, risk, reward together.
- Improvements must be planned in detail with the cross functional Kaizen teams with no blame or shame.
- Successes must be translated to the bottom line and/or market share.
Planning IR Services for the New Hospital: The Role of Value Stream Mapping

- Historically three departments have provided interventional services
  - Radiology
  - Cardiology
  - Vascular Surgery
- There has been no significant sharing of
  - Resources including personnel, space and equipment
  - Expertise
- There has been joint planning or purchasing
- Physicians cordial but not highly collaborative
Administration’s Goal

- With the planning of a new hospital facility with a coherent procedural floor, efficiency became a priority
  - Equipment, space, personnel
- This configuration required interaction of historically separate teams
  - Facility design
  - Patient flow
  - Shared resources: people and materials flow
  - Shared information
How do you Solve a Thorny Issue?

Hold a Kaizen!

• 3P = Production, Preparation, Process
• An event-driven process for developing a new “product” concurrently with the operation (process) that will produce it, by the people who will interact with it
• Advantages
  – Collaboration
  – Structured process
  – Marries process and product development
  – Rapid learning, try-storming (simulation)
• Goals
  – The right features
  – The right price point
  – The lowest production cost
  – The highest customer satisfaction
### Reason for Action:

New Hospital Pavilion operational process is needed to support the 7 flows of the patient care process.

Need for overall 5th floor operational process while leveraging the existing facility and process designs.

### Event Scope:

5th Floor NHP

### Deliverables:

Operationalize the processes housed on the 5th floor of the NHP

### Future State:

Processes that facilitate flow

Clear vision on the impact to flow

No construction change orders

No impact to IDPH approved design

### Alignment with Objectives:

<table>
<thead>
<tr>
<th>People</th>
<th>Safety</th>
<th>Quality</th>
<th>Service</th>
<th>Finance</th>
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### Kaizen Participants:

<table>
<thead>
<tr>
<th>Full time:</th>
<th>Dept. / Role</th>
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<tbody>
<tr>
<td>Monica Geyer</td>
<td>IR/Radiology</td>
</tr>
<tr>
<td>Raynette Pucik-Maisura</td>
<td>Radiology</td>
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<tr>
<td>Stewart Thomas</td>
<td>IR</td>
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<tr>
<td>Dr. Seon-Kyu Lee</td>
<td>Neuro IR</td>
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<td>Dr. Brian Funaki</td>
<td>Radiology</td>
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<td>Dr. David Paushter</td>
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<tr>
<td>Kelli Hodges</td>
<td>GI</td>
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<td>Mark Mitchell</td>
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<td>Dr. Ira Hanan</td>
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<tr>
<td>Marilu Andrade</td>
<td>CERT</td>
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<td>Dr. Allan Klock</td>
<td>Anesthesia</td>
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<tr>
<td>Dr. Ori Gottlieb</td>
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<td>Nada Williamson</td>
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<tbody>
<tr>
<td>Sheri Pautlitz</td>
<td>DCAM Ops</td>
</tr>
<tr>
<td>Jean Blake</td>
<td>NHP Operations</td>
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<tr>
<td>Elizabeth Lockwood</td>
<td>NHP Project Office</td>
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<tr>
<td>Susan Ourada</td>
<td>Program Director</td>
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<tr>
<td>Krista Svach</td>
<td>Dept of Medicine</td>
</tr>
<tr>
<td>Dr. Gautham Reddy</td>
<td>GI</td>
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<tr>
<td>Dr. Douglas Hogarth</td>
<td>Pulmonary</td>
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<tr>
<td>Jason Keeler</td>
<td>Clin &amp; Proc Services</td>
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### Logistics Information:

Mon 1 - 4:00; Tue - Thu 8:00 - 4:00; Fri 8:00 - 12:00

Location: Billings, Room P-118
## Kaizen Road Map - Interventional

### Interventional Radiology

| Jake Sordelet | 55868 |
| Adrienne Mitchell | 42462 |

<table>
<thead>
<tr>
<th>Event</th>
<th>Lean Methodology</th>
<th>Start</th>
<th>End</th>
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<tr>
<td>5th Floor NHP Process Design</td>
<td>3P</td>
<td><strong>12/12/2011</strong></td>
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<td>Standardize Prep/Recovery Rooms</td>
<td>5S/Standard Work</td>
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<td>Standardize Supply/Equipment Rooms</td>
<td>5S/Standard Work</td>
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<td>Standardize Procedure Rooms</td>
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<td>Add-on/Change Order Precert Impact</td>
<td>Standard Work</td>
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<td>Inpatient Bed Scheduling</td>
<td>Transactional Process Improvement</td>
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<td>Radiant Build</td>
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<tr>
<td>Patient Transportation</td>
<td>Standard Work</td>
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<td>TBD</td>
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<td>Anesthesia Scheduling</td>
<td>Transactional Process Improvement</td>
<td>TBD</td>
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<td>Patient/Referring Provider Education</td>
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<td>Incorrect/Incomplete Orders &amp; Labs</td>
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<td>Wayfinding Visual Management</td>
<td>Just Do It</td>
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IR/Radiology - Value Stream Map Kaizen

Start Date: 14-Nov-11

Reason for Action:

Need a clear understanding of the current state of the IR and Radiology value streams

Need a future state design for IR and Radiology in the New Hospital Pavilion

Need a roadmap of incremental improvement events that facilitate flow

Event Scope:

Value Stream Maps IR and Radiology

Deliverables:

Current State Maps IR and Radiology
Kaizen Event Roadmap for IR and Radiology value streams

Future State:

Improvements to facilitate flow
Clear vision on the impact to flow
Design and implementation of future state in NHP and other zones

Current State:

No Current State Value Stream Map
Excessive process waste
Lack of process flow

Alignment with Objectives:

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<tr>
<td>Elizabeth Lockwood</td>
<td>NHP Project Office</td>
<td>Pete Nanos</td>
<td>CBIS</td>
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<tr>
<td>Earl Wilson</td>
<td>GP Imaging Team Leader</td>
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<tr>
<td>Andre Williams</td>
<td>CT Imaging Team Leader</td>
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<tr>
<td>Rosalie Hughes</td>
<td>Manager, Patient Access</td>
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<tr>
<td>Raynette Pucik-Maisura</td>
<td>Radiology Nurse Manager</td>
<td></td>
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<tr>
<td>Stewart Thomas</td>
<td>IR Manager</td>
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<tr>
<td>Brian Tymkiw</td>
<td>MRI Manager</td>
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<tr>
<td>Monica Geyer</td>
<td>Director, Radiology</td>
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<tr>
<td>Dr. Rakesh Navuluri</td>
<td>MD</td>
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<tr>
<td>Dr. Seon-Kyu Lee</td>
<td>MD</td>
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<tr>
<td>Ian O'Malley</td>
<td>Sourcing</td>
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<tr>
<td>Pennie Stivan</td>
<td>Ultrasound Manager</td>
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Kaizen Leadership:

PROCESS OWNER: Monica Geyer
OE FACILITATOR: Jake Sordelet/Adrienne Mitchell

Logistics Information:

Mon 1 - 4:00; Tue - Thu 8:00 - 4:00; Fri 8:00 - 12:00

Location: Mon. & Tues, American School, Room 428; Wed & Thurs, AS-420; Fri AS-428
Process Narratives – Inpatient Flow

Highlights:

• Transportation Communication Board

• Bypass inpatient holding (when possible)

• EVS/Patient Transportation station on floor

5th floor IVHP - Inpatient flow
• Patient is picked up by transportation from inpatient unit in IVHP or Mitchell hospital. Patient is transported via east or west inpatient elevators based on procedure type.

• After offloading from the elevator, transportation personnel verifies destination (prep, radiology, patient holding area, or direct to procedure area) via status board.

• Patient is prepped (see outpatient flow for additional details)

• Procedure is completed

• After procedure is completed and patient is recovered, transportation is notified.

• Transportation retrieves patient from recovery or holding and returns patient to inpatient floor.

Note: If the patient is an ICU patient or coming from the ED, additional medical personnel may be required for transport (from sending area, destination or both).
Highlights:
- Communication Boards
- Pagers
- Signals
- Greeter/Host
Process Narratives – Family Flow

Highlights:

• Communication Boards

• Pagers

• Maximum 2 family members per patient

• Greeter/Host
Process Narratives – Materials Flow

Highlights:
• Delivered off shift
• No pallets
• Standardized sourcing
• Kanban “pull” system

Ordering
• The ordering process will be managed via Kanban “pull” system.
• Each unit will work with supply chain to establish par levels.

Delivery
• Supplies will be delivered to the main receiving dock and unboxed in designated breakfast area.
• Supply chain staff will deliver supplies to procedure floor via clean materials elevator on a clean cart.
• Supply chain staff will deliver supplies to all designated supply rooms.
• Supply chain staff will replace Kanban cards if also rotate stock.
• Order/delivery of specialty items will remain the responsibility of the departments. Note: Supply chain may review/revise this process at a future date.

Note: Stocking procedure rooms and Prep/Recovery rooms will be the responsibility of the floor staff.
# Final Design – Suggested Improvements

<table>
<thead>
<tr>
<th>Theme</th>
<th>Improvement</th>
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<tbody>
<tr>
<td><strong>Staff Flows</strong></td>
<td>• New location for IR reading &amp; control room</td>
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<tr>
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<td>• Anesthesia coverage strategy</td>
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<td></td>
<td>• Medication flow</td>
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<td></td>
<td>• Optimal placement of Cardiac Catheterization Lab/Neuro IR</td>
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<td></td>
<td>• Additional post-procedure consult room</td>
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<td></td>
<td>• Supplies at prep/recovery bedside</td>
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<td></td>
<td>• Supplies at procedure room are in close proximity</td>
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<tr>
<td><strong>Patient Flows</strong></td>
<td>• Repurposed file room for EVS/Patient Transport operation</td>
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<td></td>
<td>• Status boards near BOH elevators for inpatient transport</td>
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<tr>
<td><strong>Staff &amp; Patient Flows</strong></td>
<td>• Prep/Recovery</td>
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<td>• Layout design</td>
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<td>• Prep/Recovery rooming strategy</td>
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<td>• Command center concept</td>
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<td>• Command center management</td>
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<td></td>
<td>• Recommended location to place Neuro IR near MRI</td>
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<td>• Designed communication boards for 5th floor</td>
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<td><strong>Staff Experience</strong></td>
<td>• Location determined for east charge nurse(s)</td>
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<td>• Designed location for staff break room</td>
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<td><strong>Improved Communications</strong></td>
<td>• Leveraging technology</td>
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<td>• Patient and clinician status</td>
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<td></td>
<td>• Signal to increase readiness</td>
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Dr. Klock/Dr. Paushter
Recommendation Summary: Floor

• Include safety mirrors at all major intersections
• Add department specific status boards to identified locations
• Convert CD file burning room into EVS/trans. station and family consult room
• Add supply carts to all prep/recovery rooms
• Remove phones from all prep/recovery rooms
• Remove TVs from prep/recovery rooms
• Add thermometers to prep/recovery rooms
• Add strategically placed house phones
• 5th floor staffed satellite pharmacy
Final Floor Design

Located:
- Status Boards
- Safety Mirrors
- House Phones
The Real Issues

• Forced marriage of multiple constituents
  – Physicians, nurses, technologists, schedulers, supply chain, transport, EVS, etc.
  – Disparate needs and operating models
• Sharing of resources requires cooperation, and a “common good” to serve the customer
• The VSM process has been successful, based upon teamwork, compromise and best practice/design
• The Value Stream Map remains fluid, allowing parties to continually come together to work on redesign and waste reduction
Interventional Services: Compromises Made

- **Services**
  - Movement to common status boards/communication tools, scheduling, ancillary support
  - One pool of prep/recovery nurses to be cross-trained and shared
  - Prep/recovery space to be shared
  - Redesign significantly reduced office space

- **Administration**
  - Services retain their own nursing and technical support (for now)
  - Original design for significant shared space and equipment modified to include only one “swing room” outfitted for all services
• Top Leadership must make the improvements a priority by holding local leadership & staff accountable for Action Plan completion
• Process Improvement is our means for achieving the future-state vision
• VSM provides a common language that helps everyone visualize the future vision
• VSM links material, patient and information flows to overall process lead-time
• The VSM Action Plan provides a blueprint for future state implementation
• VSM answers the question about process improvement priorities
• We must manage change effectively to foster a healthy work environment