RPIW Participant Fieldbook

Guide to the Rapid Process Improvement Workshop

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Table of Contents:

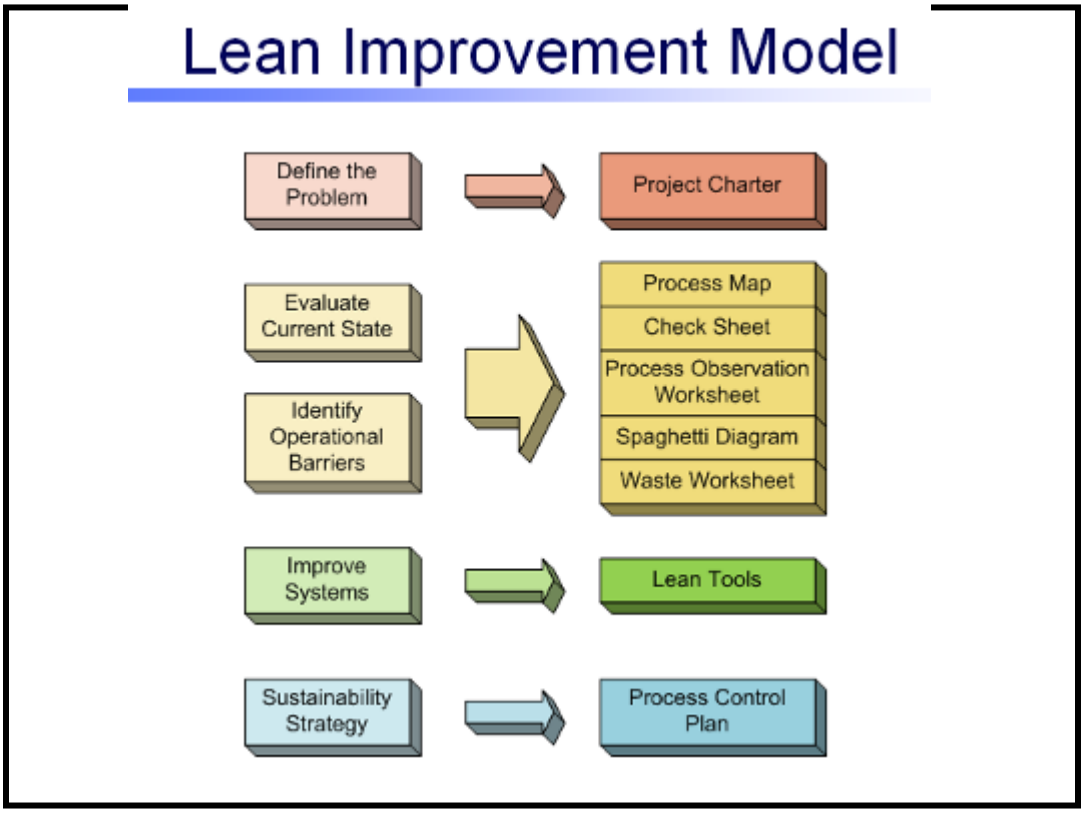
Introduction to 'Lean' Improvement

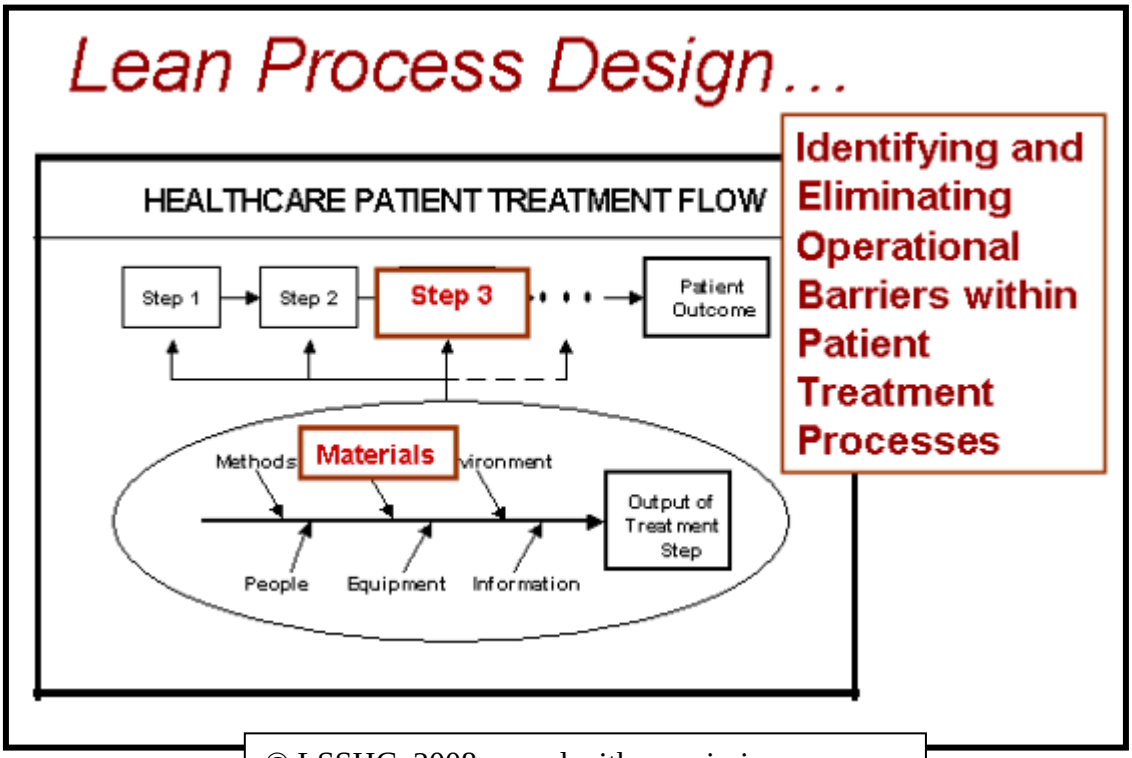
Lean is a systematic approach to improving the reliability of processes through the identification and elimination of operational barriers and sources of variability within a process or system.

Lean is derived from methodologies developed in the Japanese automotive manufacturing industry. It has been successfully adapted in healthcare industries in such systems as Virginia Mason Medical Center (http://www.entnet.org/Practice/upload/GoingLeaninHealthCareWhitePaper.pdf). The methodologies and tools presented within this field guide have been adapted specifically for use within the Healthcare industry.

Within healthcare processes, *Lean* involves an in-depth examination of the clinical and operational processes from the perspective of the patient or staff member. This analysis is limited in scope to the process under investigation and may include qualitative and quantitative assessments of work processes.

Lean tools and methodologies are typically applied by the project team during an improvement cycle as outlined below:





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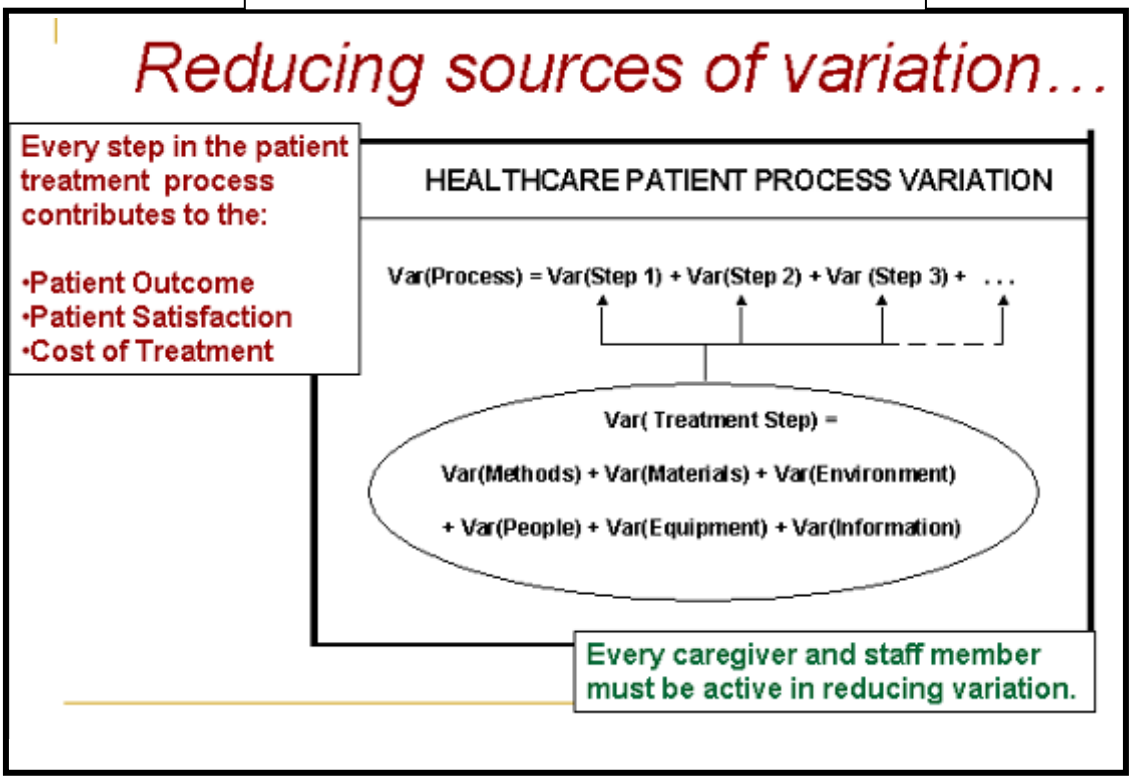


Rapid Process Improvement Workshops (RPIW)

A Rapid Process Improvement Workshop (RPIW) is a term used to describe a short term, in-depth application of Lean Healthcare tools to improve a process or system. These types of events are also known as ‘Kaizen’ events in traditional Lean terminology.

Within an RPIW cycle, a Project Team, typically composed of front line staff and area supervisors from the clinical and/or operational areas impacted by the process under investigation, applies Lean tools to assess the current state of the process and redesign the current processes or systems to meet specific objectives, timeline and deliverables. Our current RPIW strategy calls for five 8-hour project team sessions, held sequentially during one week.

Each RPIW session incorporates instruction in basic systems engineering and Lean principles with practical, healthcare based examples and case studies. Hand-on exercises are then used to reinforce principles and provide a mechanism for more active engagement. Following the instructional part of each session, the team members apply these systems engineering and lean techniques to the assessment and redesign of current processes within the process under investigation. Intersession Deliverables may be assigned to accomplish project tasks not completed during team sessions.

The objectives for the RPIW sessions are to:

- Define the problem/processes under investigation
- Baseline current systems and processes
- Identify operational barriers and failure modes in current processes
- Apply basic and advanced lean and systems engineering principles to redesign current processes to eliminate or mitigate failure modes
- Design and perform implementation pilot to test process redesign
- Implement new processes/systems with a robust control strategy to insure long term sustainability of improvements.

The final outcomes from the RPIW sessions are:

- Implementation plan for test pilot of process redesign to ensure that the new processes meet project objectives (including economic objectives), timeline and project deliverables
- Development of team members' proficiency in use of systems engineering and Lean tools to redesign clinical and operational processes
- Enable long term sustainability of improvements and application in areas outside of the initial project focus (spread adoption).

Once the implementation pilot has been approved by the Management Guidance Team, the team enters approximately 90 days of pilot implementation. During the pilot, small to moderate, incremental process changes are made and impacts to process outputs assessed. The results from the implementation pilot are presented to the Management Guidance Team with two possible outcomes: 1) approval is given to proceed with full implementation or 2) further assessment is required and the pilot is extended.

The agenda for the 5 session RPIW project cycle may include:

Session #1: Define the Problem

Session #2: Baseline Current Processes

Session #3: Identify Operational Barriers

Session #4: Develop Future State Process - Basic Lean Tools

Session #5: Pilot Implementation and Process Control Strategy

Management Guidance Team Sessions

Prior to chartering the project team and scheduling the RPIW sessions, a RPIW Management Guidance Team must identify a project focus area that will be investigated during the RPIW sessions.

The Management Guidance Team is typically composed of hospital administrators, departmental managers and key clinicians that are stakeholders within the sponsoring organization and/or the process under investigation. These sessions typically consist of two 1-hour project Management Guidance Team sessions, held approximately one-week apart.

The objectives of the Management Guidance Team sessions are to:

- identify opportunities for systems redesign
- develop the opportunities into a formal systems redesign project
- charter the project team(s).

The expected outcomes from the Management Guidance Team sessions are:

- Identification and ranking of potential opportunities for systems redesign
- Project charter development
- Project team selection

Session 1 Suggested Agenda:

1. Opportunity Identification
2. Project Selection Matrix

Intersession Deliverable:

- Collect data on current process to aid in selection of project focus area during 2nd meeting

Session 2 Suggested Agenda:

1. Selection of RPIW Project Focus
2. Project Charter Development
3. Project Team Selection

Intersession Deliverable:

- Schedule Project Team Sessions

Management Guidance Team Session #1: Opportunity Identification:

Background:

The goal of the *opportunity identification* process is to apply affinity diagram and brainstorming techniques to identify opportunities for application of systems redesign within the sponsoring organization. Multi-voting techniques, as well as review of current performance metrics are used to select 4-5 potential project opportunities for the focus of the RPIW event(s).

Why use an analytical technique for project selection? Projects must be evaluated and selected in a manner similar to other major capital expenditures. As a result the following must be assessed prior to project selection:

1. What are the costs associated with conducting the project?
2. What are the potential benefits of improvements realized as a result of the project?

For smaller scope Lean projects, opportunities ideas can be identified by front line staff and/or customer feedback and brought to the attention of the Management Guidance Team group. Alternatively, business criteria and/or performance metrics can be evaluated to determine performance gaps and select project focus areas.

Opportunity Identification tools and techniques:

- Affinity Diagram
- Multi-voting techniques

Affinity Diagrams

Background:

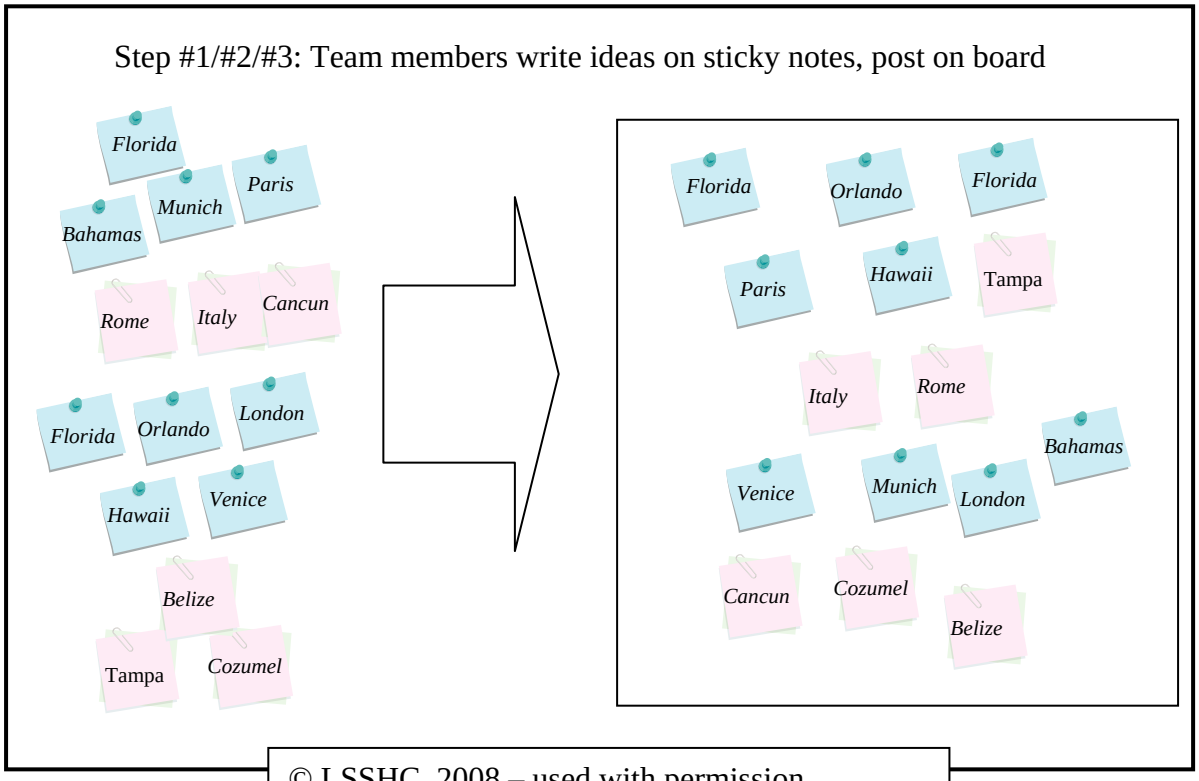
Affinity Diagrams are used to collect and organize input from across a group or team. This technique is similar to brainstorming, except that ideas from team members are compiled through written means, rather than intense discussion. When compared to brainstorming technique, affinity diagrams often provide the greatest opportunities for equitable, objective input from all team members

Recommendations for using *Affinity Diagram* techniques:

- Utilize sticky notes to record and organize thoughts and ideas
- Place poster paper on the wall in a central location within the meeting room.
- Challenge the team members to write as many ideas as quickly as possible with no discussion among team members
- The ideas should be posted on the poster paper in random order
- Team members (not the facilitator) are responsible for grouping ideas by common themes and determining categories. Team members may ask for clarification from the facilitator, but not validation.

Steps for using *Affinity Diagram* techniques for opportunities identification:

1. Pass out sticky notes to all team members.
2. Allow the team members ~5 minutes to write as many ideas as possible for project opportunities within the organization.
3. When completed, place post-it notes on the wall in random order.
4. Team members group ideas by common themes and group duplicate ideas.
5. Team members should discuss to determine category headers.
6. Use multi-voting to determine preferred project opportunities.



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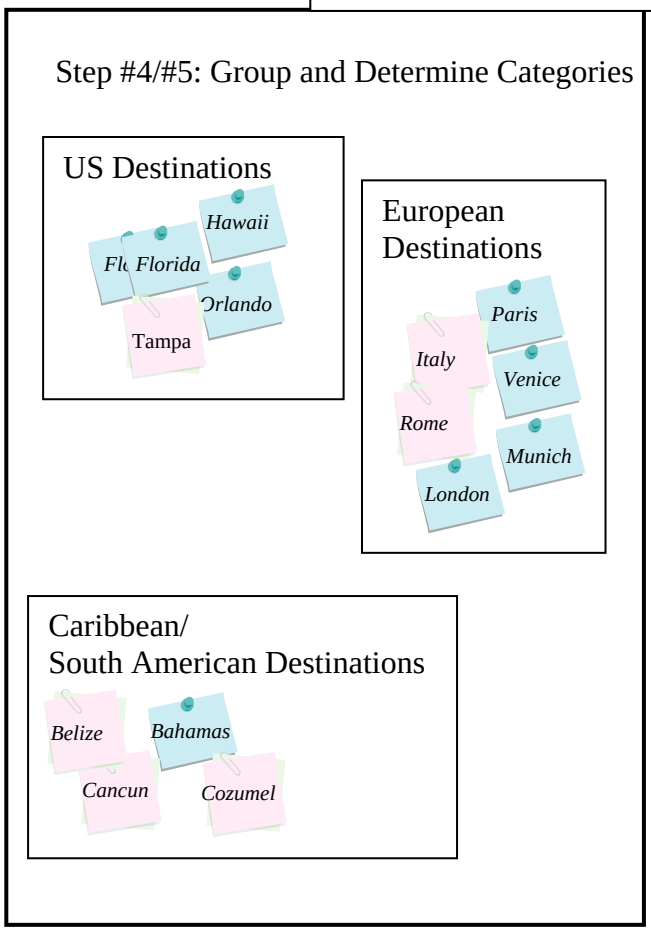
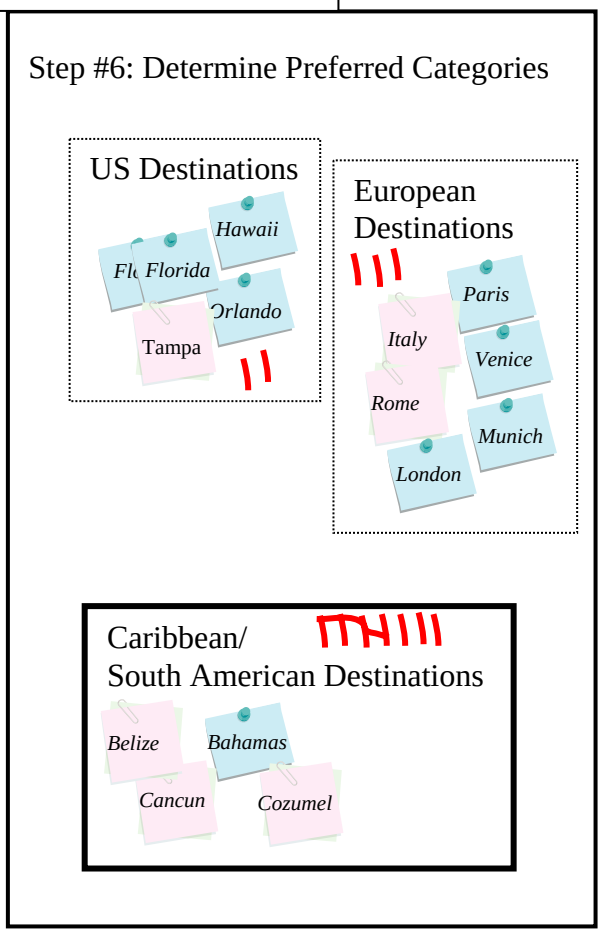




Project Selection Matrix

Background:

A *project selection matrix* is used to rank and compare potential project areas to determine which should be resourced.

Ranking criteria may include, but are not limited to:

1. Organizational/strategic goals
2. Potential financial impact to the organization
3. Patient and employee satisfaction impacts
4. Likelihood of success
5. Completion within a specified timeframe (typically 8-12 weeks)

Steps to creating a *Project Selection Matrix*:

1. List the opportunities from the affinity diagram exercise that received the most votes.
2. Determine the ranking criteria. This sample list of ranking criteria is outlined above.
3. Rank each project with respect to the ranking criteria using a scale of 1-10, with 0= no impact, 10=high impact.
4. Ranking criteria may be weighted and the project scores added. Management Guidance Team teams should discuss:
    - Which project(s) should be chosen for the business case review?

Example Project Selection Matrix:

	Project			
Criteria	**#1**	**#2**	**#3**	**#4**
Likelihood of Success	5	10	8	10
$$ Impact (cost or revenue)	10	5	6	1
Patient Satisfaction	10	4	5	10
Employee Satisfaction	10	2	5	10
Completion in 4-6 weeks	1	10	10	10

- Which project would you select?
- Which project is the 'Big' Project?
- Which project is the 'Quick Hit' Project?
- Would project #4 be appropriate to consider under any circumstances?

Note that additional data may be needed to validate project ranking and assist in project selection. This data collection should be assigned as 'intersession deliverables' and collected by Management Guidance Team Team members between Management Guidance Team meeting #1 and #2.

Management Guidance Team Session #2: Project Selection/Development

The purpose of the 2nd Management Guidance Team session is to properly define the project focus and charter the project team. Following presentations any additional data collected following Management Guidance Team Session #1, the Management Guidance Team selects the focus area for the RPIW project, begins to build the project charter and selects the project team participants.

Tools Used for Project Selection:

- Project Selection Matrix
- Additional data collected after Management Guidance Team Meeting #1

Tools Used for Project Development:

- Project Charter

Project Charter

The *project charter* contains the business case for the project, including background, problem definition, project scope, financial expectations and project deliverables. The project charter represents a 'binding contract' between the project team and project Management Guidance Teams with respect to project direction and outcomes and is often used as a reference document by the project team during project execution.

The *Project Charter* is a useful tool for:

- Insuring that project expectations, including scope and deliverables are clearly identified prior to project initiation.
- Insuring continuity of the project throughout the project cycle

The *Project Charter* contains information about:

- The project background, including problem and goal statements.
- The project scope, including process start and stop and identification of items not within consideration for the project.
- The project deliverables, including specific end results expected from the project and a definition of how change will be validated following improvements.

Steps to creating the *Project Charter*:

1. The Project Charter is first developed by the Management Guidance Team.
2. The Project Team reviews and finalizes the project charter.
3. The revised Project Charter may be presented during the tollgate for Management Guidance Team approval.

Project Charter

Project Name:

Date Chartered	Start Date:	Target Completion Date:
Project Team	Phone	Title
Process Owner	Phone	Title

Fill in team members names and contact information

Problem Statement

- Describe the problem, opportunity, or objective in concise, measurable terms.
- Include a summary of the problem and impact (a.k.a. PAIN).

Goal Statement

- Describe the team's improvement objective
- Begin with the words "reduce, eliminate, control"
- Should be 'SMART' – specific, measurable, attainable, relevant, timebound

Project Scope

- Where does the process under investigation start?
- Where does this process stop?
- What is inside of the project scope?
- What is outside of the project scope?

Deliverables

- What end result(s) do are expected to be achieved from this project?
- How will you know that any changes have resulted in improvements?

Project Charter Example

Project Name: Improve Outpatient Registration Process

Date Chartered	Start Date:	Target Completion Date:
Project Team	Phone	Title
Process Owner	Phone	Title

Fill in team members names and contact information

Problem Statement

City Hospital's current outpatient registration processes are very disorganized and inefficient. This is resulting in long patient registration and wait times (over 30 minutes), unhappy patients, and decreased patient volume in outpatient services.

Goal Statement

Improve City Hospital's outpatient registration processes to reduce outpatient registration to an average of less than 5 minutes for all patients by 4/1/2006.

Project Scope

- Process Start Once an outpatient walks through the hospital doors.
- Process Stop: Once the outpatient arrives in radiology

- In scope: All outpatient services
- Out of scope: Inpatient services, ED

Deliverables

1. Baseline of current processes
2. Pilot implementation and control plan to reduce registration and patient wait times

Project Team Selection

Project teams are selected by Management Guidance Team group following the project selection and project charter completion. The *project team* should be composed of front line staff and area supervisors (i.e. nurses, physicians, clerks, ancillary services staff) directly impacted by the process under investigation.

The ideal team size is 8-12 people, and team size should not increase beyond 15 people unless absolutely necessary.

For those stakeholders not represented within either the project team or the Management Guidance Team, a communication mechanism (team minutes, session report) should be developed and implemented by the project team.

The *Process Owner* is the team member that will be responsible and accountable to sustaining improvements during and following implementation. Ideally, the process owner should be someone with authority over front line staff directly involved in the process under investigation.

Remember…chosen team members must be able to commit to attend team meetings and meet their responsibilities as outline below.

Team Member Responsibilities:

- Actively participate on the Lean team through project implementation
- Complete Intersession Deliverables as required
- Participate in data collection and data analysis
- Regularly inform non team member co-workers of the project status and progress
- Lead or participate in future Lean projects

Process Owner Responsibilities:

- Lean Project or Management Guidance Team Member
- Owns project implementation
- Responsible for long term process control following implementation

RPIW Project Sessions:

Each RPIW session incorporates instruction in basic systems engineering and Lean principles with practical, healthcare based examples, case studies and immediate application of tools and methodologies to the process under investigation. Intersession Deliverables may be assigned to accomplish project tasks not completed during team sessions.

The objectives for the RPIW sessions are to:

- Define the problem/processes under investigation
- Baseline current systems and processes
- Identify operational barriers and failure modes in current processes
- Apply basic and advanced lean and systems engineering principles to redesign current processes to eliminate or mitigate failure modes
- Design and perform implementation pilot to test process redesign
- Implement new processes/systems with a robust control strategy to insure long term sustainability of improvements.

The final outcomes from the RPIW sessions are:

- Implementation plan for test pilot of process redesign to ensure that the new processes meet project objectives, timelines and project deliverables
- Development of team members' proficiency in use of systems engineering and Lean tools to redesign clinical and operational processes
- Enable long term sustainability of improvements and application in areas outside of the initial project focus (spread adoption).

The agenda for the 5 session RPIW project cycle may include:

Session #1: Define the Problem

Session #2: Baseline Current Processes

Session #3: Identify Operational Barriers

Session #4: Develop Future State Process - Basic Lean Tools

Session #5: Pilot Implementation and Process Control Strategy

The methodologies, concepts and tools presented in each of the project sessions follows.

RPIW Session #1: Define the Problem

The goal of this project session is to provide an introduction to Lean tools, review and identify changes to the project charter that was developed by the Management Guidance Team and begin to understand customer requirements for the process under investigation.

The objectives of the Day #1 project session are to:

- Introduction to Lean Healthcare
- Perform an initial review of the project charter
- Introduction to Building Effective Lean Healthcare Teams
- Conduct a Voice of the Customer study

The expected outcomes include:

- Required/suggested modifications to project charter
- Development of Team Ground Rules
- Design for Voice of the Customer Study

The agenda for this project week includes:

- Introduction to Lean Healthcare
- Project Charter Ratification
- Building Effective Lean Healthcare Teams
- Introduction to Voice of the Customer Analysis

Intersession Deliverables (IDs):

- Project Charter Modifications
- Conduct Voice of the Customer Interviews

Building Effective Lean Healthcare Teams

Background:

A *Team* is a group of people working to accomplish a common, collective goal.

Steps to Building an Effective Lean Healthcare Team:

1. Form the team.
2. Select the Team Leader.
3. Appoint recorder/time keeper.
4. Draft Mission Statement.
5. Lay ground rules.
6. Identify Success Criteria a.k.a. goals.

Within Lean Healthcare Teams, the *mission statement* and *goals* are often developed as part of the project charter development.

Team Ground Rules often fall within 6 categories:

1. Attendance: What are the attendance requirements for team members?
2. Participation: What are the team member expectations for participation?
3. Interruptions: How will interruptions during the team meetings be handled?
4. Preparation: What level of preparation is expected for team meetings?
5. Timeliness: What are the expectations for meeting start times, what type of preparation is expected?
6. Conflict: How will conflict between team members be resolved?

The *Tuckman Model* is used to describe the four stages of team formation:

1. **Forming** represents the teambuilding phase immediately following introduction of the team members. During this time, team members are transitioning from individuals to team members.
    - Team Characteristics: Reserved, awkward silences, overly polite, excited, anxious
    - Typical Behaviors: Members speak as individuals, hesitant participation
2. **Storming** is often the most difficult stage of team formation. During this phase, team members are assessing boundaries/roles within team and realizing that tasks may be difficult or different from what they expected.
    - Team Characteristics: Team members resist collaboration and participation because they are frustrated with the lack of progress.
    - Typical Behaviors: Arguing, competition, disregard to ground rules, increase in hindering behaviors
3. **Norming** is the phase where team members begin to accept each other and the team goals.
    - Team Characteristics: Enthusiasm is high, Relationships become more cooperative, a sense of trust and team cohesion builds.
    - Typical Behaviors: Increased focus on group norms and team relationship behaviors
4. **Performing** is the final stage in team formation where the greatest amount of work is accomplished. During this phase, the team has settled down and has become a cohesive unit. Additionally, the team has worked through personal and relationship issues and can concentrate on the team performance goals.
    - Team Characteristics: Members understand and accept their place within the team environment.
    - Team Behaviors: Members willing to make individual sacrifices, open disagreement

Voice of the Customer Analysis

The "Voice of the Customer" is a term used to describe the customer requirements from a specified process.

This type of analysis can be conducted utilizing a variety of ‘proactive’ techniques including direct discussion or interviews, surveys, and focus groups. Historically collected ‘reactive’ data, such a complaints or comments cards can also be included.

During the voice of the customer evaluation, it is important to evaluate not only the customer requirements, but to also determine areas associated with basic customer needs as well as performance attributes correlated directly to customer satisfaction. For example, if evaluating customer requirements for an critical care patient treatment process, it is important to not only understand the evidence based requirements for the standard level of care, but also the customers perception of cultural implementation barriers, such as physician buy-in and hospital administrator support.

The *Voice of the Customer Analysis* is a useful tool for:

- Understanding and validating customer requirements, expectations and areas of dissatisfaction with the current processes

- Engagement of staff members involved in the process under investigation that are not part of the process team.

Example interview questions for Voice of the Customer Analysis include:

1. What do you like about the current processes?
2. What do you think needs improvement?
3. What would you recommend to improve the current processes?
4. What could potentially threaten the success of the project?

Steps to conducting the *Voice of the Customer Analysis*:

1. List the customers for the process under investigation. Be sure to include both internal and external customers.

2. Assign team members to interview customers using the 4 interview questions.

3. Compile responses to determine common themes.

Hints for successful *Voice of the Customer Analysis*:

- Ask pre-defined, open ended questions
- Encourage the customer to do most of the talking.
- Take careful notes, and record the customers most powerful statements of facts or feelings word for word.

RPIW Session #2: Evaluate Current State

The goal of this project session is to assess the performance of current processes against the customer requirements collected in Session #1. Systems engineering and Lean tools such as workflow analysis, process flow diagrams, direct process observation and checksheets are used to collect current process data. Additionally, historical data may be used to provide a wider assessment of process performance. Basic graphing skills (Pareto graphs, trend graphs) are also introduced in order to graphically display baseline data.

The objectives of the RPIW Session #2 are to:

- Thoroughly understand the current state of the process.
- Collect reliable data on process speed and quality to begin to identify and quantify operational barriers present within the process under investigation.

The expected outcomes are:

- Validated Current State Process Flow Diagram
- Completed workflow analysis
- Initial operational barriers identified and impact quantified

The agenda for this project session include:

1. Review Session #1 ID's: Voice of the Customer Requirements
2. Finalize and Ratify Project Charter
3. Introduction to Workflow Analysis Tools and Methodologies
4. Perform Workflow Analysis on the RPIW process(es)

Workflow Analysis

Background:

Workflow analysis is derived from human factors engineering where this term describes the study of the human computer interaction with software and hardware systems.

Within healthcare processes, *workflow analysis* involves an in-depth examination of the clinical and operational processes from the perspective of the patient or staff member.

This analysis is limited in scope to the process under investigation and may include qualitative and quantitative assessments of work processes.

A workflow analysis study is typically used to baseline existing clinical processes prior to the improvement cycle as well as to validate process outputs following implementation. While conducting this study, direct process observation techniques are used to physically observe the process under investigation. Lean tools and techniques are used to collect data to identify and quantify the impact of operational barriers.

Workflow Analysis tools and techniques:

- Current State Process Flow Diagram
- Direct Process Observation
- Process Observation Worksheets
- Spaghetti Diagrams
- Checksheets

Current State Process Flow Diagram

Background:

A process flow diagram is a diagram that uses graphical symbols to depict the nature and flow of the steps within a process. These types of diagrams are also referred to as 'process flow maps'. The act of 'mapping the process' should begin with the project team brainstorming the processing steps. These steps are then placed in time sequence order of occurrence.

The 'current state' process flow diagram is used to represent how the process *currently* operates to allow for identification and investigation process failure modes and operational barriers. Additionally, the process of creating the current state process map often leads to identification of opportunities for process optimization and improvement.

Current State Process Flow Diagrams provide a powerful visual tool for:

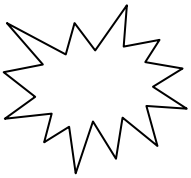
- Understanding the process flow and processing steps
- Identifying hand-offs
- Identifying primary operational barriers that can be targeted for improvement

Steps to creating a *current state process flow diagram*:

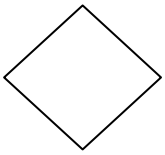
1. Review the process under investigation and establish boundaries as outlined in the project charter.
2. Using brainstorming techniques, identify steps in the process.
3. Arrange the processing steps in order.
4. Validate the process flow either by showing the process map to a non-team member involved in the process, or by physically observing the process.

We recommend the use of four symbols to create process flow diagrams:

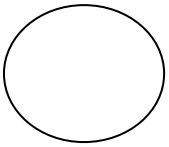
Square or Rectangle



Star



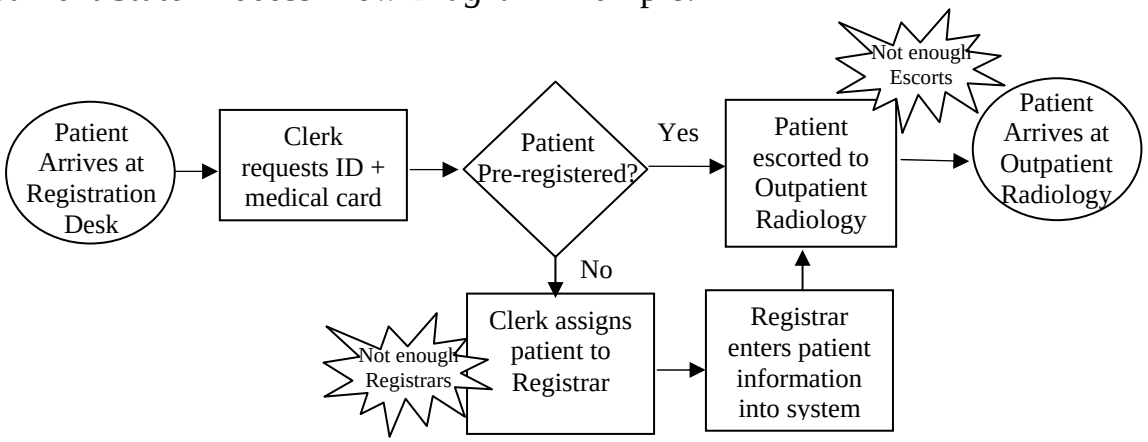
Diamond



Circle

Square or Rectangle:	Events or processing steps that have a single possible outcome
Diamond:	Events or processing steps that have multiple possible outcomes.
Star:	Events that occur resulting in an interruption to the processing flow, a.k.a. ‘Kapowees’
Circle:	Beginning or End processing step or event

Current State Process Flow Diagram Example:



Hints for creating current state process flow diagrams:

- Be careful to discuss the 'level' of process flow diagram that will be created. Flow diagrams may be 'high level' in nature (less detailed) or 'lower level' (more detailed). If in doubt, start with the higher level (less detailed) process map and add detail as needed at a later time.

- Steps may be written on sticky notes and posted on poster paper to create the initial revision of the process flow diagram.

- Insure that the process flow diagram clearly represents the current state of the process, i.e. what is actually happening on the floor on a day to day basis.

Checksheets

Background

A *checksheet* is a worksheet template used to collect quantitative process output data, such as compliance and adherence data or frequency of occurrence for operational barriers.

Checksheets are used to:

1. Collect baseline performance data for the current state process
2. Collect performance data following the implementation to validate the impact of process changes

Checksheets should be standardized in order to build confidence in the data collection system and insure that data is collected in a reliable, repeatable way.

Steps to creating a checksheet:

1. Select the output variable(s) to be measured and type of checklist to be used.

2. Add columns to collect additional information in addition to the process output variable, such as dates, time, shift, patient room.

3. Add columns that may be used to indicate reasons for non-compliance/adherence (audit checklist) or process failure (operational barrier checklist).

4. Pilot test the form design and make changes as required.

There are two basic types of checksheets:

- Audit checksheets
- Operational Barrier Checksheets

Audit Checksheets:

- Used to monitor compliance against protocols or policies during audits

- Typically, these types of checksheets are filled out during an audit and represent compliance during a specified timeframe.

- Examples:
  - # of patients receiving components of the VAP bundle for a 24 hour period
  - # of staff members performing hand hygiene prior to entering the patient room during 1-hour direct process observation

Example #1: Audit Checksheet

Project Name:					
Output metric:					
Date/Time	Unit	Room #	Compliance against Hand Hygiene protocol (Y/N)	Reason if non-compliant:	Comments:
1/1/2007 10:00AM	ICU	405	Y		
1/1/2007 10:05AM	ICU	405	N	Alcohol dispenser empty	
1/1/2007 10:10AM	ICU	405	N	Nurse carrying items	

Operational Barrier Checksheets:

- Used to collect data to determine how frequently operational barriers negatively impact the process

- Typically, these types of checksheets are filled out over an extended period of time, by personnel directly involved in the process under investigation

- Examples:
  - Type and frequency of delays in outpatient registration
  - Type and frequency of equipment/supplies not in store room

Example #2: Operational Barrier Checksheet

Project Name:					
Output metric:					
Date/Time	Patient Delay?	Delay Type	Patient Pre-reg'd?	Reason for delay	Comments:
1/1/2007 10:00AM	N		Y		
1/1/2007 10:05AM	Y	DATA	N	Wrong billing info	
1/1/2007 10:10AM	Y	ES	N	Call-off, low staffing	
Reason codes:	DATA: Data Error				
	REG: Waiting on Registrar				
	ES: Waiting on Escort				

Process Observation Worksheet

Background:

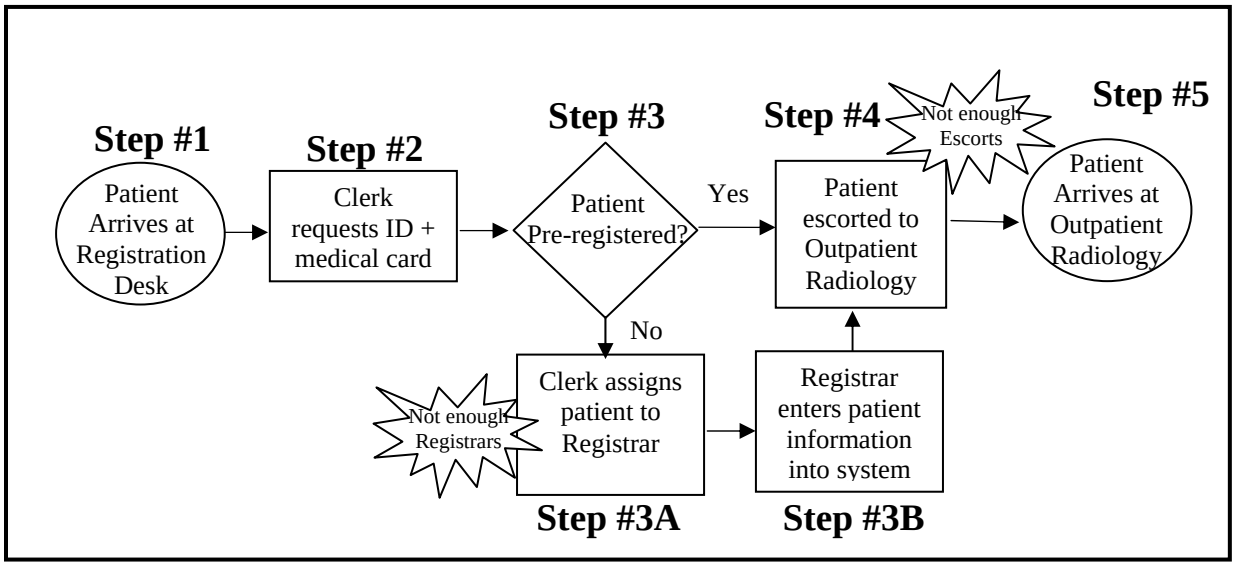
A *process observation worksheet* is used as a data collection tool during direct process observation. Processing steps from the process flow diagram are numbered and recorded sequentially on a process observation worksheet template. During direct process observation, an observer records the duration, wait time and the length of the physical path taken to complete the step on a process observation worksheet.

Process Observation Worksheets are used to:

- Quantify the duration and frequency of processing steps
- Identify and quantify the impact of operational barriers on the process under investigation

Steps to creating/using a process observation worksheet:

1. List the steps from the process map in sequential order. Steps following decision points may be listed as separate rows and numbered as sub-steps of decision point.
2. Observe the process and collect information on process step durations, wait times, and travel distances.
3. Multiple observations should be done in order to determine the range of variation in processing steps/times.



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Process Observation Worksheet		Process:	Outpatient Registration		Name:	Jane
Step #	Description	Distance	Clock Time	Task Time	Wait Time	Observations
			0:00			
1	Patient Arrives at the Registration Desk		0:10	0:10		Long line at desk
2	Clerk Requests ID + Medical Card		0:13	0:03		
3	Patient Pre-registered? (Y/N)		N			
3A	- Clerk Assigns patient to Registrar		0:15	0:02		
3B	- Registrar enters patient information into system	100	0:25	0:10	0:03	wait for registrar
4	Patient escorted to Outpatient Radiology	200	0:33	0:08	0:05	wait for escort
5	Patient Arrives at Outpatient Radiology		0:45	0:12		

Key Terms:

Distance: Travel distance in feet or steps
Clock Time: The elapsed time on a stop watch. This is should be filled into correspond to the time that each step is *completed*.
Task Time: The calculated time for each processing step. The task time is calculated by subtracting the clock time for the current step from the clock time for the previous step.
Wait Time: The amount of wait time present within each task time.
Observations: Comment on any observations with respect to the processing step.

Spaghetti Diagrams

The spaghetti diagram is used to examine the physical path that a patient takes through a treatment area or the path that a health care worker takes as they perform tasks associated with patient care. The term ‘spaghetti’ is used as these diagrams often begin to look like spaghetti noodles as process flow is recorded.

These types of charts provide a graphical depiction of physical movement, enabling identification of inefficient workspace and/or area layout. A comprehensive understanding of the physical work flow allows the project team to identify problem areas including waste caused by inefficient movement and patient, information or supply transportation.

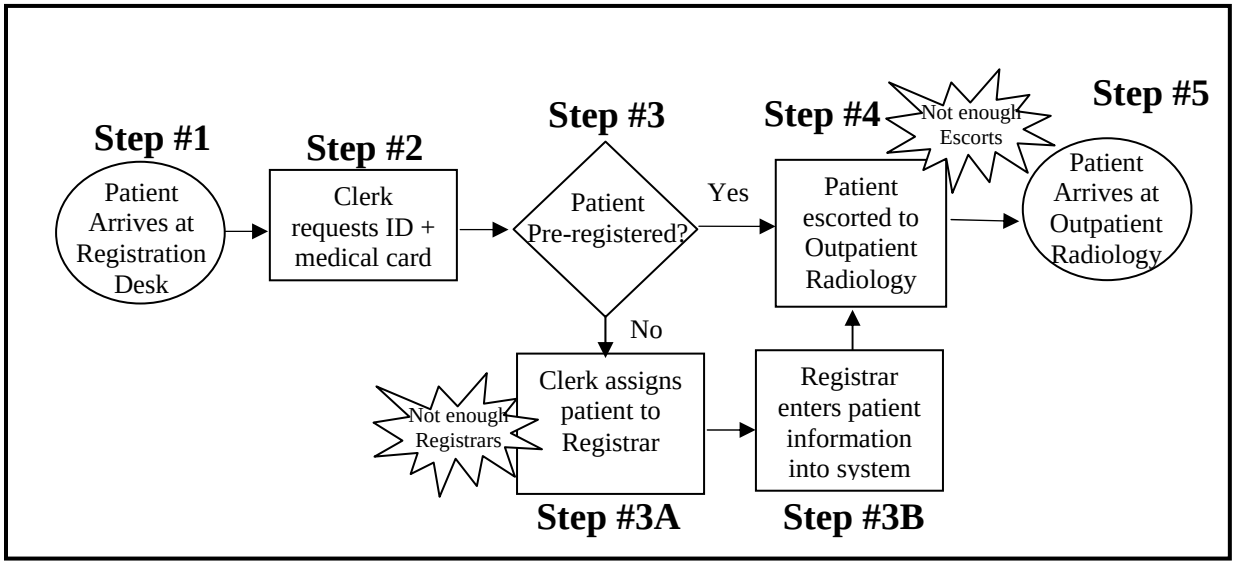
Steps for creating spaghetti diagrams:

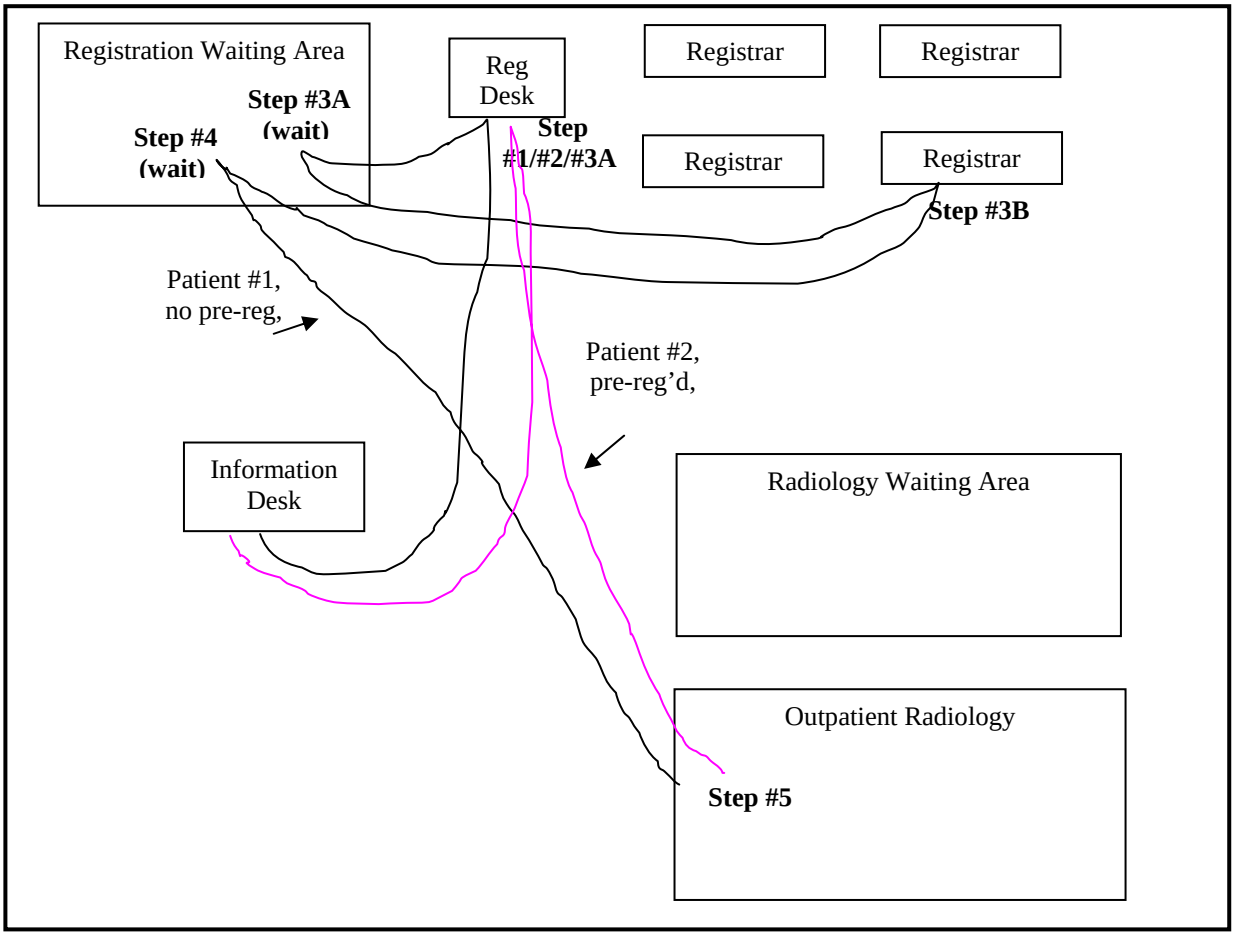
1. Find or create a diagram of the workspace.

2. Note the physical location of the worker at the beginning of the process.

3. Observe the process, drawing lines that follow the path that the worker takes as they complete the processing steps.

4. Lines may be numbered to reflect the steps on the process map.


Step #1
Patient Arrives at Registration Desk
Step #2
Clerk requests ID + medical card
Step #3
Patient Pre-registered?
Yes
No
Step #4
Not enough Escorts
Patient escorted to Outpatient Radiology
Step #5
Patient Arrives at Outpatient Radiology
Not enough Registrars
Clerk assigns patient to Registrar
Step #3A
Registrar enters patient information into system
Step #3B


Registration Waiting Area
Step #3A (wait)
Step #4 (wait)
Reg Desk
Step #1/#2/#3A
Registrar
Registrar
Registrar
Registrar
Step #3B
Patient #1, no pre-reg,
Patient #2, pre-reg'd,
Information Desk
Radiology Waiting Area
Outpatient Radiology
Step #5

RPIW Session #3: Identifying Operational Barriers

The goal of this project session is to identify operational barriers within your process through analysis of process baseline data (collected in Session # 2) and matched to the Voice of the Customer data (collected in Session #1).

The objectives of the RPIW Session #3 are to:

- Achieve a basic understanding of the Lean concepts of 'Waste' and 'Value-Added' processing
- Utilize Lean concepts to identify and quantify failure modes and operation barriers within the process under investigation

The expected outcomes are:

- Identification of Operational Barriers within the process under investigation

The agenda for RPIW session #3 includes:

1. Introduction to Lean concepts:
    - Seven types of waste
    - Value-Added Processing

2. Identification of Operational Barriers within the process under investigation

Identifying Operational Barriers

Background:

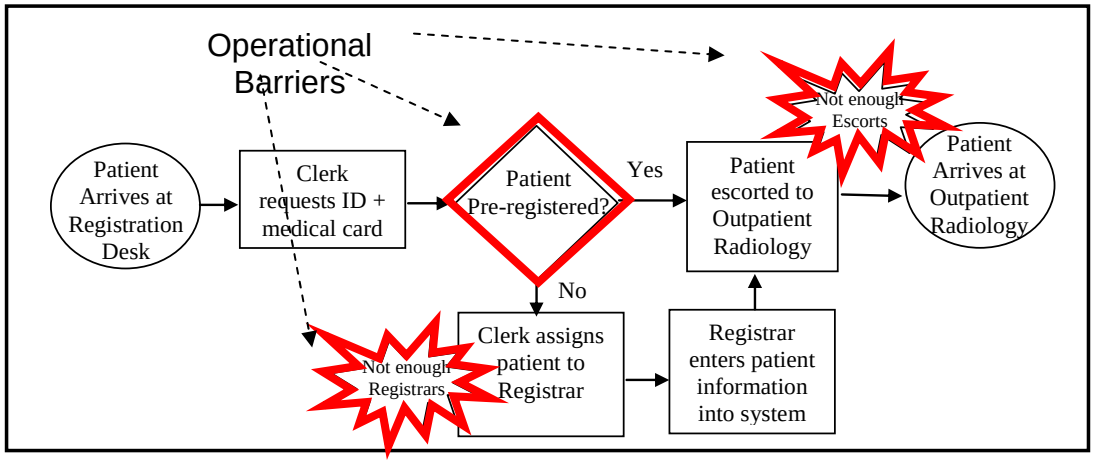
During an improvement cycle, the project committee will assess the performance of current processes against the customer requirements, Voice of the Customer, collected in RPIW Session #1. In Session # 2: Baseline Current Processes, systems engineering and Lean tools such as workflow analysis, process flow diagrams, direct process observation and checksheets are used to collect current process data. In Session # 3: Identify Operational Barriers, the project committee identifies process failure modes through analysis of process baseline data.

What are *operational barriers* within healthcare?

Operational Barriers can be physical or informational events in a process that result in an interruption to the processing flow. Operational Barriers are sometimes referred to as "kapowees" on the current state process map.

Kapowees are defined as those events that occur during the course of the workday which keep the staff members from following through on the steps needed to complete the process under investigation or that increase the possibility of errors occurring.

Additionally, decision points (diamonds on the process map) may be considered to be operational barriers if the decision paths lead to delays or the possibility of errors in the process (as shown in the following diagram).



Within Lean, operational barriers are also referred to as 'Waste'.

There are typically seven categories of *Waste* in Healthcare Organizations as outlined in the table below. Every healthcare organization exhibits 'waste' within their processes.

Seven Type of Waste within Healthcare Processes		
Waste Category	**Description**	**Examples**
Scrap	- Equipment or supplies that are discarded without use	- Expired medications or supplies - Excess sterile towels - Linens from an isolation room
Rework	- Repeating a step or process, often to correct a previous processing error	-Repeated requests for patient information -Correcting registration errors in radiology -Lab test re-collect
Processing Delays	- process steps delayed, often due to incomplete or missing supplies, equipment, personnel and/or information	-Patient Wait time at registration -Physician call-backs -Patient waiting for ED bed
Motion/Flow	- unnecessary movement during processing, often to search for equipment and supplies	-Searching for medical supplies and Equipment -Registrar walking from ED bedside to enter data
Overproduction	- producing more than is needed at that point in time	-Pharmacy send multiple doses of meds to unit -Multiple lab tests collected but not required for treatment
Transportation	- unecessary transportation of equipment, supplies and/or patients	-Transporter called to wrong room or with wrong equipment -Patient movement for testing or treatment
Defects	- Work that contains errors or mistakes	- Med errors - Procedure errors - Low bundle compliance

RPIW Session #4: Improve Systems

The goal of this project session is to apply systems engineering and Lean techniques to the redesign of current processes to eliminate or mitigate operational or systematic deficiencies, insuring that the processes can reliably meet requirements as outlined in the project charter. Plan-Do-Study-Act (PDSA) cycles are used to test application of Lean techniques to the current state. A future state process map is created to visually depict the process redesign. Tools such as affinity diagrams, multi-voting and impact/effort matrices will aid the solution generation process.

The objectives of the Day #4 project session is to:

- Understand basic Lean tools and how they can be applied to the redesign of the clinical and operational processes.
- Develop and test PDSA cycles to test application of Lean principles to the process under investigation
- Develop future state process map

The expected outcomes are:

- Basic Lean tool understanding and application:
    - 5S
    - Visual Control/Visual Workplace Rules
    - Setup Reduction
    - Error-Proofing (Poka-Yoke)
    - Future State Process Map
- PDSA cycles used to test/validate proposed application of Lean tools and methodologies to the process under investigation
- Future state process map developed to enable the process under investigation to meet requirements set out in the project charter

The agenda for this project session includes:

1. Introduction to 5S, Setup Reduction, Error Proofing and Constraint Management
2. Lean Exercise
3. Solution Generation
4. Develop/Test PDSA cycles
5. Future State Process Map
6. Assign Intersession Deliverables

5S

Background:

5S is an approach to waste and variability identification utilizing techniques to organize a workplace or workspace. *5S* is a simple and practical approach to improvement that can achieve a great amount of results in a very short period of time. In some organizations there is a 6th S added; Safety.

This 5-step process focuses on cleaning, organizing, and arranging a workplace to eliminate the waste associated with looking for items required to complete a process.

Example: It is estimated that nurses spend greater than 40% of their time locating information, equipment, or materials required for patient treatment.

5S steps are:

- Seiri (Sort)
- Seiton (Set in order/straighten)
- Seiso (Shine/scrub)
- Seiketsu (Systematize)
- Shitsuke (Sustain/Standardize)

5S is a structured program that results in dramatic changes and results – not just a housekeeping program.

Recommendations for long term sustainability:

- Front line staff members who use the workspace should be *heavily* involved in applying 5S.
- Regular (daily) appraisal of the workplace must be conducted

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Steps to utilizing the *5S* Tool:

1. *Sort* – Obsolete, unused and/or broken equipment and supplies are removed from the workspace area.
2. *Set-In-Order* – Locate frequently used and necessary items and place in logical predetermined locations. Frequently used items are placed at or near the workplace while infrequently used items are placed farther away or stored in specified locations.
3. *Shine/Scrub* – Clean all items to minimize downtime. Daily cleaning reduces breakdowns and maintenance time lost.
4. *Systemize* –Develop policies, procedures, and workplace rules to maintain the best practices set in place. This is achieved by providing visual warnings as well as standardized, documented and communicated workflow methods.
5. *Sustain/Standardize* – this last step involves developing habits to implement the 5S philosophy on an ongoing basis.

Before 5S

99

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S1: Sort

- Remove and Red Tag Items not used or excess supplies

100

S2: Set in Order
S3: Shine

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S4: Simplify/Standardize
S5: Sustain

Right Side

Drawer 1

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Examples of 5S:

Prior to a 5S workshop, lab supplies were stored on the floor and countertops, as shown

Afterwards, countertops are clear; drawers and cabinets are labeled with their contents, as shown in the two bottom photos.

Over-stocking and stock-outs were virtually eliminated.

Visual Workplace Rules

Visual Controls and Visual Workplace rules are visual cues to provide immediate indication of the process state. Often visual controls are combined with other lean techniques, such as 5S and Error-Proofing to allow staff to immediately access operational states.

Visual Controls/Visual Workplace rules:

- Tools, Supplies & Equipment must be:
  - Easy to See
  - Easy to Use
  - Easy to Return

- Apply the 30-Second Rule
  - Items accessed at least once a month should be located within 30-seconds
    - Supplies
    - Tools, equipment
    - Information

The key principle is to make all components of the process *visible*. Everyone, including outsiders, should be able to see and understand the status of a process at all times.

Visual Control allows you to see the flow, performance, problems and opportunities for improvement within a process.

Examples of Visual Controls:

Items locations are labeled and placed in order.

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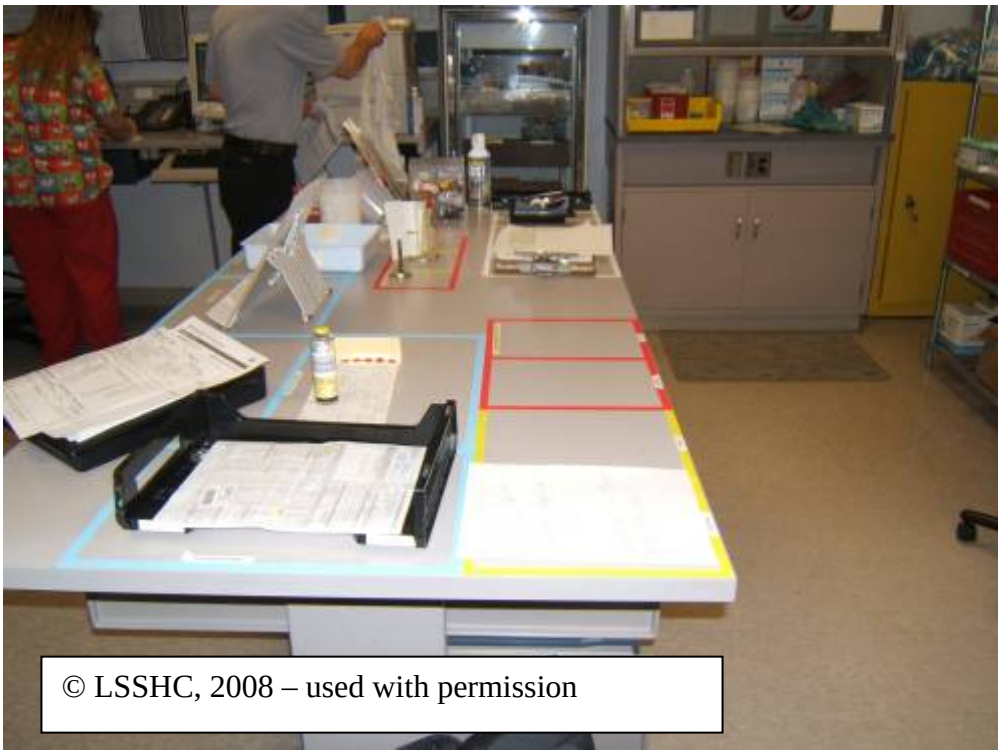
Item locations and items are labeled and placed in order to facilitate easy use and return.

5S + Visual Controls



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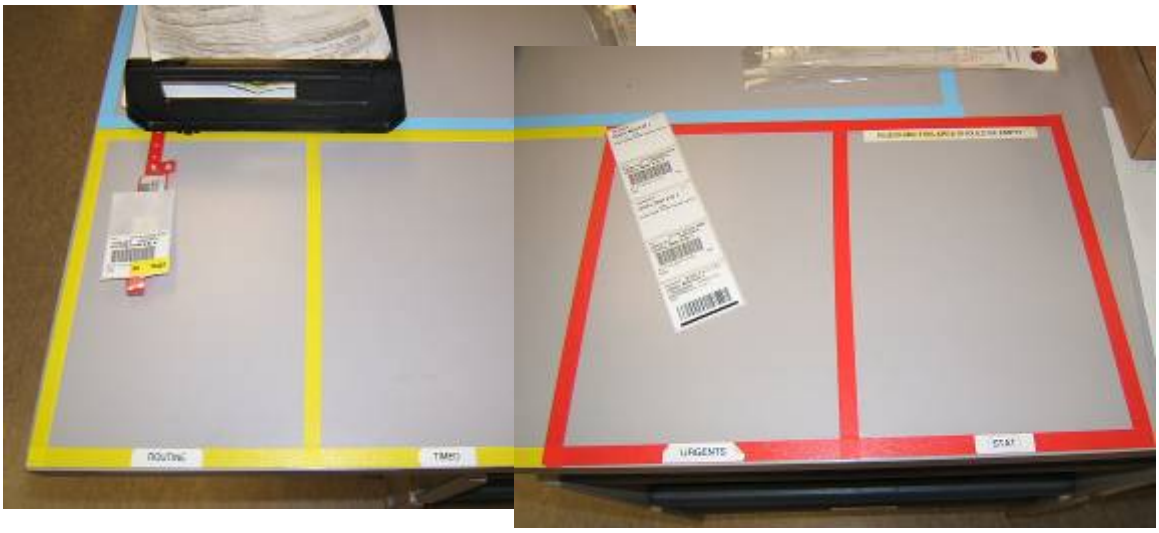
Lab requests have a color coded and labeled place depending on where they are in the process. The labels delineate Routine, Timed, Urgent and Stat procedures.



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Setup Reduction

Setup Reduction is the reduction and elimination of setup time associated with each patient process.

Example: Reduction in patient prep time prior to a surgical or radiology procedure.

Our goal is to strive for performance of as much setup work as possible prior to a treatment step.

Dressing Change Kit

IV Start Kit

Error Proofing (Poka-yoke)

Error-Proofing (Poka-Yoke) is an approach to preventing mistakes when an action requires human intervention and judgment.

Poka-yoke techniques used in healthcare include the use of color-coded patient banding to identify allergies or exceptions to treatment regimens.

Our goal is to improve and simplify the process steps involved with the operational barrier by applying the following steps and to mitigate errors.

Steps for using *Error-Proofing (Poka-yoke)*:

1. Understand the operational barriers
2. Ask the team to brainstorm the following:
    a. Can the confusing or redundant processes be simplified or adjusted?
    b. Can operations be standardized utilizing visual controls and/or setup reduction?
    c. Can duplicate systems be used to eliminate error prior to reaching the patient? (Redundancy)
    d. Can the process/system be set to 'fail safe' upon an error. (Failsafe System?
3. As a team determine how to implement Error-Proofing, Visual Controls and Setup Reduction in the Future State Process.
4. Decide on appropriate metrics to measure outcomes.

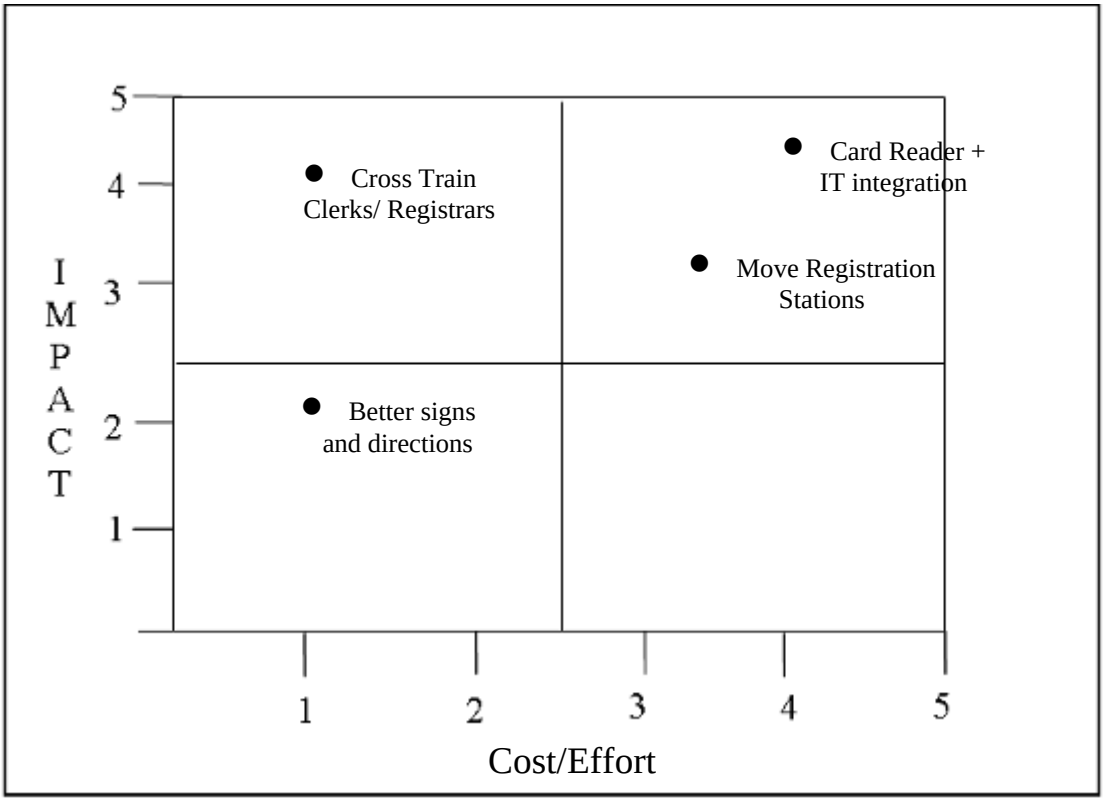
Example of Detection: This visually depicts that a patient is having other tests done in other departments during this visit.

Impact/Effort Matrix

The *Impact/Effort Matrix* is used to assess potential impact of solutions against estimated cost or effort. This type of diagram is also known as an Impact/Cost matrix.

Steps for creating an *Impact/Effort Matrix*:

1. For each solution listed as a potential solution, place a symbol corresponding to the cost required for implementation (x-axis) and the impact on the overall process (y-axis), where 1 is the lowest amount of effort and/or impact and 5 is the highest amount of effort and/or impact.
2. Solutions in the highest impact, lowest effort quadrant should be considered prior to project in other quadrants. Solutions in the low effort, low impact quadrant may be considered as part of a 'quick-fix'



Plan-Do-Study-Act (PDSA) Cycles

Plan-Do-Study-Act (PDSA) Cycles are used to test the solutions pathways chosen from the Impact/Effort Matrix. Small tests of change are carried out within the current processes and data collected following the test to verify improvements.

Stage #1: Plan

- Plan the test or observation, including a plan for collecting data:
  1. State the objective of the test.
  2. Make predictions about what will happen and why.
  3. Develop a plan to baseline the current process and test the change. (Who? What? When? Where? What data need to be collected?)

Stage #2: Do

- Try out the test on a small scale:
  1. Carry out the test.
  2. Document problems and unexpected observations.
  3. Begin analysis of the data.

Stage #3: Check

- Analyze the data and study the results
  1. Complete the analysis of the data.
  2. Compare the data to your predictions.
  3. Summarize and reflect on what was learned.
  4. Adapt, Adopt, Abandon?

Stage #4: Act

- Refine the change, based on what was learned from the test:
  1. Determine what modifications should be made.
  2. Prepare a plan for the next test.

PDSA Cycle

Begin to Trial potential solutions

Stage	Description	Steps	Comments
Plan	Plan the test or observation, including a plan for collecting data.	1.) State the objective of the test. 2.) Make predictions about what will happen and why. 3.) Develop a plan to baseline the current process and test the change. (Who? What? When? Where? What data need to be collected?)	**Describe Problem, make prediction.** **Summarize Baseline Data**
Do	Try out the test on a small scale.	1.) Carry out the test. 2.) Document problems and unexpected observations. 3.) Begin analysis of the data.	**Enter Trial Information/ Results**
Study	Analyze the data and study the results.	1.) Complete the analysis of the data. 2.) Compare the data to your predictions. 3.) Summarize and reflect on what was learned. ▪ Adapt, Adopt, Abandon?	**Summarize Results** **Decide: Adapt, Adopt, Abandon?**
Act	Refine the change, based on what was learned from the test.	1.) Determine what modifications should be made. 2.) Prepare a plan for the next test.	**Modify and Retest**

Future State Process Map

Once viable solutions are chosen, a *Future State Process Map* is used to visualize the process following implementation. Using affinity diagrams and/or brainstorming techniques, modifications to the current process flow are determined to eliminate and/or reduce failure mode impact on process performance.

Lean tools and systems engineering principles implementation strategies are developed to move the process under consideration from 'current' to 'future' state. Solutions under consideration should be well within boundary conditions and the project scope as defined in the project charter. Often, solutions can be linked to strategic business objectives such as increased revenue or reduced cost.

The future state process map and solution pathways are further validated through communication to staff members not on the project team or by physically testing the future state process.

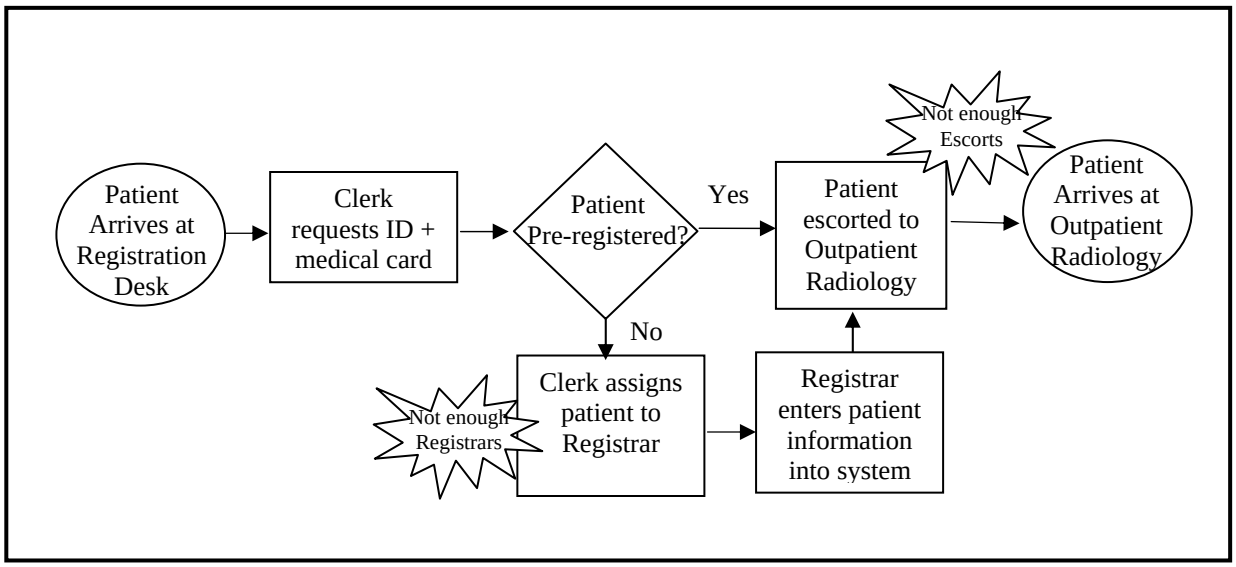
Anticipated process improvements incorporated into the *Future State Process Map* may include:

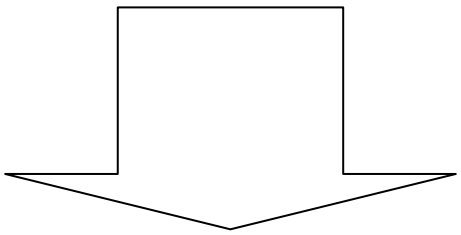
- Application of 5S, visual controls and workstation design techniques to improve workflow
- Relocation of equipment and supplies to optimize access and flow
- Process redesign to remove of reduce impact of constraints

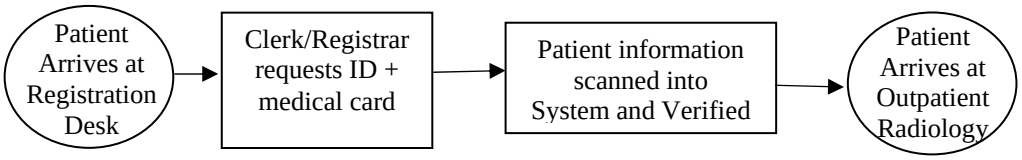
Steps to creating a *Future State Process Map*:

1. Review the current state process map.
2. Utilizing brainstorming and affinity diagram techniques, apply basic and advanced Lean techniques to reduce or eliminate the impact of operational barriers.
3. Generate a list of potential solution pathways that must be implemented to move the process from current to future state.
4. Validate the future state process map and solution pathways by:
    - Share with non-team staff members, ask for input
    - Physically test the new process during a trial run

Example Future State Process Map for Registration Process







Potential Solutions:

- Cross train clerks/registrars
- Card Reader + IT Integration into registration system
- Move Radiology Clerk Station Closer to Radiology
- Better Signs and Directions from registration to Radiology

RPIW Session #5: Sustainability Strategy

The goal of this project session is to finalize the future state process map, generate a comprehensive list of solutions and develop a pilot implementation plan to implement the solutions over a 4-6 week timeframe. This type of implementation strategy is often referred to as a 'staggered' implementation. The scope of the implementation during the pilot may be narrowed to a specific patient population or unit.

Additionally, during this project session, the project team develops a process control strategy to insure regular feedback of protocol compliance levels during and following implementation. In our experience, daily feedback through the implementation is necessary to assess the impact of process changes. The results from daily audits are often displayed prominently within the process areas to encourage staff discussion of progress and foster awareness among staff members, including those not on the process team.

The objectives of this project session are to:

- Finalize the Future State Process Map
- Develop a Pilot Study Implementation Plan
- Develop pilot and long term process control plans

The expected outcomes include:

- Future State Process Map
- Solution List with assessment of 'Best Solution'
- 1st revision Pilot Study Implementation Plan
- Pilot process control plans

The agenda for this project week includes:

1. Finalize Future State Process Map
2. Introduction to Pilot implementation tools
3. Develop Pilot Implementation Plan
4. Develop Pilot Control Strategy

Pilot Implementation Plan

A *pilot implementation plan* is generated to outline implementation of solutions throughout a 90 day pilot implementation cycle. This type of implementation strategy is often referred to as a 'staggered' implementation. Often, the scope of the implementation during the pilot is narrowed to a specific patient population or unit.

The implementation plan is created to detailed actions that must occur prior to implementation of a specific process redesign component. Team members are typically assigned as owners for individual action items and dates for completion are determined.

The components of the *pilot implementation plan* include:

- Listing of solutions that will be implemented
- Action items associated with the implementation of each solutions prior to pilot
- Owners and completion dates for each action item

Example Pilot Implementation Plan

Solution	Task	Owner	Completion Date	Status
Card Reader	Get Pricing/Features	JJ	1/1/2006	Completed
	Source Vendor	JJ	1/15/2006	Completed
	Select Vendor	JJ	1/20/2006	In-Progress
	Purchase	JJ	1/25/2006	
IT Integration	Vendor Selection	AB	1/20/2006	In-Progress
	Data Entry Integration	AB	2/15/2006	
	Validation Function	AB	2/15/2006	

Process Control Strategy

The process control strategy includes components of data feedback from the process under investigation following implementation and creation of administrative infrastructure to encourage sustainability of process improvements.

The *control plan* is developed to insure regular feedback of protocol compliance levels during and following implementation. In our experience, regular, daily feedback through the pilot implementation is necessary to assess the impact of process changes. The results from daily audits are often displayed prominently within the process areas to encourage staff discussion of progress and foster awareness among staff members, including those not on the process team.

A *Control Plan* includes the following information:

- Metric: Description or title of measurement
- Target Value: Goal or Target operating value
- Data Source: Location of data
- Collected by: Persons or role responsible for data collection
- Sample Size/Frequency: # of samples and how frequently data will be collected
- Collection Method: How the data will be collected, i.e. historical, manual, form
- Review Frequency: Frequency that the data will be reviewed, i.e. daily, weekly, quarterly

Note that all metrics impacted by the implementation plan should be monitored as part of the pilot control plan.

Example Control Plan Template

Project Title:

Process Owner:

Metric	Target Value	Collected By:	Sample Size/ Frequency	Collection Method	Review Frequency
Door to Radiology Time	<5 minutes	JA	5 patients/hour, 7am-10am and 2pm-5pm	Manual Time Studies	Daily
Registration Time	<2 minutes	All	All	Data from Reg System	Daily
Registration Wait Time	<1 minute	JB	5 patients/hour, 7am-10am and 2pm-5pm	Manual Time Studies	Daily
Travel Time to Radiology	<1 minute	Varies	5 patients/hour, 7am-10am and 2pm-5pm	Manual Time Studies	Daily
Registration Patient Satisfaction	>85% very satisfied	JD	All/Daily	Survey at end of process	Daily
Employee Satisfaction	>85% very satisfied	AA	Weekly	Employee Survey	Weekly

Other Topics:

Sustainability and Spread

Sustainability and *Spread* (a.k.a diffusion) are important considerations when building a quality program. Any Lean Healthcare program must be specifically designed to encourage sustainability and spread of improvements, tools and techniques.

What is *Sustainability*? Performance improvements persist over time.

How is *Sustainability* assessed?

- Excellent: Fully implemented, Sustained to goal for greater than 12 months
- Good: Significant or partial implementation, sustained to goal for greater than 6 months
- Fair: Some implementation occurred, but did not sustain to goal for greater than 3 months
- Poor: No Implementation, and/or did not meet goal for at least 3 months following implementation or other sustainability issues

What is *Spread* (a.k.a *Diffusion*)? The application of tools and techniques outside of the original project focus area.

How is *Spread asses*sed?

- Excellent: Principles spread to other unit or project area with no outside assistance
- Good: Principles spread to other unit or project area with limited outside assistance
- Fair: Some evidence of application of principles beyond initial project area

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- Poor: No evidence of application of principles beyond initial project area

What are the factors impacting *Sustainability [1]*?

- Bottom up vs Top Down Initiatives: change should be driven from the lowest level possible within the organization
- Small Incremental Tests of Change: change should be gradual, beginning with the lowest levels of implementation complexity and migrating to higher levels over 4-6 weeks.
- Regular (Daily) Data Feedback to front line staff: Process performance data should be presented to the front line staff members on a regular basis (daily is preferred, reducing frequency as process stability is achieved).
- Accountability infrastructure: Performance metrics should be monitored and supervisors, front line staff members held accountable to low performance and recognized/rewarded for high performance.

What are the factors influencing *Spread [2,3]*?

- Perceived Benefit - organizational and personal
- Compatibility with existing systems, values, beliefs, current needs
- Simplicity – Simple innovations spread faster than complicated ones due to the role of adaptation in spread of innovation.
- Trialability – Changes should be tested and verified prior to full implementation.
- Observability – Tests of change should be conducted in such a way so as to be readily observable by other 'early adopters'.

Discussion: How would a Lean Healthcare Program be designed to best encourage sustainability and spread?

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Berwick's 7 rules for disseminating innovations in healthcare [2,3]:

1. Find Sound Innovations
2. Find and support Innovators
3. Invest in Early Adopters
4. Make early adopter activity observable
5. Trust and enable reinvention
6. Create 'slack' for change

[1] Nolan K, Schall MW, Erb F, Nolan T. Using a framework for spread: The case of patient access in the Veterans Health Administration. Jt Comm J Qual Patient Saf. 2005 Jun;31(6):339-47.

[2] Hankinson MT, Faraone D, Blumenfrucht M. Sustained improvement for specialty clinic access. Jt Comm J Qual Patient Saf. 2006 Mar;32(3):142-51.

[3] Berwick DM. Disseminating innovations in health care. JAMA. 2003 Apr 16;289(15):1969-75