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A Guide to Lean Healthcare Workflows

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International Technical Support Organization

A Guide to Lean Healthcare Workflows

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First Edition (August 2015)

This edition is about the Lean methodology.

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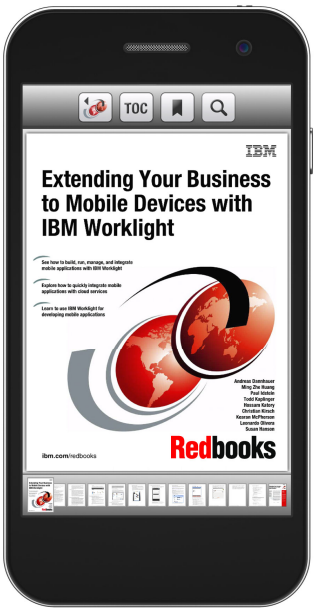

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Preface

This IBM® Redpaper™ publication describes Lean, which is a systematic approach to understanding and optimizing processes. Various methodologies can be used to help an organization reach its objectives depending on their criteria: lowest risk of failure, fast to resolution, or lowest cost for deployment. What every organization should consider is what method has the greatest impact. This paper explains why Lean is the best fit.

The paper also delves into the five steps of Lean and describes each step in-depth and includes techniques, example worksheets, and materials that can be used during the overall analysis and implementation process. The paper provides insights that are derived from the real-world experience of the authors.

This paper is intended to serve as a guide for readers during a process-improvement project and is not necessarily intended to be read end-to-end in one sitting. It is written primarily for clinical practitioners to use as a step-by-step guide to *lean out* clinical workflows without having to rely on complex statistical hypothesis-testing tools. This guide can also be used by clinical or nonclinical practitioners in non-patient-centered workflows. The steps are based on a universal Lean language that uses industry-standard terms and techniques and, therefore, can be applied to almost any process.

Here are the five steps of Lean that are described in this paper:

- Define value from the patient's perspective.
- Map the value stream, and identify issues and constraints.
- Remove waste, and make the value flow without interruption.
- Implement the solution, and allow patients to pull value.
- Maintain the gain, and pursue perfection.

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This paper was produced by a team of specialists from around the world working at the International Technical Support Organization, Poughkeepsie Center.

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Amy Valentini is a Certified Lean Six Sigma Black Belt with four years of experience in process improvement at Phytel and six years of experience in Organization Development. Amy serves as a Senior Quality Management Specialist at Phytel and Scrum Master for several of Phytel's software development teams. She holds a Bachelor of Fine Arts from Texas Christian University. She has served as a project leader for many process improvement initiatives and has taught over 150 Lean Six Sigma modules for both internal employees and clients. Amy is also a Certified Scrum Master, is trained as an ISO 9001:2008 Internal Auditor, and served as an examiner for the Quality Texas Foundation. She helped implement a Quality Management System that included process excellence initiatives and an ISO 9001:2008 Certification that in 2013 was awarded the Runner-up for “Best Start Up Business Process Excellence Program (Under 2 Years)” globally by the Performance Excellence Network (PEX).

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1

Introduction

This chapter provides a unique and experience-based perspective on process improvement that uses methodologies such as Lean.

This chapter covers the following topics:

- Stopping the confusion and Lean first
- Failure does not have to be an option
- Purpose of this publication
- What Is Lean

1.1 Stopping the confusion and Lean first

Author perspective: This section was written by Jerry Green, PhD.

My views of industry standard process improvement methodologies have dramatically changed during my career. I have been exposed to many methodologies, such as:

- Plan–Do–Check–Act or Plan–Do–Check–Adjust (PDCA)
- Plan-Do-Study-Act (PDSA)
- Define, Measure, Analyze, Improve, Control (DMAIC)
- Define, Measure, Analyze, Design, Verify (DMADV)
- Define, Measure, Analyze, Design, Optimize, Verify (DMADOV)
- Identify, Design, Optimize, and Verify (IDOV)
- Define, Measure Analyze, Improve, Install, Control (DMAIIC)
- Hoshin Kanri
- A3 Process
- Agile
- Project Management (PM)
- Lean
- Helix Method
- Rummler-Brache

Every time that I turn around, another consultant is coming up with a modified version, along with a convincing story about the reason we all need to start following their approach to improve internal processes. Of course, the entire organization must purchase that consultant's book and pay for that consultant's training. What I finally realized is that most process improvement approaches work well when applied to the right situations. All of them have the same basic objectives in mind, such as improving patient satisfaction, lowering the cost of doing business, and improving profit margins. So, if they all work reasonably well, which method should an organization start with?

When I use my Global Positioning System (GPS) to find a specific location, I can choose the shortest path, the fastest path, a path without tolls, or a path without major highways. Each path gets me to the same destination but with varying degrees of difficulty and speed. Choosing a methodology for process improvement is similar. Which methodology helps an organization reach its objectives with the lowest risk of failure, at the fastest rate of speed, and at the lowest cost for deployment, while having the biggest impact? The answer is Lean.

Deploying Lean first and removing non-value-added activities can help ensure that an organization is not spending time and money improving activities that should be eliminated or automated and that front-line employees are working only on activities that add value for the customer. Further, Lean can be applied when building a process from scratch to ensure that non-value-added activities are designed out of the process. Lastly, Lean can be applied effectively in many environments beyond manufacturing, such as healthcare, and can easily be integrated with PDCA, PDSA, DMAIC, DMADV, A3, Rummler-Brache, and many of the other methodologies. For this exact reason, by combining the two approaches, Lean Six Sigma was born.

Lean can be learned quickly and applied immediately for cycle-time reduction. Lean does not require statistics or hypothesis-testing tools, technical language, or years of experience. Most of the Lean tools can be applied by using sticky-note pads, white paper, and markers.

1.2 Failure does not have to be an option

Author perspective: This section was written by Amy Valentini**.**

Too often in my career, I have seen projects that are initiated and never completed. This has been my experience in the nonprofit sector, in software development, and from what I have learned while working with clients in the healthcare community. When initiating improvement projects, people typically start with the best intentions to increase revenue or customer satisfaction or even to streamline internal processes for employees. The two things I have seen most often that cause an improvement effort to fail are jumping to a solution without properly addressing the root cause and not being prepared for the change management component that is, without a doubt, critical to change. Both of these things are addressed in detail in this step-by-step guide to lean project management.

No one knows better than a healthcare provider that time is often crucial when treating a patient, but you cannot jump to a diagnosis without fully examining that patient. Underlying issues can, and most likely will, surface and cause bigger problems down the road. It is no different when analyzing a process that is broken. If the right people do not ask the right questions, the solution might not solve the true root cause, and therefore it does not close the gap in your process. It might seem fine for a while, but the project has failed because this problem will rear its ugly head again, costing more time and money. While reading about root-cause analysis (see 3.10, “Prioritizing the issues by using a Failure Mode and Effects Analysis” on page 31) you realize it is not hard to ask the questions and identify steps in your process that are non-value-added. What can be difficult is communicating to the process-step owners that what they are doing each day is not adding value to the business or the patient.

It is rare to find a person who can really embrace change. I will never forget one manager I worked with who came to me begging for help for a drowning team. After we defined what to go after first, measured the current state, and brainstormed solutions, the manager said to me, “Uh, you're going to change it?” I laughed to myself, thinking, Really? You came to me and asked for help, and now you do not want me to change anything? It is natural for people to fear change. They have been working hard at their jobs and often get defensive when told that there might be a better way to perform those tasks. In my experience, change management has proven to be a difficult and often missing piece of the process. It is common to get pushback and be told, “It just won't work,” or, “We've tried it before.” These are the people who want the project to fail so that they do not have to change and can keep plugging along as they are. One benefit of this publication is that we chose to address the change management subject along the way instead of separately from the improvement process steps. That way, the project leader can communicate effectively, lean on the champion, be part of a guiding coalition, and foster the change as a team. With this approach, there is a better chance that the change sticks and not fail because of lack of buy-in from the team members and those performing the process steps.

My coauthor (Jerry Green, PhD) and I have been fortunate to offer Lean Six Sigma training to clients in the healthcare industry and, while doing so, have listened to attendees describe gaps in processes from patient registration to quality of care. We realize that with the complexities of healthcare, band-aids are common, and changes are often widespread. These intricacies are what set healthcare apart from all other industries. There is such a variety of “customers” who are directly or indirectly involved in the processes. Some of the less obvious customers include insurance providers, government agencies, and pharmaceutical companies. This is what has fueled our desire to write this publication. We hope that it can assist you during process-improvement projects and lead you to smaller wins along the way to big success.

1.3 Purpose of this publication

This publication is intended to serve as a guide for readers during a process-improvement project and is not necessarily intended to be read end-to-end in one sitting. It is written primarily for clinical practitioners to use as a step-by-step guide to *lean out* clinical workflows without having to rely on complex statistical hypothesis-testing tools. This guide can also be used by clinical or nonclinical practitioners in non-patient-centered workflows. The steps are based on a universal Lean language that uses industry-standard terms and techniques and, therefore, can be applied to almost any process.

We believe that by following the Lean approach, 75 - 80% of problems in an organization can be mitigated. This approach is referred to as going after “low-hanging fruit”. There are still many complex situations in which robust Six Sigma tools and techniques should be used.

The ideas that we present in this paper are our sole opinions based on our personal training and experiences. Readers might find that other Lean Six Sigma practitioners have different opinions and thoughts on process improvement techniques. Therefore, we are not suggesting that this is an all-or-nothing approach. Use the knowledge in this paper as a guide to add to your own personal trainings and experiences, and modify your own process improvements in ways that work best for you and your organization.

1.4 What Is Lean

Lean is cycle-time reduction through waste elimination.

1.4.1 Five Lean steps in sequence

Regardless of how or where Lean is deployed, it remains a systematic approach. Whether used with PDSA, PDCA, DMAIC, or other methodologies, the five Lean steps remain unchanged and must be followed in sequence. This remains true for all organizations within a company, including healthcare, manufacturing, marketing, sales, or other environments. Here are the five steps in Lean:

- Define value from the patient's perspective.
- Map the value stream, and identify issues and constraints.
- Remove waste, and make the value flow without interruption.
- Implement the solution, and allow patients to pull value.
- Maintain the gain, and pursue perfection.

The following chapters describe each of these steps in more detail.

2

Defining value from the patient's perspective

This chapter describes step 1 in the Lean process: Defining the value stream from the patients perspective.

This chapter covers the following topics:

- Identifying the area to investigate
- Creating a sense of urgency
- Starting the charter
- Getting a champion
- Agreeing on the scope with the champion
- Assembling the core project team
- Developing a simple SIPOC map
- Defining patient basic needs by using the Kano model
- Categorizing and labeling patient needs
- Tollgate 1: Reviewing the value as defined by the patient

2.1 Identifying the area to investigate

The first step in defining the value stream from the patient's perspective is to identify an area to investigate. This likely is a process with known issues or an area that has challenging goals that must be met, such as patient-satisfaction scores, clinical revenue, or processes such as hiring, claims, and equipment ordering, to name just a few.

2.2 Creating a sense of urgency

The problem statement must be measurable, for example:

- Improve patient satisfaction scores.
- Improve clinic revenue.
- Decrease overtime work.
- Decrease cycle time for taking vitals.
- Decrease time to register.

Be careful to not use a solution as the problem statement, for example:

- Decrease registration cycle time to improve patient satisfaction scores.
- Automate the registration process.

Both of these statements suggest a solution. You might find, for example, that the difficulty of patients finding a parking space or the lack of wifi in the waiting room might affect patient satisfaction more than the registration process. So, be open at this stage of the process improvement and do not suggest a solution.

2.3 Starting the charter

No charter, no project! The charter does not need to be completely filled out because it will be progressively elaborated over time. At this stage, the charter should include:

- The problem statement
- The proposed champion
- The benefit

Later, and with the champion's help, you decide on:

- The project leader
- The project team members
- Scope (what is included and excluded)

2.4 Getting a champion

The champion is a sponsor who can approve the release of an employee's time, funding, and other resources to work on an improvement project. Sometimes a champion comes to you for help, and other times you must influence a champion to sponsor your idea for a process improvement. The champion must be someone who has the authority to remove barriers and influence change. Change management, which is described in 5.2, “Following a robust change management process” on page 57, represents a critical success factor for project effectiveness. Having an influential champion with enough formal authority to remove barriers improves the probability of success. The champion should be someone who is easily accessible and at least one level higher than the leaders of the primary processes being changed when an improvement is cross-functional.

2.5 Agreeing on the scope with the champion

The scope represents the boundaries of the project, specifically what is included and excluded. Think of the scope as the *do not cross* line. This is an important step because the project timeline can easily slip when stakeholders attempt to broaden the project with other ideas. For example, the champion might want to focus on a specific region, only one clinic, or on a particular patient group, or they might want to exclude a specific patient group, region, or clinic. In most cases, the champion makes this call, but the project leader can negotiate, depending on the timeline and constraints. Later, if other stakeholders attempt to broaden the scope, it can be offered as a phase-two project after the current project is completed. If they continue to push back, discuss with the champion. Any change in scope impacts the timeline and resources that are needed for the project and often results in the need for a larger team.

Reminder: Remember to update your charter scope.

2.6 Assembling the core project team

Have the champion help select the team members. Remember to think cross-functionally, not just in the department on which the change will likely focus. For example, having an IT person on the team might be helpful if you believe that the system must be modified to support the change. Having the IT person's input during the improvement process versus informing him or her after the decision of a system change is made can help save time and money.

Keep the team membership between five and eight. Too many team members and it becomes difficult to manage calendars and to gain consensus. These team members are subject matter experts (SME) from the functional areas who give input into the current process and potential solutions as you move forward in the project. If the champion or others want to add more team members, then create an extended team. Extended team members can be brought in on an as-needed basis.

Have the champion set up a kickoff meeting to discuss the sense of urgency and why each team member was selected.

Reminder: Remember to update your charter team members.

2.7 Developing a simple SIPOC map

Creating a Supplier, Input, Process, Output, Customer (SIPOC) map is a simple process that can be completed in about thirty minutes to help identify the suppliers, inputs, steps, outputs, and customers of the process. A SIPOC can help the team visualize the elements of a process to ensure that items are remembered that can easily be overlooked during the Kano and mapping process, which is described in 2.8, “Defining patient basic needs by using the Kano model” on page 10 and in 5.1.3, “Allowing patients to pull value” on page 55.

2.7.1 Starting with the inputs by using the 5Ms and P method

Remembering everything that goes into a SIPOC map can be difficult. Start the inputs by using the Methods, Machines, Materials, Measurements, Mother Nature, and People (5Ms and P) method. This approach can help team members identify the inputs, and in turn the inputs help identify other areas of the SIPOC map.

Using white paper and sticky notes, have team members brainstorm the 5Ms and P that will be involved in the process. Do not worry if there is disagreement on which 5Ms and P to place in an input; if the input is remembered, the category it is placed in is not important. The inputs do not have to be in any particular order on the SIPOC (for example, see Figure 2-1).

Methods	Machines	Materials	Measurements	Mother Nature	People
Sign In Register EMR workflow Clinical workflow Care coordination Many more...	IBM Watson Health EMR Laptops Desktops Stethoscopes Exam lights Otoscopes Many more...	Registration forms Insurance cards Sign in sheet Paper for copier Needles Sharp containers Glove dispenser Many more...	Revenue Volume of patients Population scores EMR Analysis IBM Watson Health Thermometers ECG device Diabetic monitors BP aneroids Scale Many more...	Hospital associations Payers HIPAA FDA Room temperature Weather outside Clinic’s location	Patient Office staff Medical Assistant Scheduler Care Coordinator Physician Nurse Dietician Many more...

Figure 2-1 Example 5Ms and P

The team should brainstorm the following items:

- Inputs (Figure 2-2 on page 9)
- Suppliers of the inputs
- Process steps
- Outputs of the process steps
- Customers of the outputs (Figure 2-3 on page 10)

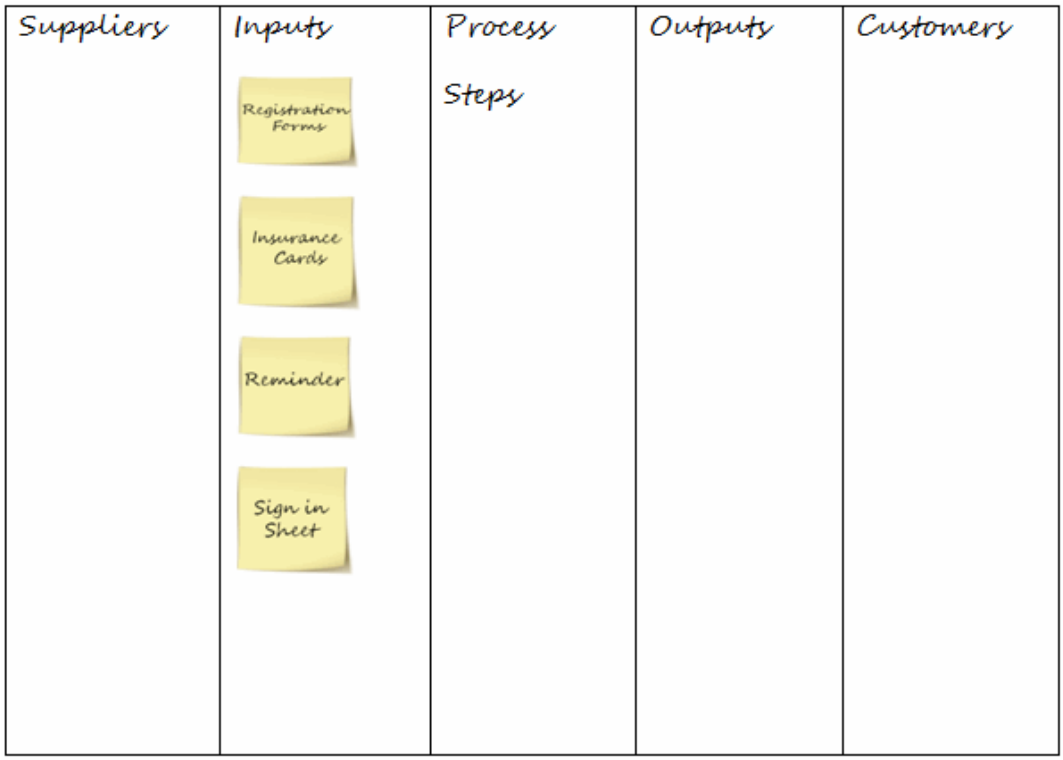

Figure 2-2 Paper SIPOC example for entering the inputs

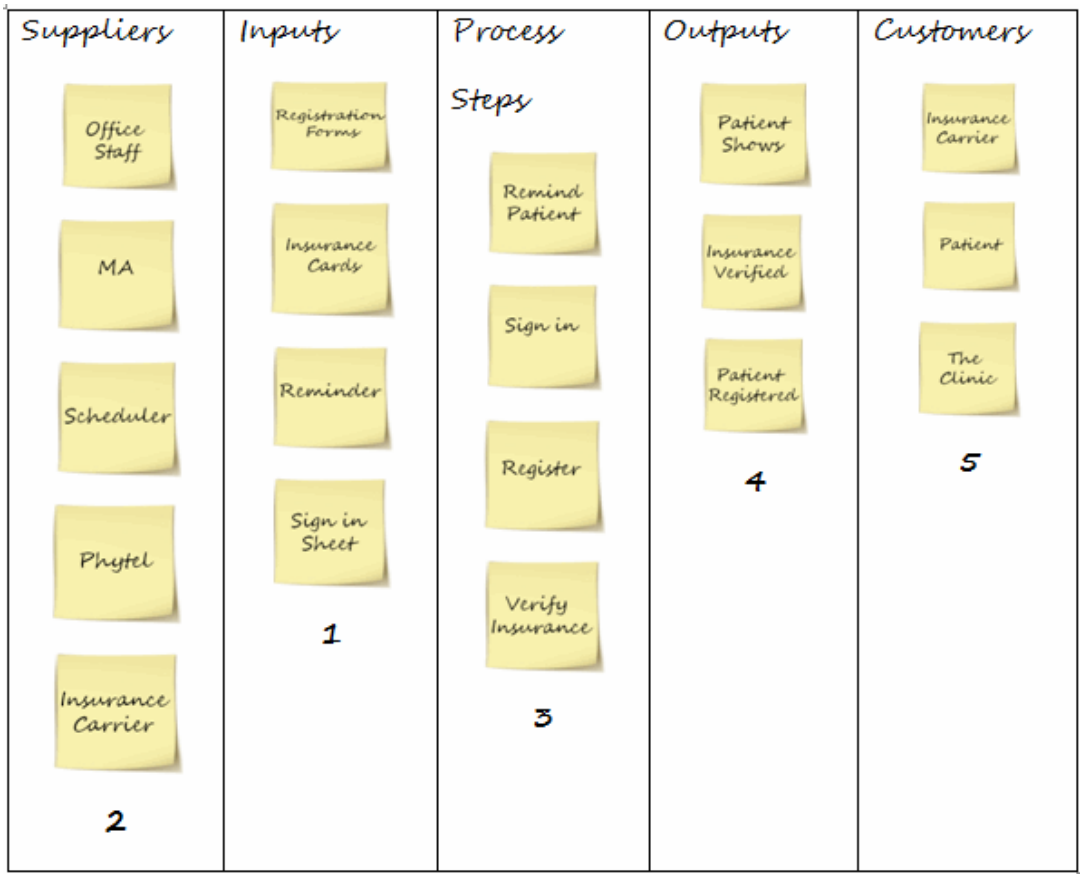

Figure 2-3 Paper SIPOC example

After the brainstorming is complete, place the SIPOC in an area that is visible to the project team for when they go through the value-stream mapping process later.

2.8 Defining patient basic needs by using the Kano model

Too often, processes are designed to *wow* customers, but miss basic needs during the process, which results in dissatisfied customers regardless of the *wow* factor. Brainstorming that is based on the Kano model, which was developed by Noriaki Kano, is a great way to ensure that basic needs are not forgotten. This tool can be valuable for brainstorming the needs of both internal and external customers. An example of the Kano model is shown in Figure 2-4 on page 11.

Note: Over time, all higher-level needs shift down and become basic needs. This concept is important to keep in mind because if you are not aware of the shift and your competitors are, you will likely lose customers.

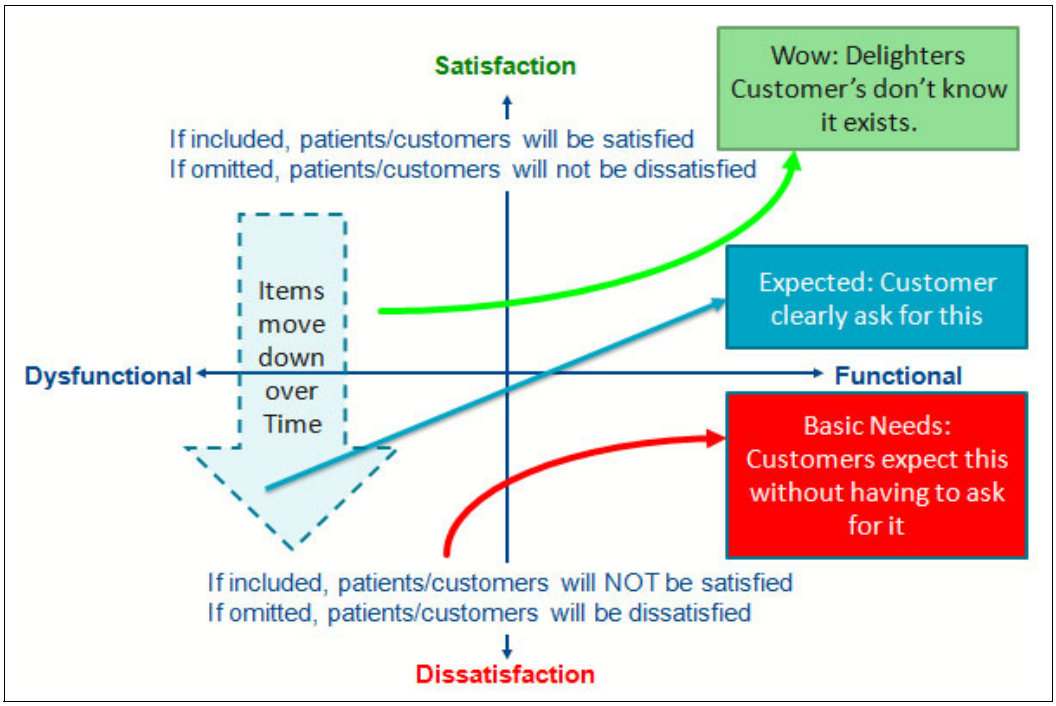

Figure 2-4 The Kano model

It is easy to remember things that customers specifically ask for, but basic needs often are forgotten. Using the Kano model as an approach to identifying customer/patient needs brings this concept to the front of the mind.

An example of a basic need for a patient is for the pharmacy to fulfill the prescription as requested by the physician. Even though a hospital might have a *wow* factor by having a pharmacy on the premises, allowing patients to fill prescriptions onsite, if the prescription is not filled correctly or takes too long, the patient will likely be dissatisfied because both of these needs are basic. However, do not expect the patient to be satisfied when the prescription is filled correctly and on time. Those needs are expected and no gratitude is expressed.

Be sure to refer to the SIPOC and brainstorm needs for every customer in the process. Using different colored sticky notes or labeling can help visually differentiate needs by customer segment.

Brainstorm the needs by using sticky notes on white paper and segment by need type, as shown in Figure 2-5. When you are done, review the notes to ensure that nothing is missing, especially a basic need.

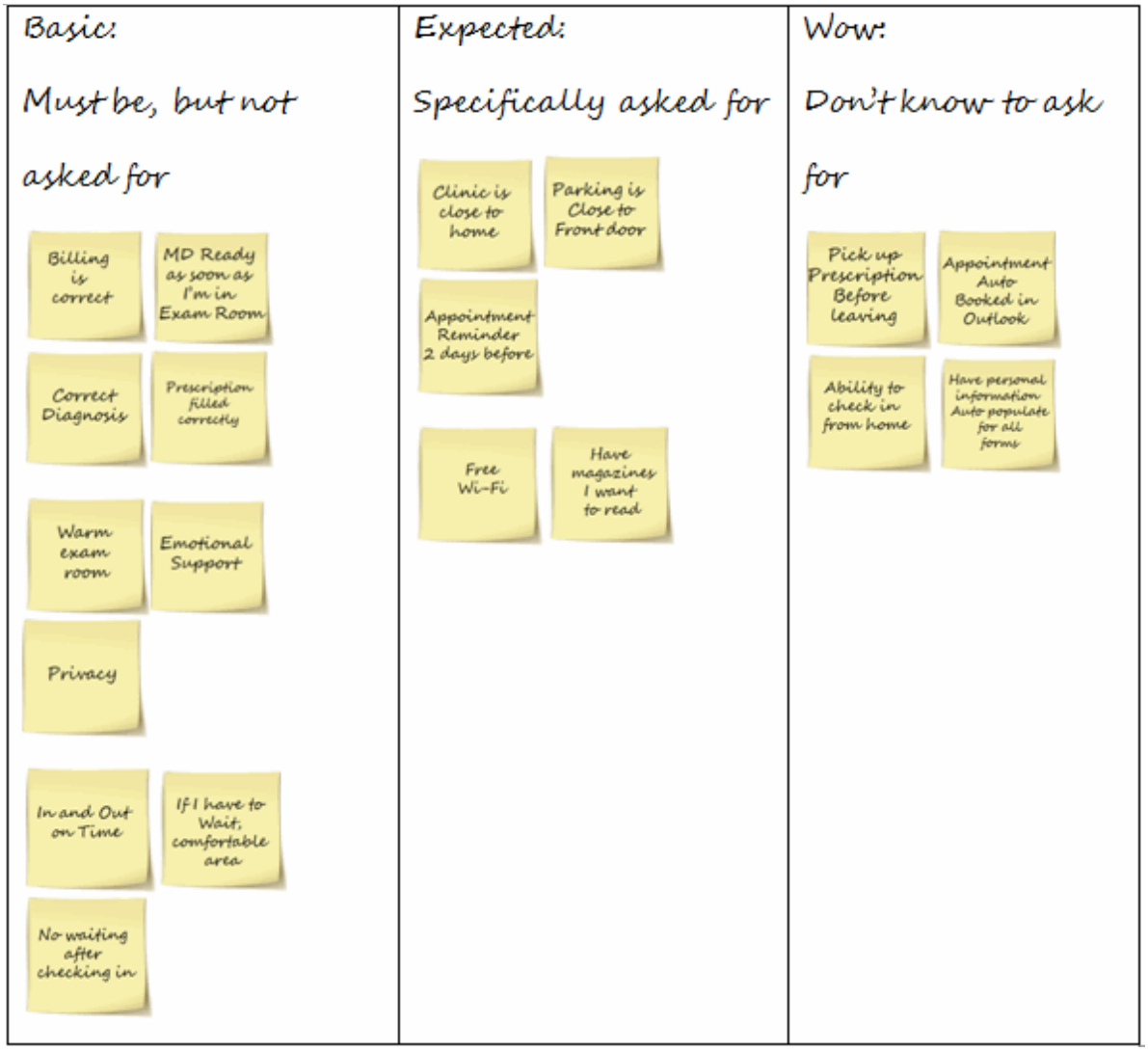

Figure 2-5 Kano brainstorming

2.9 Categorizing and labeling patient needs

Engage the team by having them work together to categorize the needs into buckets, and then label each category. This task is referred to as an *affinity diagram*, as shown in Figure 2-6, which is sometimes referred to as the KJ method, which is named after its inventor, Jiro Kawakita.

Figure 2-6 Affinity diagram based on Kano results

It is common for needs to belong to more than one category. For those needs, create additional sticky notes and place them in all the appropriate areas.

During the value-stream mapping exercise, the list of needs help ensure two things:

- The need is being solved or not.
- Depending on whether the need is solved or not helps identify potential opportunities for improvement where the gap is discovered.

2.10 Tollgate 1: Reviewing the value as defined by the patient

Set up a meeting with the team, champion, and other key stakeholders. Start with a summary of the reason for the project, and bring all stakeholders up to speed.

Explain that this meeting is not a decision-making one, but merely a review of findings to date. Review the categories that came out of the Kano model, and determine whether anything was missed. Update the categories as necessary.

Reminder: Update your charter customer needs.

If you store information electronically, you can take pictures of the work that is done so far and upload them with the charter.

3

Mapping the value stream and identifying issues and constraints

This chapter describes step 2 in the Lean process: Mapping the value stream and identifying issues and constraints.

This chapter covers the following topics:

- What is a value stream
- How many value streams does your organization have
- Benefits of value stream mapping
- Mapping the value stream
- Calculating the time that is spent on each activity and line on the map
- Conducting a value-add flow analysis
- Going to Gemba
- Identifying the value stream's constraints
- Tollgate 2: Reviewing the map with key stakeholders
- Prioritizing the issues by using a Failure Mode and Effects Analysis
- Tollgate 3: Reviewing the FMEA and Priority Matrix with key stakeholders

3.1 What is a value stream

A value stream is an end-to-end process that flows horizontally through an organization to provide value to a client, patient, or customer. Many process-improvement leaders make the mistake of mapping processes vertically rather than horizontally, focusing on a department instead of the entity that flows through the entire organization. In a horizontal-process design, because what is being mapped is an entity and not a facility, employees, or a department, handoffs can be visualized and downstream effects can be identified.

3.2 How many value streams does your organization have

Many entities can flow through an organization, but only one entity can flow through a single value stream. For example, a patient represents the primary entity that flows through the core value stream of a medical practice or hospital, and a staff member, who also represents an entity flowing through a healthcare organization, flows through an entirely separate value stream. Experience has shown that most organizations have 5 - 8 value streams that either directly or indirectly touch their constituents.

3.3 Benefits of value stream mapping

Here are some of the benefits in visualizing the path of an entity as it flows through an organization:

- Staff members can see how their process directly or indirectly touches a patient.
- The effects that upstream processes have on downstream processes become evident.
- When changes are made to an upstream process, it is much easier to model the expected downstream effect.
- When quality and process metrics fail to meet requirements, it is easier to determine the point at which the root cause occurred.
- Handoffs between processes can be better managed. In many cases, the transition between handoffs is where both defects and delays occur.
- Each process step can be measured in terms of its impact on overall cycle time.
- It can aid in identifying areas for quick improvement.

Horizontally value stream mapping of how an entity moves end-to-end through an organization can offer many benefits beyond the traditional vertical way of thinking. This method encourages organizations to take a patient-centered focus in how they manage processes and measures success.

3.4 Mapping the value stream

To identify issues and constraints in a process, create a visualization of the value stream and where the issues and bottlenecks are believed to occur. Using a value stream map can help the team visually identify areas to focus on, and which issues and constraints have the greatest impact on the value stream's outcomes.

3.4.1 Traditional value stream map

A traditional value stream map starts at the right with the customer of the process (Figure 3-1). Then, the information that is received from the customer/patient flows from right to left at the top, as illustrated with the lightning-bolt lines. The customer/patient or thing flowing through the map flows across the bottom from left to right. Non-value-added (NVA) times and value-added (VA) times are captured at the bottom of the map and summed at the right. Most traditional value stream maps also include metrics and current state figures in the process step boxes.

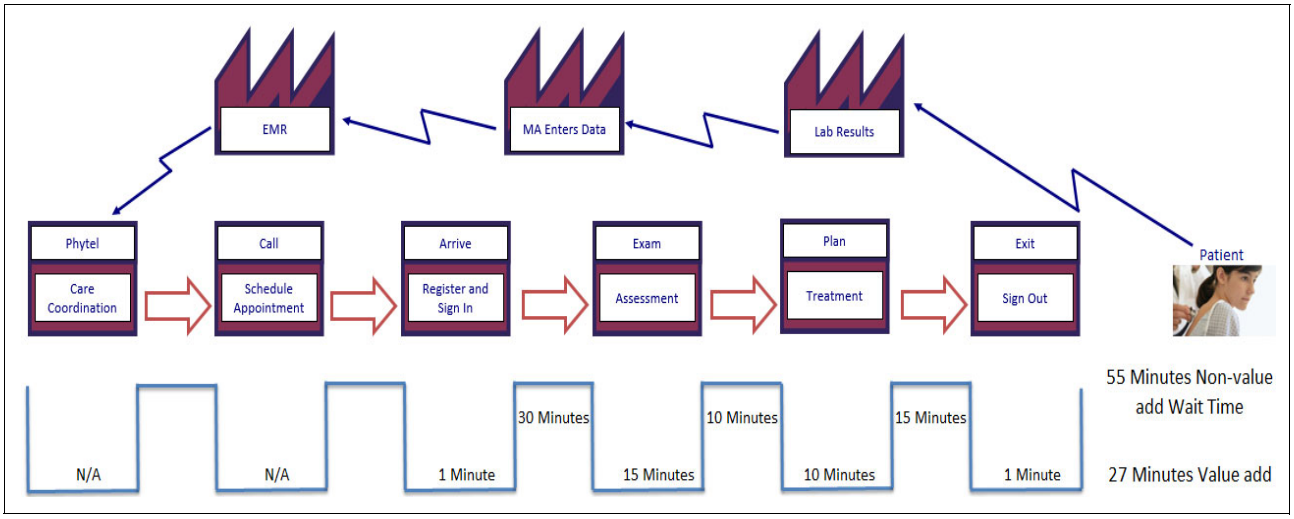

Figure 3-1 Traditional value stream map

For transactional processes, such as with healthcare, a cross-functional map is preferred because it illustrates where handoffs occur in the value stream. Many issues occur during the handoffs and must be captured. Also, a cross-functional map better illustrates the complexity of a process that might be missed with the traditional value stream map. In addition, because it still represents the value stream, it is still referred to as a value stream map.

3.4.2 Identifying the entity

An entity is anything tangible, such as a person or item, which flows through the process end-to-end. There can be many entities that flow through an organization. For example, a hospital includes, but is not limited to, the following entities:

- Patient
- Physician
- Nurse
- Medical equipment
- Medicine by type
- Cafeteria food and supplies
- Patient information
- Insurance claims

Each entity flows through its own value stream map, that is, only one entity can flow through any single map. For this reason, it is important to know which entity is mapped. The SIPOC can be a good place to start. Many times, the entity to map is the primary customer in the C of the SIPOC, although that is not always the case. For example, although the patient is the primary entity flowing through a clinical value stream, if the hiring process is the issue that the project will focus on, then candidates are the entity and not the patient. If improving the patient experience is the issue to work on, then the patient is the entity.

During the first team meeting, having everyone on the team agree on the entity is crucial. Mapping cannot begin until the entity to map is known and agreed to.

Be sure that the champion agrees before starting the mapping process.

3.4.3 Thinking horizontally

It is natural to think about and focus on your own functional area and how that area is affected by the process or the identified gap. However, the sources of problems often occur during handoffs or are because of process issues in other functional areas. Upstream activities affect downstream processes, which are missed in a vertical process map. Therefore, it is critical to visualize the value stream end-to-end.

3.4.4 Identifying the entity start point

For a value stream map to be effective, it is critical to determine the beginning and ending points of the end-to-end horizontal process. Identifying the beginning and ending of a value stream can easily become an area of great debate.

For example, many people might feel that the patient value stream begins when a person enters the practice or hospital, and others might feel that the value stream begins through a healthcare branding campaign. Both are correct, but everyone in the team must agree on which beginning point to use for the value stream. The same goes for the ending point. It is preferable to start the process at the first point in which the entity is touched and then end at the last point.

With the project team, agree about the point where the entity is first touched by the process. For a patient, this is not the front door, but more likely the campaign or appointment call. For an employment candidate, it is not the day of orientation, but when the requisition was created by the hiring manager.

3.4.5 Identifying the entity stop point

Next, similar to the entity start, agree about the point in time where the entity is last touched by the process. For a patient, it might not be the back door of the clinic, but might go further to a follow-up call or follow-up lab test. For an employment candidate, the last step is likely not the end of day one, but might extend through the new hire training program or even further out.

It is preferable to start and stop at extremes rather than to cut the map short and miss critical activities that can affect the value stream. For example, in one mapping session, we discovered that the problem with patients not showing up on time was because of issues in finding parking places. If the map had started at the point where the patient walked through the door of the clinic, then the parking lot issue would have been missed.

3.4.6 Naming it end-to-end

Name the map based on the start and stop points. If the patient value stream starts at the appointment and ends at the follow-up call, then the value stream is named *appointment-to-follow-up*. If the hiring process value stream starts at the requisition and ends with training, then name the value stream *requisition-to-training*.

3.4.7 Identifying process steps

After the beginning and ending process steps are established, individual process steps must be identified in order of flow. These steps represent a noun and a verb that are combined to articulate a high-level action that is necessary to deliver the entity through the process.

After the high-level process steps are determined and aligned into the proper flow, the subprocess steps must be identified for each high-level process step. Again, it is critical that each subprocess step is aligned in its logical flow. It is recommended that during the mapping exercise, the departmental groups performing each subprocess are named. This allows for a cross-functional visualization for the end-to-end value stream.

3.4.8 Preparing for mapping

If you are using flip charts, start with six wide and two deep. If using white butcher paper rolls, start with about eight to ten feet. Always use painter's tape when taping up on a wall. This ensures that you do not peel the paint off the wall when you remove it.

Be sure to have plenty of sticky-note pads and markers.

3.4.9 Mapping

There are many mapping symbols (Figure 3-2), but you need to know only the primary ones for basic value stream mapping.

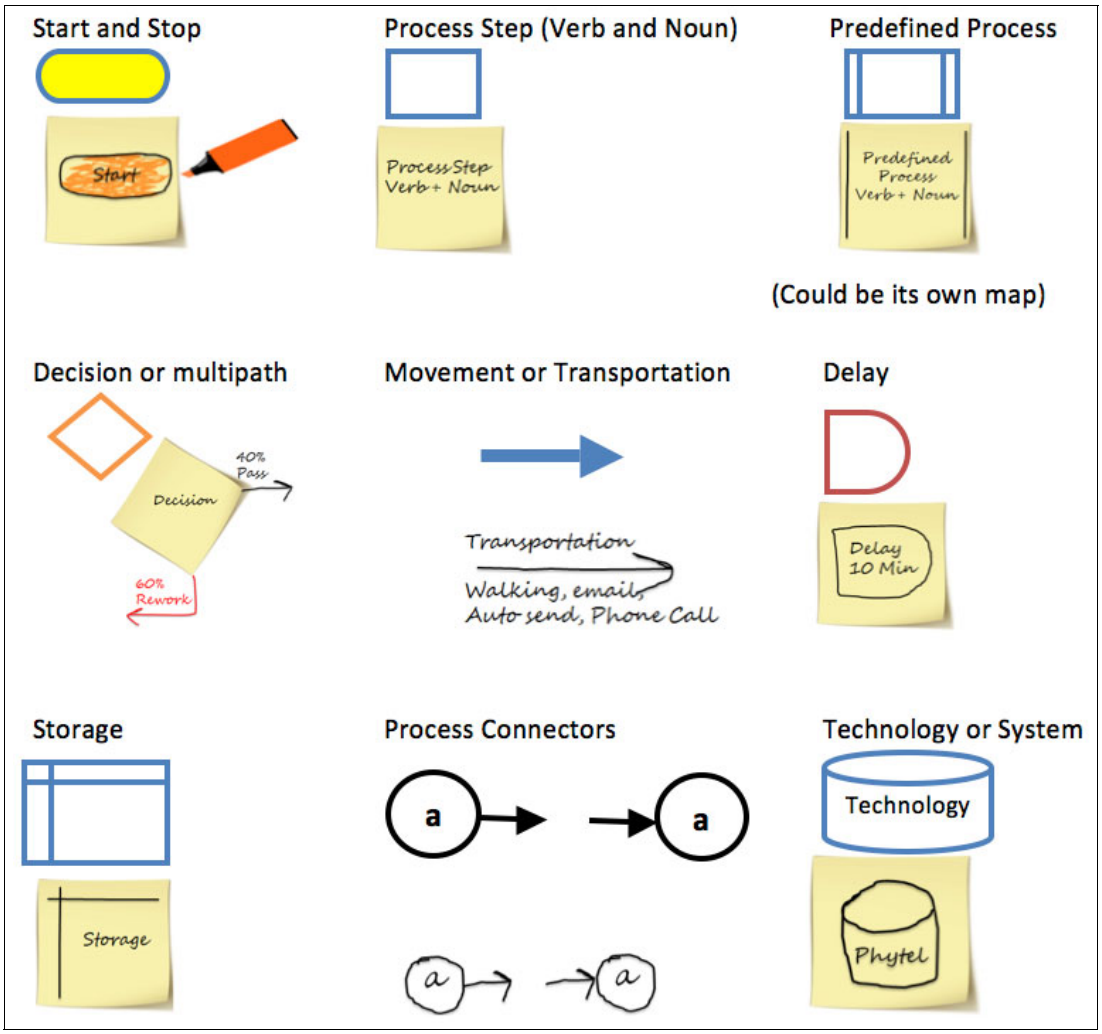

Figure 3-2 Mapping symbols

Here are tips to remember when mapping:

- Invite SMEs from potentially impacted cross-functional organizations or you might be remapping later.
- Use mapping paper and sticky notes to make changes during the mapping session easier.
- Use mapping paper and sticky notes to engage the team around the map.
- Start and stop at extremes:
  - A value stream can have multiple starts and multiple stops.
  - Color code each start and stop so that they stand out.
- Be the entity flowing through and capture everything that happens to it.
- Only one activity per sticky note.
- Do not put swimlanes on the paper map until it is completed:

  - Write the swimlane name at the bottom of the sticky notes.
  - Position the sticky notes so that you can add lines later and have each functional group or title positioned within its own swimlane area on the map.
- For decisions, always show the percentage that goes down each path.
- Do not leave naked lines:
  - Transportation is always a line. Emailing or delivering something is a line, not a process step.
  - Label the line and include percentages if more than one transportation type is used.
- Try to not use too many predefined processes or you will miss opportunities for improvement and quagmires will be hidden within them.
- Capture all rework loops and the percentage that goes back to an earlier process step.

Visualize the process flow from the perspective of the person or thing flowing through it. Map the detail so you can see every activity that flows through, which might include, but is not limited to, the following items (Figure 3-3):

- Wait time for something in someone's email folder
- Wait time for the next process step
- Flight time and travel to a client site
- Driving, walking, or standing in line
- Walking to a copy machine
- Every form filled out as separate process steps
- Systems in to which the data about the entity or person flows

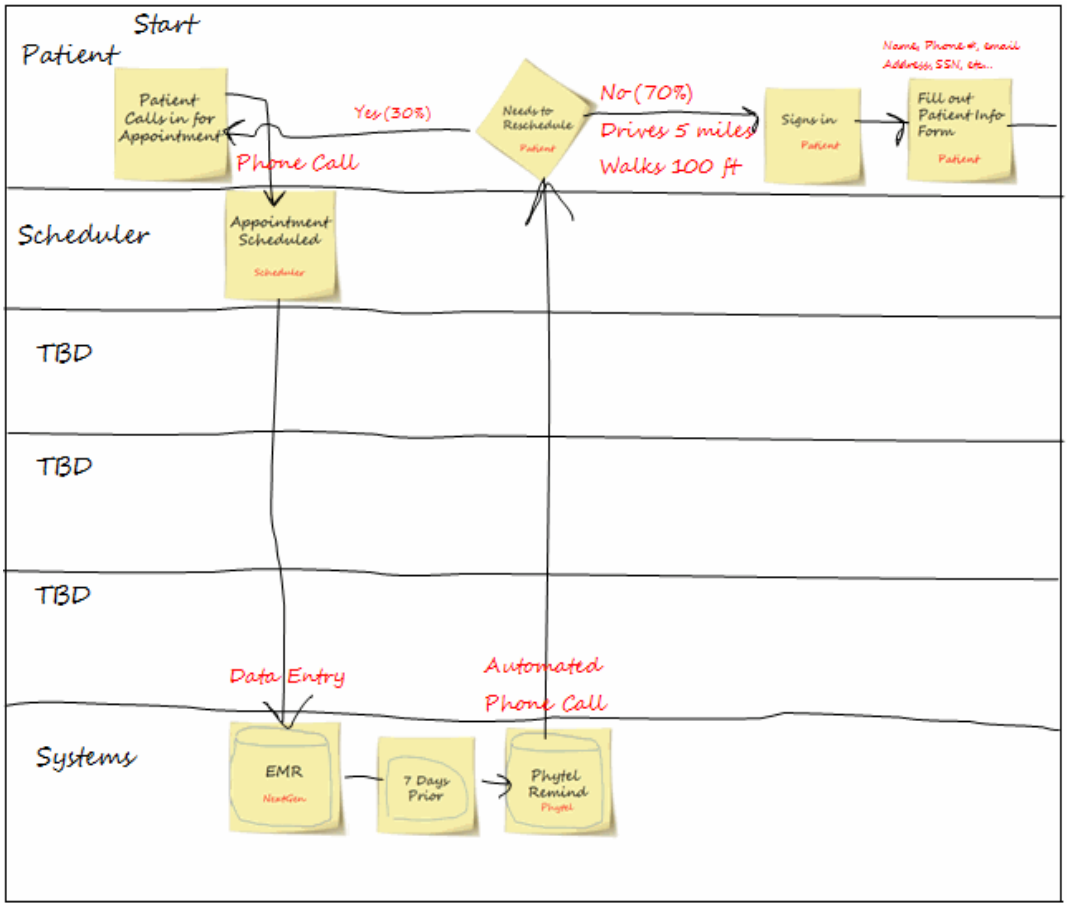

Figure 3-3 Mapping process example

When building a value-stream map of a cross-functional type, do not put swimlanes on the map when starting; instead, label the sticky notes with the title or functional group completing the process step. Always start at the top of the map with the customer of the process. For each new functional group working on a process step, shift the sticky note down so that a swimlane can be added after the mapping is completed (Figure 3-4). Then, when the map is completed, add the swimlanes. Some swimlanes might need to be wider than others because of more complexity occurring in that swimlane. Always put the systems or technology at the bottom of the map as the last swimlane.

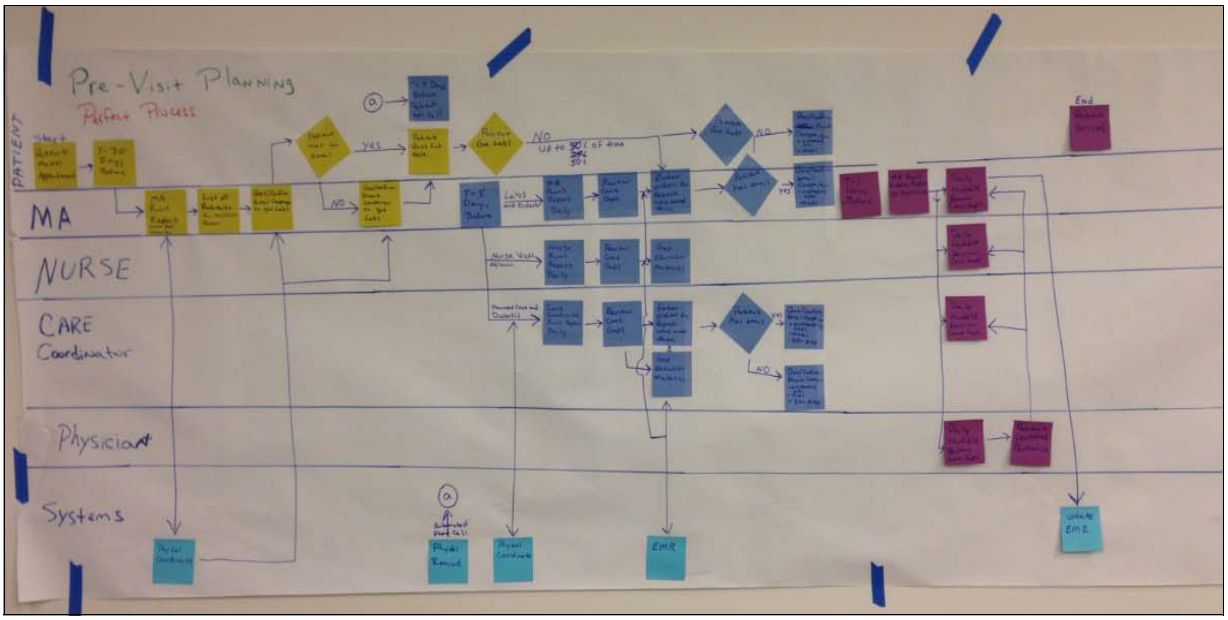

Figure 3-4 Example of a real-time paper process map

If a team feels that a value stream is overly complex, which is referred to as a *quagmire*, then the map should have areas that look complex (Figure 3-5). If a map is too high level and includes too many predefined processes, non-value-added activities might be hidden in value-added process steps. For example, there can be non-value-added activities that are hidden within the exam, which is a value-added process step.

Visualization is critical to creating a sense of urgency. If a process map looks perfect, then gaining support from key stakeholders to improve it is difficult.

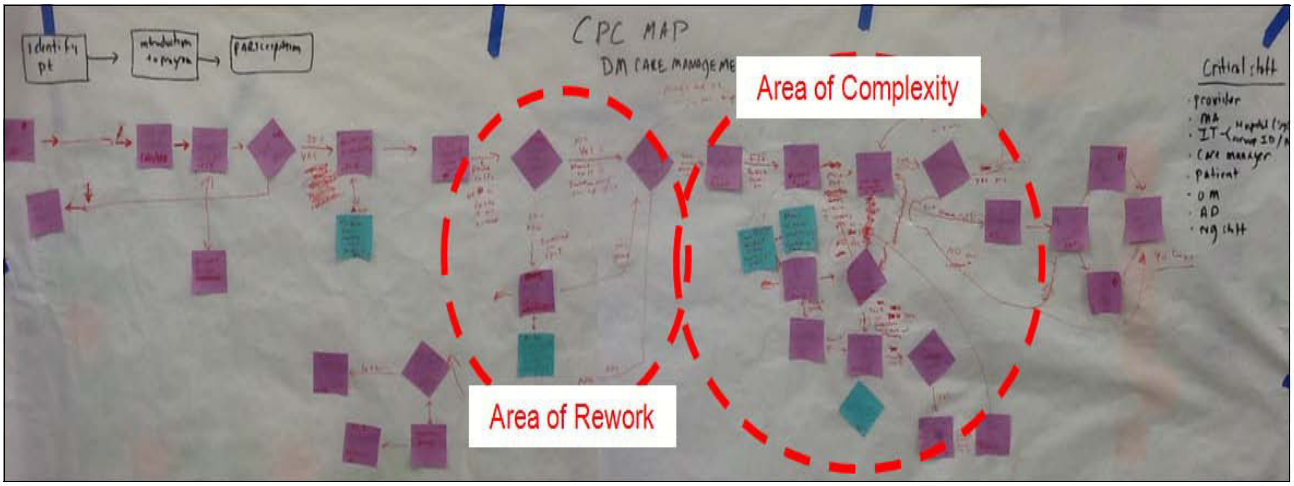

Figure 3-5 Example of a real-time paper process map with areas of rework and complexity highlighted

3.5 Calculating the time that is spent on each activity and line on the map

With the SMEs, estimate the time to perform each activity and write it next to the sticky note. Do not attempt to be perfect; just use an *in-the-ballpark* estimate. Keep the times as one minute, five minutes, ten minutes, fifteen minutes, and so on. This is one of the mapping steps that many teams over think and spend too much time trying to get to a perfect time frame. The point of this exercise is to estimate how much time is spent on value-added activities versus non-value-added activities.

Also, add the amount of time for each line on the map. Often, teams find that transportation, which is captured on the line, takes more time than the process step in to which it feeds. For example, a team that travels might identify travel as the key non-value-added time beyond the time that is spent on the process activity itself. Teams also often find that wait time for emails to be read and responded to can take much more time than the amount of work that is required to resolve the email. Therefore, include any wait time for the line as a delay on the map. Again, estimate based on past experiences; do not over think.

In cases in which there is much variation for an activity, capture the fastest time, average time, and slowest time, and then estimate the percentage for each time. You might find that the slowest time occurs only rarely or every day. Those findings can help shed light on issues to solve. Write those issues next to the appropriate sticky note or line.

Add up all the estimates for a total average time and write it down at the end of the map.

Circle the two sticky notes that have the greatest estimated average times. These notes might be the number one and number two constraints in the value stream.

3.5.1 Estimating the time for the hidden factory and adding it to the total time

The *hidden factory i*s an industry-wide standard term that is used in Lean that refers to the amount of time spent reworking. For each rework loop, calculate the percentage that goes through that loop. Then, add the time for each activity and multiply that times the percentage that goes back for rework (Figure 3-6). This will give you an idea of how much time is spent working on an activity again because it was not done correctly the first time. This also allows your team to estimate how much of the organization's time is spent reworking.

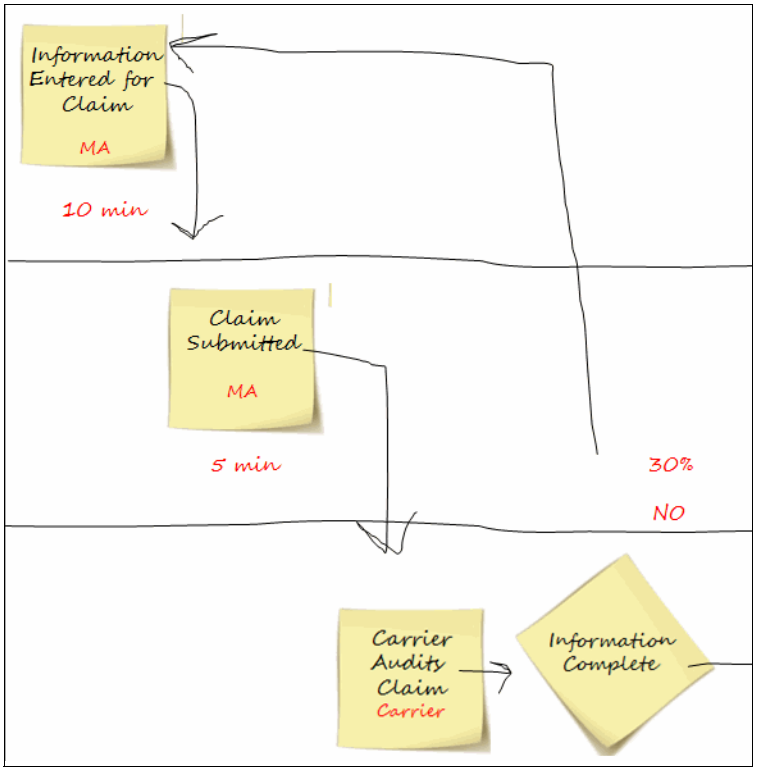

Figure 3-6 Mapping process example of the hidden factory

Here is the hidden factory equation:

Hidden Factory = Rework Percentage (Activity 1 time + Activity 2 time + Activity 3 time, and so on)

In the following example, 30% of the time is spent reworking to reenter information and resubmit claims. This time is added to the total time of 15 minutes per claim.

Total Hidden Factory = 15 minutes X 30 percent = 4.5 minutes per claim spent reworking

Then, to capture the daily time, weekly time, monthly time, annual time, and so on, multiply the total time by the number of claims that are submitted during the chosen time frame. If claims are submitted for 20 patients per day, then 4.5 minutes times 20 patients equates to 90 minutes per day in the hidden factory, as shown in the following example:

- Rework Time per day: 20 patients per day X 4.5 minutes = 90 minutes per day, or 1.5 hours for the MA
- Rework time annually: 20 patients per day, 240 days per year = 4,800 patients per year
- 4,800 patients per year X 4.5 minutes = 21,600 minutes per year, or 360 hours (9 weeks)

3.6 Conducting a value-add flow analysis

There are three criteria that determine whether an activity is value-add or non-value-add. If any one of the three criteria is a *no*, then the process activity is non-value-add. In other words, all three criteria must be true for the activity to be value-added from the patient's perspective.

3.6.1 Value-add criteria

Here are the value-add criteria:

- The patient must care about it.
- The activity changes the patient or knowledge about the patient.
- The activity was done correctly the first time.

Clearly, if the customer of a process does not care about it, then it is not valued by the customer. If the activity does not change the person or thing, then no value is being added to it. A customer does not want to pay for something that has to be done again because of an error. All inspections, although sometimes necessary, are non-value-add because the activity does not change the thing being inspected. Solutions should be put in place so that errors cannot occur and downstream inspections become unnecessary.

3.6.2 Applying red dots and green dots to the map

The next step in the Lean process is to evaluate each sticky note based on the value-add criteria. For activities that meet all three criteria, place a green dot on the sticky note. For any activity that fails at least one of the criteria, place a red dot on the sticky note (Figure 3-7).

Figure 3-7 Example of a real-time paper process map with red and green dots added

For rework loops, place a red dot on the line that goes back in to a previous process step.

Add up all the red dot times and all of the green dot times separately, then calculate the percentage for both, as shown by the following formulas:

- Red Dot Time ÷ Total Time = percentage of non-value-add
- Green Dot Time ÷ Total Time = percentage of value-add

Write down the time and percentage for red dots and green dots at the end of the map near the total time that was documented earlier. In the map that is shown in Figure 3-8, about 50% of the total time for a patient to flow through a clinic was non-value-added time. When all of the red dots are evaluated and marked, sum up the time for each type of waste and write that down at the end of the map. This sum gives the team an idea of what types of waste are prevalent in the value stream. In the example map that is shown in Figure 3-8, of the 51 minutes of non-value-added time, 35 minutes, roughly 70%, was wait time.

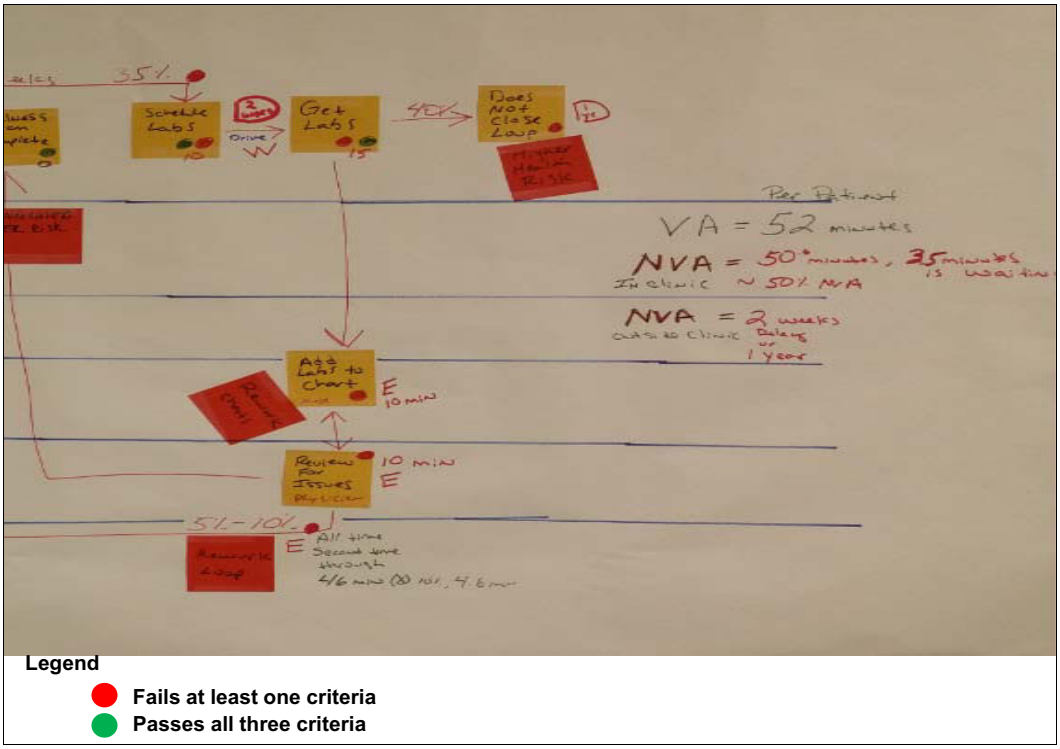

Figure 3-8 Example of a real-time paper process map with red and green dots added

3.6.3 Evaluating the type of waste for each red dot

Waste falls into one of eight categories. It can be helpful in the improvement phase to know the type of waste that is targeted for elimination or reduction.

The acronym DOWNTIME can help you remember the eight wastes.

Note: There are several acronyms for the eight wastes if you search on Google for *Lean Wastes*.

Here are the Eight Lean Wastes [DOWNTIME]

- **D**efects
- **O**verproduction
- **W**aiting
- u**N**used creativity

- **T**ransportation
- **I**nventory
- **M**otion
- **E**xtra processing

On your map, write down the letter for the waste by each red dot by using the following criteria:

- Defects
  - Errors
  - Incorrect data
  - Incomplete information
  - Usually the cause for rework
- Overproduction
  - Preparing extra reports
  - Reports that are not acted upon
  - Unnecessary lab tests
  - When capacity exceeds demand
- Waiting
  - When the next activity in the process flow is not ready
  - Batching
  - Not processing when the person or thing is ready for the next activity
- uNused creativity
  - Not listening to the ideas of others
  - Not working at the top of license
- Transportation
  - Traveling to the next activity
  - Walking to a copy machine or to find something
  - Walking to the next activity
- Inventory
  - Purchasing more than needed
  - Shelved or stored assets
  - Patients in a waiting room
- Motion
  - Movement when stationary
  - Reaching, stretching to get something, bending, sitting and then standing
- Extra processing
  - Unnecessary and extra approvals
  - Filling out forms, especially multiple forms with the same information
  - Most meetings
  - Rework and inspections
  - Dragging, dropping, typing, and clicking
  - Searching for information on a PC or on the web

Use a different color sticky note, such as red, to denote areas of caution in the map (Figure 3-9). For example, in the process map, a red note is used to capture what happens when a patient shows up but does not have his or her labs completed. In this scenario, it results in about 5 - 10% of patients going through the clinical process a second time. The calculation suggests that the total equates to about five minutes per patient on average, and for a clinic with 20 patients a day, this is 100 minutes or 1 hour and 40 minutes per day that is lost in rework.

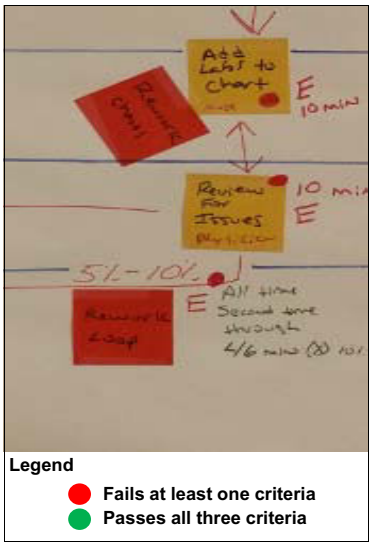

Figure 3-9 Areas of caution in the value stream on red sticky note pads

3.7 Going to Gemba

Gemba is a Japanese term that is used in Lean that means going to the real place. Although a visual map is useful in highlighting non-value added activities, nothing can replace seeing the process run in real time. In Lean, this is often referred to as a *waste walk*.

You will start by walking the process from end-to-end, following the entity flowing through it, noting any activity that does not meet the criteria of value-add. You might find surprises that are not visible on the map, such as workarounds or activities that were forgotten. Even with SMEs helping build the map, things can be missed that become evident during the waste walk.

Many Lean practitioners prefer to go to Gemba before the process mapping exercise. We prefer to go to Gemba after the process mapping because finding issues becomes a little easier when we have a reference point, such as the value stream map. Either way is acceptable.

Be sure to not compromise safety, privacy, and confidentiality. Everyone must wear the proper safety equipment and in some cases, only qualified individuals may conduct the waste walk for the team to protect patient or customer privacy and confidentiality, or an organization's intellectual property.

Update the value stream map based on the information that is learned from going to Gemba.

Reminder: Remember to update your charter digital picture of the map.

3.8 Identifying the value stream's constraints

Removing non-value-added time from a process can result in the following outcomes:

- Improve customer satisfaction.
- Reduce costs.

But it cannot result in an increase of overall capacity.

For example, decreasing the wait time in a clinic for patients likely improves patient satisfaction. Likewise, reducing the amount of paperwork through automation can lower the cost that is required for manual processing. However, although both of these gains are often wanted, the process cannot flow faster than the number one constraint in the overall value stream.

A four-lane highway that quickly narrows to become a two-lane highway is not a four-lane highway but rather a two-lane highway. The number of vehicles that can flow through is the same in both scenarios, as the four-lane highway is capped at two lanes and a bottleneck ensues at the merge point where the four lanes become two lanes.

As illustrated in the capacity diagram (Figure 3-10), if a process improvement removed all of the non-value-added time (identified in red), overall capacity remains at 20 because capacity for the exam is 20 per shift. Again, patient satisfaction likely increases because patients are spending less time in the clinic, but the revenue for the clinic does not increase because of the improvement in patient satisfaction. Unless the number one constraint is addressed, more work cannot be completed at the end of the value stream because it is capped at the level of capacity of the number one constraint. Then, if the number one constraint in the diagram, the exam, increased to a capacity of 30, for example, the overall value stream capacity then is capped at 25 because the registration process then becomes the number one constraint.

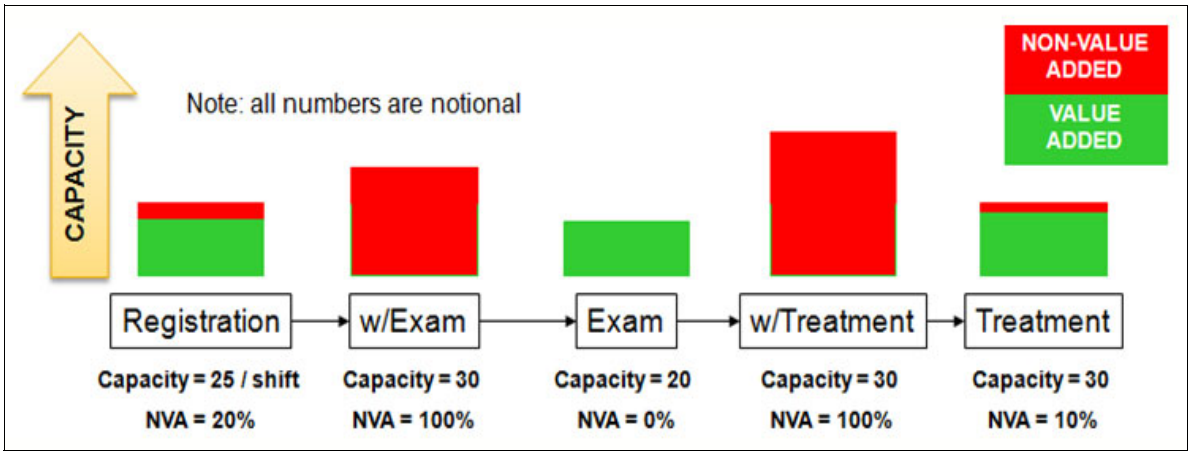

Figure 3-10 Capacity diagram

If the constraint is a non-value-added process step, then the solution becomes much easier: Eliminate the activity. However, when the constraint is a value-added process step, such as conducting the physical exam, then the process step must be horizontally mapped out in detail, in an attempt to identify areas where you can remove any non-value-added time within that value-added process step. Just because a process step is considered value-add, with a green dot, does not mean that it does not have any non-value-added activities within it (Figure 3-11).

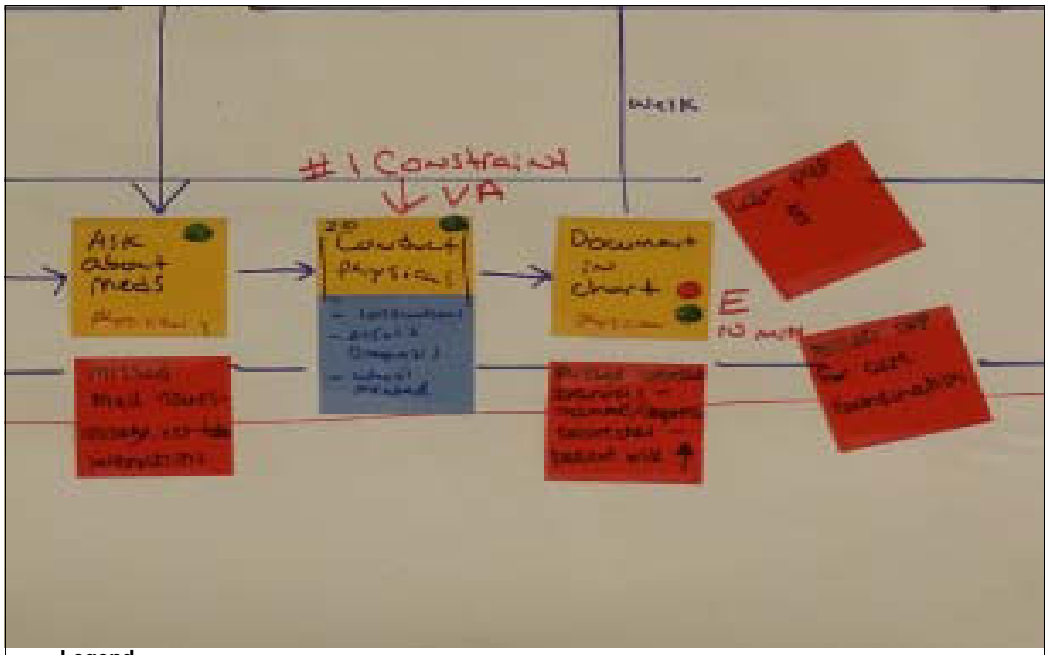

Figure 3-11 Example of a value-add constraint

3.9 Tollgate 2: Reviewing the map with key stakeholders

Set up a meeting with the team, champion, and other key stakeholders. This is an opportunity to gain support for your project. One of the most difficult challenges you face is change management. Having the key stakeholders review the paper map goes a long way in *telling your story* and creating a sense of urgency for your project. It also helps ensure that project team members stay engaged and motivated.

Have those who helped create the map present it to the key stakeholders step-by-step, pointing out areas of concern. At this stage, do not allow the stakeholders to find solutions for the issues, but instead use a parking lot to store their ideas as they surface. Do this by writing their ideas on sticky notes and placing them on the wall or a flip chart. All solutions must be vetted and prioritized, and therefore more solutons are needed before you select the optimal solutions.

Reminder: Remember to update your charter with a focus on listing the top constraints and capturing any parking lot ideas so that they are not forgotten.

3.10 Prioritizing the issues by using a Failure Mode and Effects Analysis

A Failure Mode and Effects Analysis (FMEA) is a technique to prioritize an issue based on its severity, how often each root cause occurs, and how well each root cause can be detected and mitigated before going to the next activity in the process. The key success factor of an FMEA is having the correct SMEs in the room to evaluate and score these items. This technique requires a great deal of constructive discussion between participants.

An FMEA has three areas to evaluate and score:

- The failure mode and scoring the severity of its effect (S)
- The root causes and scoring how often each one occurs (O)
- Current controls and scoring their ability to be detected (D)

The overall score on an FMEA is referred to as the RPN (Risk Priority Number) and is calculated as follows:

RPN = S x O x D

An FMEA can be a difficult process to facilitate and can quickly become complex. For this reason, if you have more than 10 issues to evaluate, assess only severity during the first round. Start with the most severe issue first, then the second most severe, and so on, then stop at an item that the team feels is not worthy to evaluate further when compared to other higher-severity issues in the list. For those items that are not evaluated, place them on a parking lot list to review again later.

Many Lean Six Sigma practitioners use a fishbone diagram or a Cause and Effect Matrix (C&E Matrix) as a pre-FMEA tool to cull the number of issues into a manageable list. Either of those methods is acceptable when you have a larger number of issues. However, just assessing severity on the FMEA to identify the most important issues and evaluating the important failure in detail can speed up the time and reduce the use of another tool.

Start with paper and populate the results into a spreadsheet later. Using paper and sticky notes engages the team and allows for quick changes as new information surfaces. This technique also gives participants the opportunity to capture their thoughts without the risk of losing their ideas while waiting for their turn to present. It also helps prevent the facilitator from having to manipulate the electronic-tool template as new points are remembered and inserted.

Complete the following steps:

1. Create the headings across the paper template and draw the lines to separate each heading item, as shown in Figure 3-12.

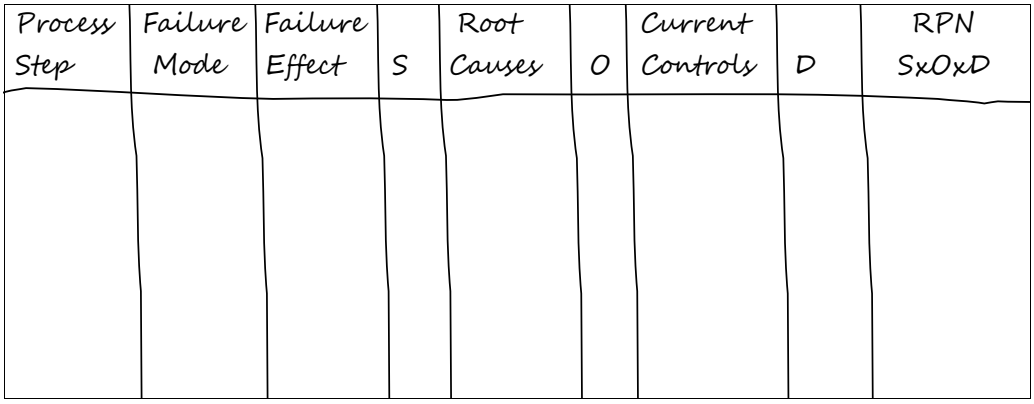

Figure 3-12 FMEA steps

2. Create failure mode sticky notes for each red dot on the map and one for the process step in which each occurs. If there are 20 red dots on the map, then create 20 sticky notes, as each red dot is one failure mode (Figure 3-13).

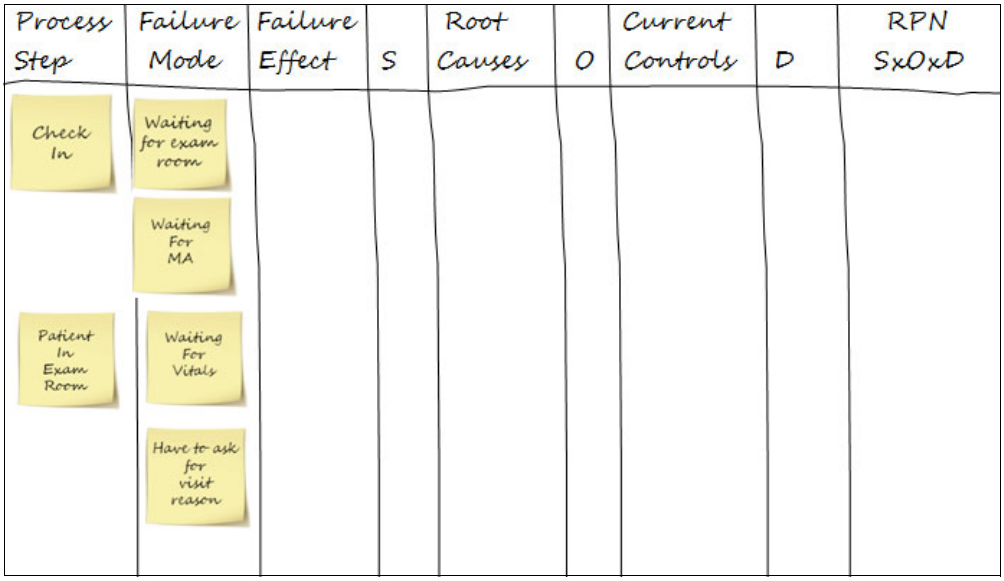

Figure 3-13 FMEA with failure modes

3. For each failure mode, brainstorm with the team to determine the effects.

   This task can become complex because each failure mode can have multiple effects. Each effect must have its own sticky note because each will likely have a different degree of severity on the output (Figure 3-14 on page 33).

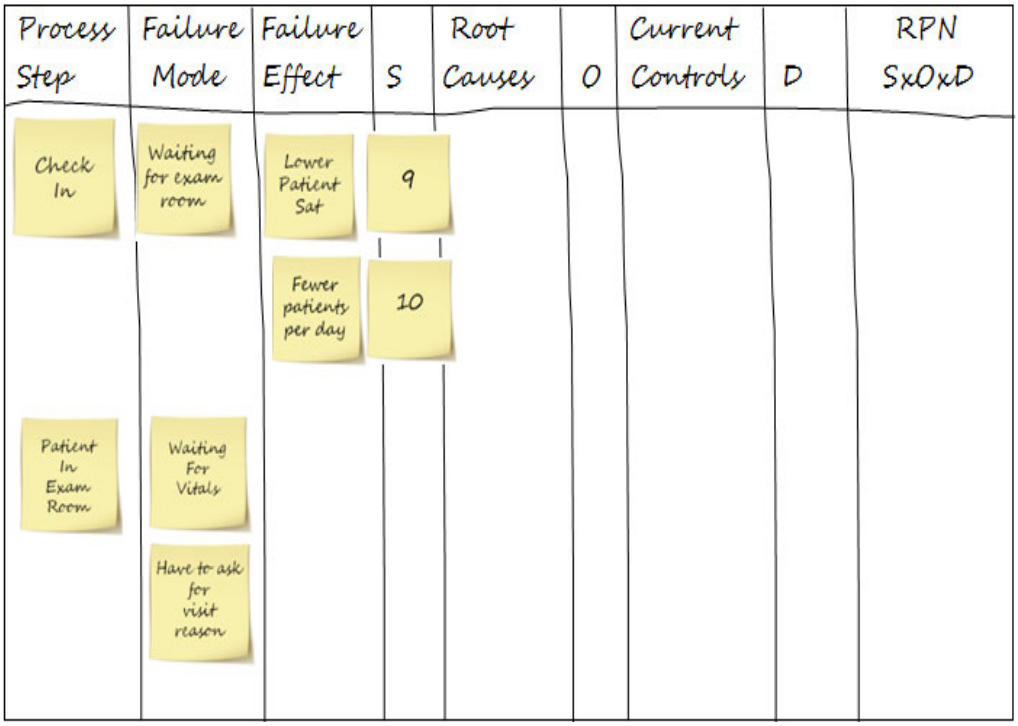

Figure 3-14 FMEA with effects and severity rankings

4. Then, for each effect, the team must come to consensus on the severity by using a ranking 1 - 10, where 1 is not severe at all and 10 is very severe. Only one or two number 10s can be used on the entire FMEA. At times, the team must compare effects to determine which ones should be reduced and which one or two should remain a 10. This rule is a preferred practice to enforce for all the items. Without it, team members often take the easy path and bypass critical thinking. Keep in mind that the rankings are relative to each other with the purpose of selecting which items to solve for first. After ranking all of the items for severity, review each one relative to all of the others, adjusting each one up or down as needed.
5. Use the 5-Why method to drill down to the root cause. It is important that the root cause is determined and to ensure that it is not merely a symptom, or the solution might not permanently resolve the issue, resulting in it resurfacing.

   Brainstorm potential causes for each failure mode, writing down each cause on a sticky note. Then, for each sticky note, follow the 5-Why method by asking *why* until the drill-down process cannot go any further. Most root causes are identified before the fifth why, but it can vary depending on the level of the original cause that was placed on the sticky note and can even take more than five to truly discover the main root cause.

   – Why did the patient have to wait for the exam room?

     Because all of the rooms were occupied.

   – Why were all of the rooms occupied?

     Because some exams take longer than normal and were not planned for.

– Why were exams that take longer not planned for?

  Because there are no scheduling guidelines for the scheduler based on exam type.

Write down the final root cause and write the words “Root Cause” at the top. Keep a record of all the causes in the drill-down process so that the team remembers what higher-level causes the root cause feeds into. Place all the sticky notes in a stack with the root cause at the top (Figure 3-15).

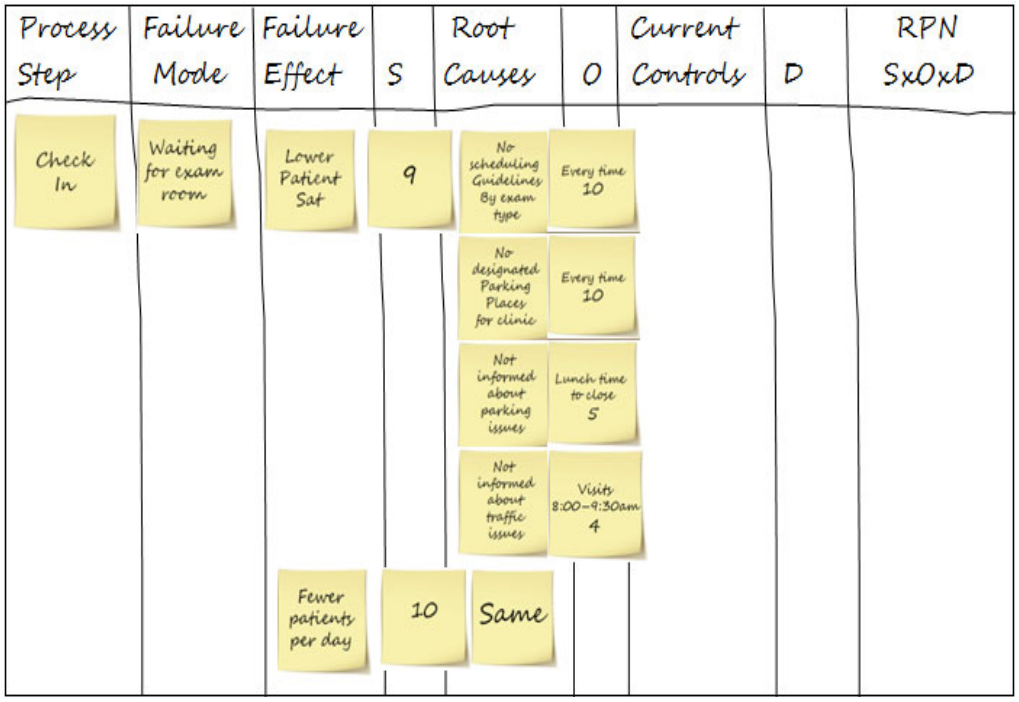

Figure 3-15 FMEA with root causes and occurrence rankings added

Note: When populating the spreadsheet, add all of the causes as a comment in the cell or write each cause, numbering them in the cell directly for visibility.

This process can become complex for a couple of reasons:

– Each cause might have multiple root causes.
– Sometimes teams go down an impractical path.

Additional root cause for the same cause:

– Why did the patient have to wait for the exam room?

  Because all of the rooms were occupied.

– Why were all of the rooms occupied?

  Because patients are often a few minutes late arriving and are therefore not out when expected.

– Why are patients often a few minutes late arriving?

  Because it takes up to 15 minutes to find a parking place near the clinic.

– Why does it take up to 15 minutes to find a parking place near the clinic?

  Because during working hours many parking places are taken up by local businesses.

  Because some patients do not know that finding a parking place can be difficult.

Two level 5s in this scenario:

- Why are parking places taken up by local businesses?

  Because there are no designated parking places for our clinic.

- Why do patients not know that finding a parking place can be difficult?

  Because patients are not notified about the issue.

Example of an *impractical* cause:

- Why did the patient have to wait for the exam room?

  Because all of the rooms were occupied.

- Why were all of the rooms occupied?

  Because patients are often a few minutes late arriving and are therefore not out when expected.

- Why are patients often a few minutes late arriving?

  Because of morning traffic issues.

- Why are there morning traffic issues?

  Because many people are driving to work.

When the team starts down an impractical path, start back at the latest logical cause and continue. In the example, the team starts back at the third question (number three).

- Why are patients often a few minutes late arriving?

  Because patients are not prepared for morning traffic issues.

- Why are patients not prepared for morning traffic issues?

  Many patients do not drive this way often during heavy traffic hours and are therefore unaware that their commute to the clinic might take longer than expected.

- Why are patients not aware that the commute might take longer during certain hours of the day?

  Because they are not notified.

These examples illustrate the complexity of the 5-Why method, as each cause might have multiple root causes and the problem of going down an impractical path.

Each root cause must be listed separately in the FMEA, as solving each one frequently requires different approaches and different or new team members.

6. For each root cause, have the team evaluate how often each one occurs. Sometimes information might exist that explicitly determines how often the cause occurs, but most of the time this evaluation requires an estimate by the team. A root cause that occurs every time, every day is a 10, and one that occurs only half of the time is a 5. Think of an occurrence as a percentage. For example, if no guideline for scheduling by exam type occurs with every appointment on a daily basis, it is considered a 10. Although traffic problems might occur for patients only in the morning hours, it is ranked as a 4 for being about a quarter of the day.

   Although the severity ranking can have only one or two number 10s, occurrence does not follow the same rule. If every root cause occurred every time, every day, each of them would be a 10.

   In our scenario, the next failure effect, *fewer patients per day*, has the same root causes. Duplicate those root causes for scoring purposes. Chosen solutions impact both the same root cause.

7. In many transactional organizations, such as healthcare, current controls do not exist. A control exists only if it stops an error from occurring before reaching the next activity in the value stream. Machines such as those used in manufacturing can be programmed to stop when certain conditions occur. With humans, however, controls work only when procedures are in place and followed explicitly. Just knowing that an issue occurs every time does not stop it from reaching the next activity in the value stream. For this reason, many controls in healthcare should be shown as “None”.
8. When no control is in place to stop an issue from reaching the next activity in the value stream, then the score detect ability (D) should be a 10. Conversely, if a control is in place that stops about half of the issues from reaching the next activity, score it as a 5. As with scoring occurrence, think of score detect ability as a percentage based on how many issues reach the next activity. If all of them move forward in the process, then score all of them as 10s (Figure 3-16).

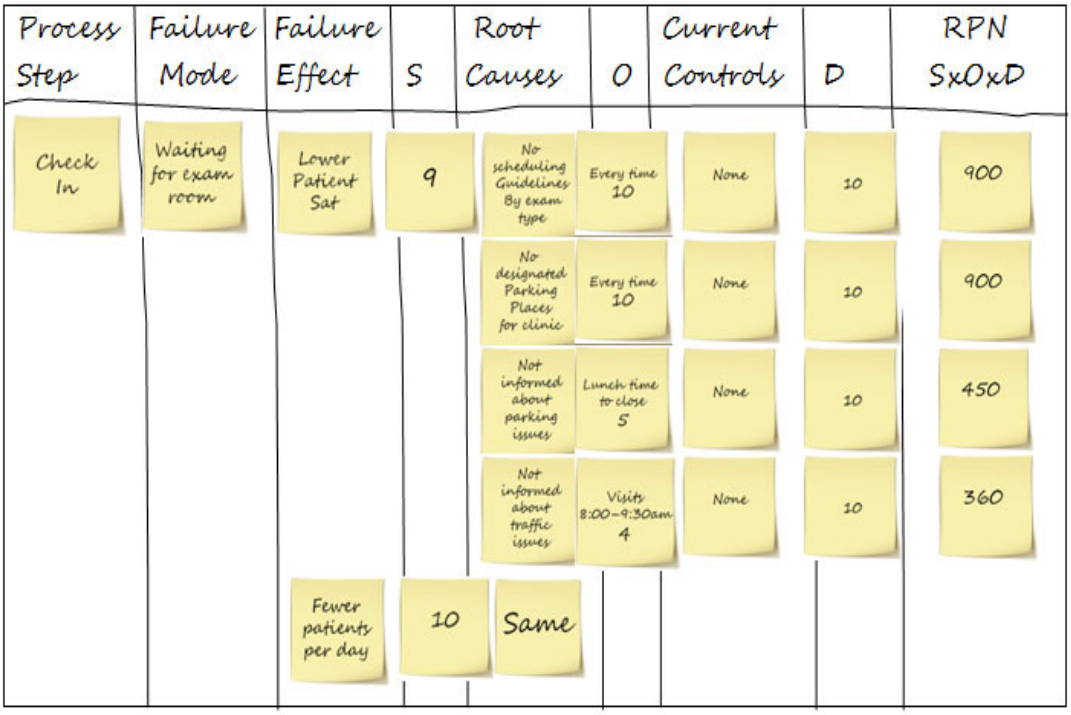

Figure 3-16 FMEA with current controls and detection rankings added

9. Calculate the RPN: S x O x D. The score rank orders the risk for each item and root causes. This is beneficial in prioritizing issues to tackle first, second, third, and so on.

Note: You might find that the outcome of the prioritized list is not what you or the team thought it would or should be. Often, assumptions are made as to what is most critical to address and improve upon, but after the FMEA is completed, another issue shows itself as the higher priority that has a greater impact on the client or the business.

Creating a Priority Matrix

A Priority Matrix can help the team visualize the impact of a solution along with the effort or cost that is associated with each proposed project.

A priority matrix consists of two axes, a Y and an X.

- The Y axis is vertical at the right.
- The X axis is horizontal at the bottom.

As with the other project activities, use paper and sticky notes to engage the team and ensure that the outcome is visible to everyone.

Use the RPN scores for the Y axis and complexity for the X axis (Figure 3-17). Because complexity is subjective and often difficult to score, think of complexity as the time it takes to complete the solution from start to finish. Using 1 - 6 months generally works well for many transactional organizations. For cases in which IT changes are needed or technology must be purchased and implemented, then using 1 -12 months is more appropriate.

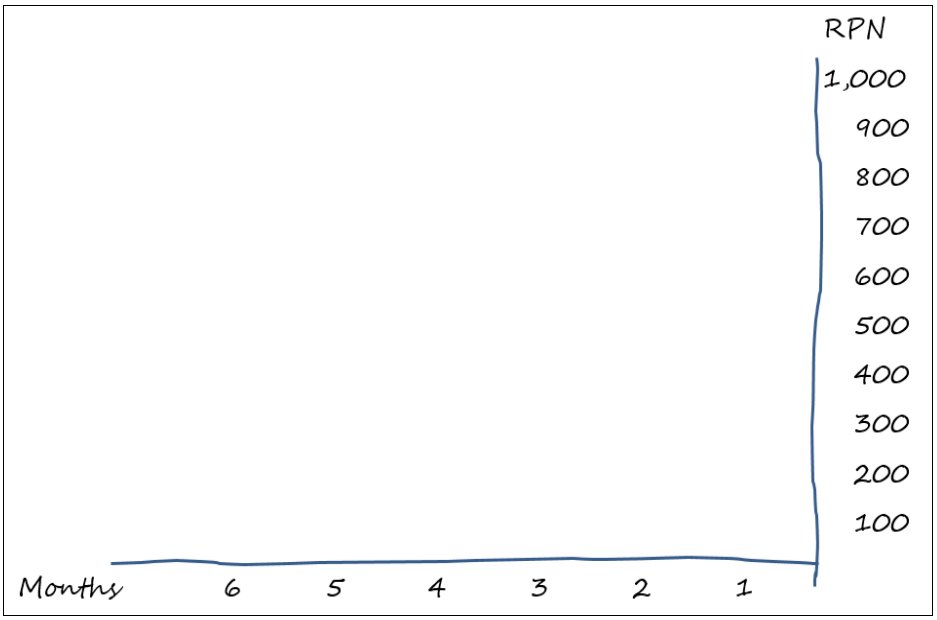

Figure 3-17 Months to complete on x axis and RPN on y axis

Separate the paper into four equal quadrants (Figure 3-18):

- Do now
- Long-term strategy-start now, finish later
- Do later
- Don't do

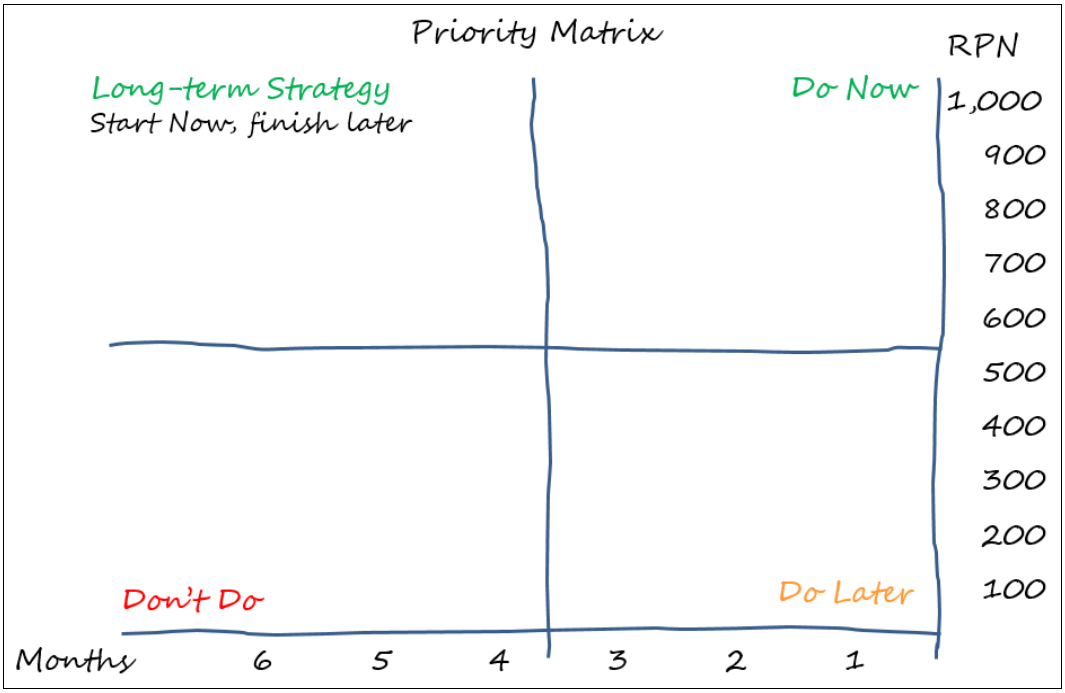

Figure 3-18 The four quadrants added

Finally, create a duplicate sticky note of each root cause, and then have the team come to consensus on the number of months they estimate it takes to resolve the issue. Find that number on the X axis, match it to the RPN on the Y axis, and place the sticky note in the respective quadrant that links the two numbers together (Figure 3-19 on page 39).

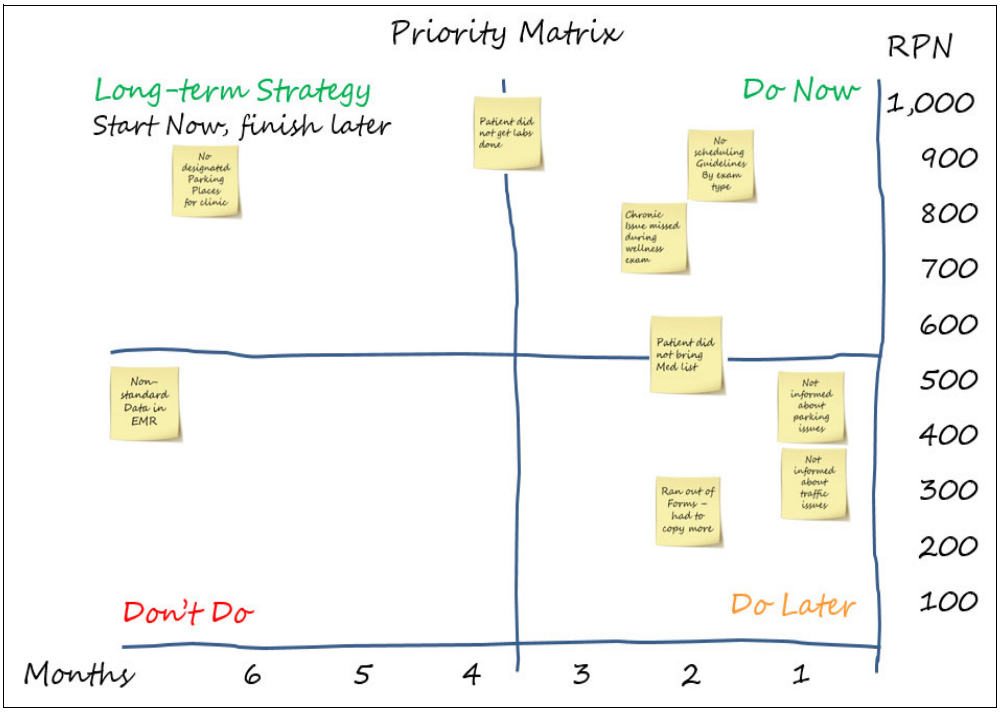

Figure 3-19 Priority matrix - part 1

In this mock scenario, which is shown in Figure 3-20, the team discusses the priority matrix with the champion and key stakeholders to choose which potential corrective actions to focus on first, second, third, and so on. Often, each sticky note requires a different project team. In those cases, multiple projects may be initiated if the same team members are not required on multiple teams. If so, initiate only one at a time and focus on that one project until it is completed and in control. Then, select the second project to initiate.

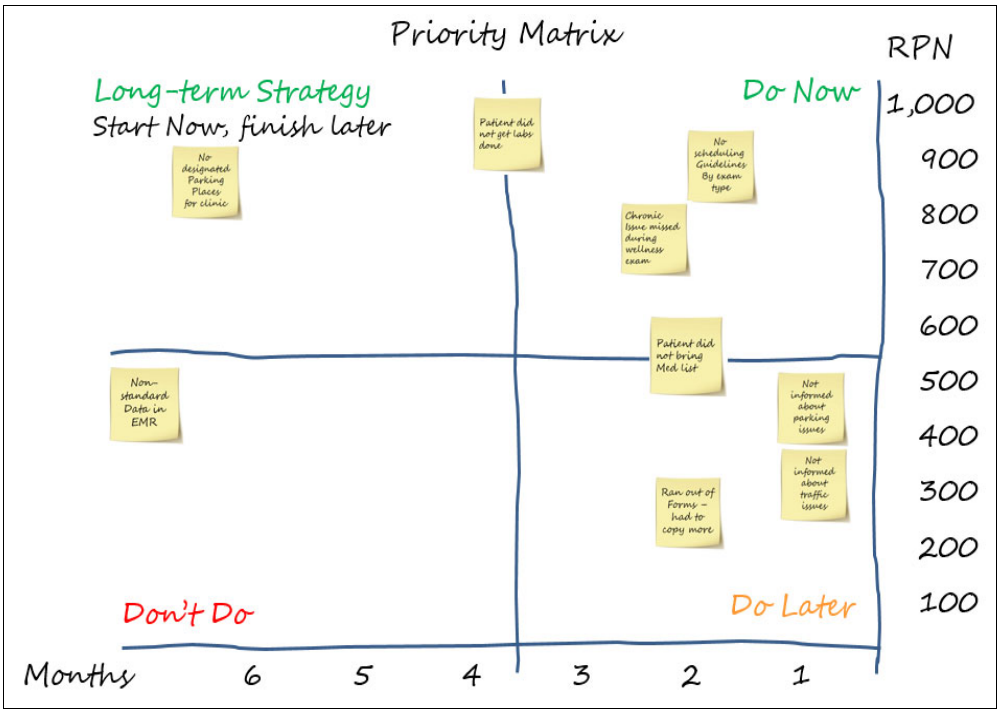

Figure 3-20 Priority matrix - part 2

A team should be put on the “Long-term strategy” item to begin preparing a benefit cost proposal. The items that are listed in the “Do now” quadrant should be initiated as soon as possible, starting with the highest and quickest win.

In the example, because there are two projects that can be done in approximately one month, even though their impact is in the “Do later” quadrant, charter those two as well to get a short-term win for the key stakeholders.

3.11 Tollgate 3: Reviewing the FMEA and Priority Matrix with key stakeholders

Set up a meeting with the team, champion, and other key stakeholders. Start with a summary of the reason for the project, bringing all stakeholders up to speed.

Explain that this is a decision-making meeting to determine which items to focus on first, second, third, and so on. Some items can be completed in parallel when different teams can be working at the same time. The next phase is to determine and select alternative solutions to implement.

Review the FMEA with the stakeholders and explain how it works. Then, explain the Priority Matrix and how items were placed on it. Give the stakeholders an opportunity to ask questions for clarification. Items might need to be shifted based on their input.

Note: Just because an item is placed in the “Do later” area of the matrix does not mean it cannot be worked on now. The stakeholders might want to secure a short-term win by selecting items that can be done within one month, although the impact is not as high as other items. However, the items in the “Do now” area must be started immediately as well.

Reminder: Update your charter digital photo of FMEA.

4

Removing waste and making the value flow without interruption

This chapter describes step 3 in the Lean process: Removing waste and making the value flow without interruption.

This chapter covers the following topics:

- Goal of this step
- Automating
- Standardizing
- Reducing motion
- Reducing multitasking
- Balancing resources
- Reducing defects
- Building a buffer
- Mapping the value stream with the solutions in mind
- Conclusion
- Tollgate 4: Reviewing solution ideas with key stakeholders

4.1 Goal of this step

The goal of this step (step 3) is to develop ideas for addressing the root causes that impede process flow for the patient, or for any entity flowing through a value stream. During this step, no improvements are implemented. All ideas are on paper only and are listed as recommendations until step 4, which is described in Chapter 5, “Implementing the solution and allowing patients to pull value” on page 53.

Lean teaches that there are three high-level ways to remove waste from a process:

- Eliminate
- Automate
- Simplify

The team should attempt to eliminate non-value-added tasks first before spending time on automation or simplification. After everything is done to eliminate non-value-added activities and to automate or simplify manual tasks, the final step is to build a buffer for the number one value-add constraint that is left in the value stream.

Each of those high-level ways includes many tactical opportunities for improvement. This process often requires that the team drill down into some of the predefined processes in great detail. For example, the team might list the exam as a value-added process step, but then determine that it is the number one constraint. If this situation is the case and the champion wants to improve clinical revenue, the team must map out the exam in great detail to identify non-value-added tasks that occur during the exam, such as transportation, extra motion, patient wait times, excessive forms to complete, and item searches, to name just a few.

Not all of the ideas that are listed in this chapter work in every situation. The team must evaluate each root cause from its own perspective and choose a solution that best fits the identified gap. Remember, the connecting lines on a value stream map can be as non-value-add as a process activity, and sometimes easier to eliminate for a quick win.

A good rule of thumb is to eliminate always before automating, then automate before simplifying, and simplify only those activities that cannot be eliminated or automated.

The following list presents a few solution ideas for consideration. The opportunities are not limited to this list and are not sequenced in order of importance.

- Eliminate
  - Handoffs
    - Everyone must work at the top of their license.
    - A worker completes a task end-to-end until it must be handed over because of license or legal issues.
  - Redundancy
    - Duplicate work, including duplicate data entry (see automate).
    - Unread reports.
  - Multiple approvals
    - Go straight to the final approver, and eliminate all others.
  - Unnecessary walking
    - Move things closer.
    - Redesign the workflow by using a U shape when appropriate.

- Automate
  - New technology
    - Applying new technology to eliminate manual tasks can free up time for healthcare workers, allowing them to spend more value-added time with the patient, resulting in a higher quality of care and better outcomes.
    - Eliminate wait time for something of value to be completed.
  - Poka Yoke
    - Mistake-proof items so that workers cannot make a mistake.
    - Use drop-down menus.
    - Use password protection.
    - Use color-coded items that go together.
    - Mark areas for equipment placing.
    - Auto-populate to eliminate duplicating a data entry.
- Simplify
  - 5S
    - Sort: Remove any unnecessary items.
    - Straighten: Arrange the items and label all of them.
    - Shine: Clean all equipment and work areas. Keep it clean and organized with all labels readable.
    - Standardize: Set up every room that serves the same needs the same way.
    - Sustain: Be disciplined to maintain the 5S going forward.
  - Colocate and sequence tasks
  - Standardize
    - Use work instructions and preferred practice documentation.
    - Use training.
  - Reduce motion
    - Move things closer to the worker.
    - Use ergonomics.
  - Reduce multitasking
    - Prioritize and use work-in-process (WIP) limits.
  - Balance resources
    - Cross-train.
    - Balance resources during the day (like a grocery store).
  - Reduce defects
    - Use traditional Six Sigma DMAIC to reduce process variation.
    - Usually more complex tools and techniques are needed.

4.2 Eliminating

This section covers ways to elminate non-value-added tasks.

4.2.1 Handoffs

One of the reasons for using a cross-functional swimlane map is to bring transparency to where handoffs occur in the value stream. This map can help identify areas in which unnecessary handoffs can be eliminated, allowing an employee to complete an activity without transferring responsibility to another worker. For example, empowering nurses to work at the top of their license without handing off to a physician, where allowable, can simplify the value stream and balance resources to eliminate bottlenecks. Similarly, allowing a medical assistant to perform all the tasks that they are legally allowed to perform frees up time for the nurses. When this process is done throughout the value stream, balancing resources to eliminate bottlenecks in the flow becomes much easier to visualize and implement. It is common for organizations to hire someone to perform a task that can be done by an existing employee if the employee is allowed to work at the top of his or her legal ability.

Reducing handoffs also eliminates wait time, which increases capacity for that activity. Often, handoffs occur when the next worker in the flow is not available, causing the patient or entity flowing through to wait for the worker.

4.2.2 Redundancy

Removing redundant reports, projects, and activities can allow an organization to repurpose resources to value-added activities. Many reports that were once considered important are no longer needed in the new process, but they continue anyway. Many forms require the same information that can be combined to shorten the time that is spent filling out forms. Sometimes, the same question is asked multiple times by different clinic employees. Identifying questions that can be combined to shorten the amount of time seeking redundant information allows you to move patients into the next process step quicker. Identify which upstream processes can be changed to possibly eliminate the need to ask the same questions again.

4.2.3 Approvals

Approvals are often necessary, especially in the medical arena. However, be careful that approvals do not become bureaucratic. For example, allow nurses and staff to work at the top of their license, empowering them to approve what they can without a physician's signature. When approvals are essential, develop the work flow so that only the final approver is necessary and remove lower hierarchical approvers from the flow.

4.2.4 Unnecessary walking

Use a spaghetti diagram to identify areas where extra walking can be eliminated. Move copy machines, files, desks, and other items closer to the primary area where most of the work is done. When feasible, redesign the work flow by using a U shape. It takes fewer steps to move from one side of the U shape to another side than to walk end-to-end in a straight line. Because rooms are rectangular, they inherently follow this philosophy. Nonetheless, review patient and worker movements outside of the rooms to identify areas where there is unnecessary walking. Move items (in rooms) that are used most often closer to where they are needed. Decreasing unnecessary walking increases the amount of available time for value-added activities.

4.3 Automating

Automation is an area of concern that must be addressed and fully understood. Many organizations fall into the trap of *manumation*. This term refers to manual processes that are automated, but the automation requires more human effort than the manual process itself. In addition to manumation, many organizations often automate work flows in one area that require additional work downstream. Automation must either reduce the overall total cycle time of a value stream or increase capacity. A business case is essential to gain support for any investments in technology. So, without those two benefits, demonstrating a value proposition is unlikely.

4.3.1 New technology

Never undervalue the idea that a new technology can replace an existing process or procedure, allowing providers more value-added time to spend with the patient. Thirty years ago, a mercury thermometer was commonplace. The time to get a patient's temperature was 2 -3 minutes. Today, a provider can take a patient's temperature, and with better accuracy, in seconds by using an electronic instrument. During the time mercury thermometers were used, the thought of taking a temperature in seconds would have seemed inconceivable.

In addition, providers can use information technology as a way to reduce non-value-added time for themselves and their staff, while increasing patient engagement. For example, by using automated interventions that work seamlessly in the background, providers can engage patients in their care by efficiently reaching those who need services and education in self-care without increasing non-value-added time. This can allow practitioners to repurpose their own time to more value-added activities.

Consider new technology that can reduce time in various activities, such as:

- Manual tasks, such as checking in or checking out, updating charts, and other tasks
- Report generation
- Data collection
- Taking patient measurements

Improvements in information technology helps reduce non-value-added time for providers and practices, thus increasing the capacity, and it can also improve the quality of care by allowing providers to act quicker by using timely and comprehensive information.

4.3.2 Poka Yoke

This is a Japanese term meaning *mistake-proofing*. Mistake-proofing an activity reduces the amount of time of rework and the cumulative negative effect of error. Two examples that many organizations use are drop-down menus on electronic forms and auto-population of data. Both methods can reduce non-value-added time, rework, and checking.

A few suggestions for Poka Yoke:

- Color-code male and female connectors so that only blue goes with blue, green with green, and so on.
- Bar coding to eliminate data entry errors.
- Pharmaceutical ordering systems.
- Automatic shut offs for equipment when not used for a certain period.
- Permanent marking that is placed for equipment setup reduces the setup time and decreases the likelihood of an error.

There are many more Poka Yoke opportunities that a little research can help identify. Again, as with any new technology, a business case is required for any technology investment.

4.4 Simplifying

This section covers ways to simplify processes.

4.4.1 5S

One way to reduce or eliminate non-value-added activity is to implement a 5S process, which was developed by Hiroyuki Hirano. Improving a value stream with the 5S approach helps reduce the amount of time for searching, sorting, walking, and extra motion. Just five minutes of added capacity per exam, for example, might be enough to see one or two more patients per day, increasing the total daily revenue without lowering the quality of care.

Here is an example of 5S for the patient exam room:

- Sort: Remove any unnecessary clutter from the exam room, keeping only essential items that are needed for the exam. Ensure that any expired materials are removed and disposed of or tagged for repair. Prioritize what is used the most during an exam.
- Straighten: Arrange the exam room so that the *most used* items are the easiest and quickest to access. Label all storage areas, such as cabinets and drawers, with the names of the items stored within. You can also label the items in the drawer if necessary. For example, an outside label for Band-Aids would not specify which size of Band-Aid each packet contained. On the inside of the drawer, the size of each packet is labeled so that the correct size is selected for its specific application. Place a *restock* note card approximately two-thirds of the way down each stack of items as a reminder that it is time to restock. This card ensures that the provider does not have to leave the exam room to obtain out-of-stock items.
- Shine: Clean all equipment, and keep it clean and all labels readable. For an exam room, this step is required and therefore nothing new. Yet for other organizations, this step is often neglected. During the exam, ensure that everything is always restored to its proper location so that it is ready for the next exam. Styrofoam inserts work well in ensuring that items, such as tools, are placed in their proper location.

- Standardize: Set up every applicable exam room in the same way. This facilitates interchangeability so that finding needed items becomes second nature and eliminates the need to search and locate. This also allows for employees to transfer easily from one exam room to another without having to search for items.
- Sustain: Within the schedule, allocate time to restock items, to sort out expired items, to shine, and to ensure that labels are always readable. Discipline is critical for 5S, and this is the step that is often neglected, resulting in backsliding to the original disarray.

The five steps are the same for any 5S activity, such as organizing an office area, a file system, a lab, a medicine cabinet, an online documentation storage area, and more.

4.4.2 Colocating and sequencing tasks

This process can be done during the 5S exercise and is often considered a part of Straighten. For example, move equipment, such as copy machines and other supplies, closer to the area that uses them the most, use tablet devices that can be carried for data retrieval and input, and design the flow so that patients, or the entity, go shorter distances from start to finish. A spaghetti diagram can be helpful in determining which items must be colocated and where wasted time can be eliminated because of decreasing transportation.

In addition, determining which upstream-process activities, or lack of them, are causing extra non-value-added work downstream in the process can shed light on which activity to modify upstream, or earlier in the process, to decrease non-value-added time in the overall value stream. For example, not having a predefined pre-visit planning process can decrease capacity in a clinic by increasing the amount of time that clinical employees spend reworking tasks.

4.4.3 Standardizing

The process of standardization is generally the easiest and quickest way to increase capacity and quality but often the hardest to see. Visualizing the trees rather than the forest can result in an inability to find the easiest and best way to perform an activity. When each worker completing the same process activity follows a different approach, preferred practices are lost in the translation. Workarounds replace preferred practices, resulting in risk and waste. When everyone is conducting an activity in the same way, it becomes easier to identify what is working well and what is not working well, making process issues much easier to identify and improve. In addition, having everyone follow a standard process decreases training time for new employees.

Nonstandardization issues become evident in the mapping of the *current* process when SMEs express opinions about how activities are performed. Conducting a *to be* map with the SMEs with a focus on improving velocity and quality can help ensure that preferred practices are captured and adopted.

After the *to be* process is mapped and standardized, document it in a work instruction that can be used to reset the process when the process shifts and for training future employees. Ensure version control so that when the process is improved, workers access only the latest version.

4.4.4 Reducing motion

Not to be confused with transportation, motion refers to movement while stationary in a closed-in area. Twisting, turning, walking a couple of steps, and reaching are all examples of motion. Although a spaghetti diagram can help identify where transportation is a quagmire, it cannot help with bringing insight into motion. Only through direct observation can motion be reduced. Observing where motion adds time to an activity can bring additional insight into where ergonomics and sequencing tasks can reduce time in the process, and reduce fatigue for those performing the activity.

4.4.5 Reducing multitasking

In Lean, multitasking is considered non-value-add when it results in the primary entity being interrupted while flowing through the value stream. For example, any time a patient, which is the primary entity flowing through a clinic, must wait, there is a good chance it was because of someone multitasking. All wait times are non-value-add because they do not meet the three value-add criteria that are described in step 2 (Chapter 3, “Mapping the value stream and identifying issues and constraints” on page 15) because the patients do not want to wait, and it does not change the patient or knowledge about the patient.

To reduce multitasking, employees must prioritize and implement WIP limits. Every function has a primary value stream, which of course has the primary entity flowing through. All employees must identify which value stream and entity are primary to their work. It was assumed in writing this guide that the clinical value stream is the primary value stream and that the patient is the primary entity flowing through. This is not always the case, even in healthcare.

Many times, employees multitask as a way to stay busy and feel that being busy equates to high performance. However, being busy does not maximize efficiency. Look around your work area and you see that most people are busy 99% the time. However, the primary entity flowing through the process is often waiting, which means that there is no value being added to it. Even though people seem to be busy working on something, the primary item is often waiting in queue behind another, less important activity.

Multitasking causes you to work against your own schedule, and when everyone else is multitasking as well, it causes you to work against your associates' schedules. Scheduling conflicts often result in delays for the primary entity. Delays can affect revenue, patient loyalty and satisfaction, and the cost of doing business.

Multitasking solution

Do not focus attention on how busy workers are, but rather focus attention on the patient flowing through the process to ensure that he or she never waits. WIP limits refer to the idea of allowing only a limited number of patients to enter the process at any time. WIP limits increase capacity by reducing the wait time that is caused when moving from one patient to another or when patients are waiting on each other. Identify wait times as follows:

1. Go to Gemba and directly observe how long patients wait at each step in a clinical visit. This is useful in setting an accurate baseline.
2. Schedule visits so the patient can arrive and check in just when the previous patient is exiting the process activity. Because patient visit types vary, knowing the time for each type can be useful in scheduling. A buffer might be necessary in addition to balancing resources during the day.
3. Complete the activity that is needed for the current patient before moving on to the next patient. This is referred to as a *one-piece flow*.

4. If staying busy is important, and there are often important things that must be done, ensure that as soon as the patient arrives, all other activities cease immediately so that the patient does not have to wait.

Multitasking can be eliminated only when activities are prioritized, planned, and scheduled with predetermined WIP limits. The entire value stream must be optimized.

4.4.6 Balancing resources

Hiring additional employees should always be the last option. Ensuring that the patient does not wait in the process is critical, but hiring more people to support non-value-added activities increases the cost of doing business without creating value. So, balancing resources to support areas of constraint represents a much better option than hiring. Balancing resources should generally be one of the last improvements that is made, because it is imperative that resources are not balanced toward non-value-added activities. There are circumstances, nonetheless, in which it is critical that resources are balanced immediately rather than after other improvements.

Balancing resources can be effective only by knowing where and when bottlenecks occur in the value stream. Using the value stream map with SMEs can help identify process activities to target for data collection. In this case, direct observation or going to Gemba is the best approach. Take a sample during different times of the day and during different days of the week to determine whether bottlenecks occur during certain times.

There are several steps that are suggested to balance resources:

1. Remove non-value-added activities from the area causing the bottleneck.
2. Identify tasks that can be done in parallel without interrupting the flow.
3. Identify tasks that are non-critical and can be done during slow times.
4. Ensure that there is enough equipment to support extra workers.
5. Empower all employees to work at the top of their license and legally allowed.
6. Cross-train workers in other areas so that they can ebb and flow to those areas when more resources are needed.
7. Use a visual system, such as a flag, to alert everyone when the bottleneck is starting to occur.

Reminder: Look downstream. It does no good to remove the bottleneck in one process step upstream only to create a bottleneck downstream.

4.4.7 Reducing defects

Although this guide refers to Lean as being a separate methodology to Six Sigma, this is the one area in which they overlap. Where Lean focuses on cycle time reduction through waste elimination, Six Sigma focuses on eliminating defects by reducing process deviation. In Lean, defects are considered one of the eight wastes and must be eliminated to reduce cycle time. Defects result in rework, referred to as the *hidden factory* in manufacturing. Because it causes workers to work on things that should have been done correctly the first time but are hidden from view as being non-value-add, an extended cycle time and interruption to the flow results. Reducing rework increases the capacity of the organization by that amount. If rework represents 30% of a worker's time, reducing it increases the overall capacity by 30%, without hiring another worker.

When defects are identified as a major cause, follow the traditional Six Sigma approach (which is not covered in this guide), referred to as Define, Measure, Analyze, Improve, and Control (DMAIC) (pronounced Duh May Ick).

DMAIC consists of the following steps:

- Define
- Measure (current state)
- Analyze (root-cause analysis)
- Improve (implement the solution)
- Control (maintain the gain)

4.5 Building a buffer

Although waiting and inventory are non-value-add, when the number one constraint is value-add, it is necessary to ensure that it is not wanting, waiting, or delayed. This is the only time in Lean that wait time is acceptable. However, the wait time must be minimized as much as possible, in various ways, such as:

- Inventories should be checked often to ensure that those people that are working in the constrained process do not have to leave the area to retrieve items.
- The primary entity flowing through the process, such as the patient, must be ready when the constraint is ready.
- Information that is needed for the constraint must be readily available without someone having to ask for it or find it. For example, obtaining necessary information about the patient upstream can facilitate a quicker diagnosis and ensure that waiting on information is reduced. In addition, having information technology available at the point of contact with the patient can also reduce motion, transportation, and waiting.

4.5.1 Calculating how much time for the patient to wait

A buffer in a clinical process flow is added wait time and supplies to ensure that a constraint is never delayed by having to wait for the next patient or look for needed items. However, because wait time and inventory are non-value-add, and are considered as two of the eight Lean wastes, it is imperative to buffer only the minimum amount that is required.

To ensure that patients do not wait longer than necessary, and that the constraint is seldom waiting for a patient, observe 20 patients flowing through the clinic, on different days and at different times of the day, and capture the amount time for each to enter the constraint and exit it. Do not use the average, or 50% of the time the constraint will be waiting for the patient and the overall volume decreases. Instead, use the following formula:

- (Slowest Patient Time (-) Fastest Patient Time) ÷ 6.
- Multiply that number by 2 and subtract that from average.

In this example scenario, the average time for 20 patients to enter and exit a constraint was 15 minutes. The fastest time through the constraint was 10 minutes and the slowest time was 30 minutes.

- 30 - 10) ÷ 6 = 3.3 minutes
- 3.3 (x) 2 = 6.6 minutes
- Subtract the 6.6 minutes from the average (15)
- 15 - 6.6 = 8.4 minutes

In this scenario, have the patient arrive about 8 minutes after the previous patient entered the process step. This formula should equate to the constraint waiting for the patient only roughly 5% of the time.

For supplies, observe usage for each item over a two-week period. Rather than calculating, merely store the number of supplies equal to the most used week and add 10%, then minimally maintain that level. Do be careful because supplies often have a shelf life; so, always use the first in first out method. Just as grocery stores position milk cartons with the nearest expiration date up front, do the same with supplies. Additional inventory is kept in another storage area; this method is for the workspace of the constraint only. Not having to leave the work area for missing items is the point.

As technology and types of supplies change over time, a recalibration is periodically necessary. In addition, when storing at a minimal level, always standardize the restocking process, just as grocery stores restock items on a schedule.

4.6 Mapping the value stream with the solutions in mind

Bring the team together and map out the entire value stream, end-to-end, as though the solutions already are implemented. To accomplish this mapping, see 3.4, “Mapping the value stream” on page 16.

Then, evaluate to determine whether any downstream problems were created, any investments must be made, or whether there are any impediments that might have a negative impact on implementation efforts. Identify those issues for the champion and prepare a business case for any investment suggestions.

Reminder: Update your charter with ideas on eliminating, automating, and simplifying.

4.7 Conclusion

Before accepting that the number one constraint cannot go faster, remember the following items:

- Eliminate:
  - Hand-offs
  - Redundancy
  - Multiple approvals
  - Unnecessary walking
- Automate:
  - New technology
  - Poka Yoke
  - Auto-populate
- Simplify:
  - 5S
  - Colocate and sequence tasks
  - Standardize
  - Reduce motion
  - Reduce multitasking
  - Balance resources
  - Reduce defects

Then, after you accept that the number one constraint cannot go faster and all the appropriate efforts have been made, the value stream must then be designed around the constraint, which is referred to as *building a buffer*.

4.8 Tollgate 4: Reviewing solution ideas with key stakeholders

Set up a meeting with the team, champion, and other key stakeholders. Start with a summary of the reason for the project, bringing all stakeholders up to speed.

Explain that this is a decision-making meeting to determine which solutions to implement first, second, third, and so on. Some solutions can be completed in parallel with different teams working at the same time.

Reminder: Update your charter with the decisions.

Step 4 can begin only when the champion has approved the proposed changes, as they are instrumental in supporting change throughout the change management process. Do not forget that the champion also is the one responsible for releasing the human and financial resources that are needed for all projects.

5

Implementing the solution and allowing patients to pull value

This chapter describes step 4 in the Lean process: Implementing the solution and allowing patients to pull value.

This chapter covers the following topics:

- Following the kaizen philosophy
- Following a robust change management process
- Remapping the new process and documenting
- Training
- Conclusion
- Tollgate 5: Reviewing the changes made to date

5.1 Following the kaizen philosophy

The Japanese term *kaizen* translates as “good change”. In the United States, it is generally taught as a Lean principle and translated as *incremental continuous change*. The kaizen philosophy states that it is less problematic to take on smaller incremental changes one at a time than to attempt to change the entire value stream at once. Furthermore, over time the small changes result in significant changes to a value stream, and often are completed in parts faster than trying to solve all the issues at once. There are several benefits to this approach:

- The organization realizes benefits faster as a result of the most important and impactful issues being solved first.
- Team membership can be modified and optimized for each small change:
  - Often, each issue needs different subject matter experts (SMEs).
  - When team members must be on more than one solution team, their time is not dominated by the project.
- One solution often solves more than one issue in the value stream.
- Teams can celebrate each incremental change as short-term wins, which helps build trust with the key stakeholders.

Organizations often think of kaizen as a *blitz* where teams come together for 3 - 5 days and complete the first three steps of Lean, up to the point of solving the problems. Nonetheless, although a blitz is recommended, a kaizen does not have to be a blitz to be effective. Yet, in order for a kaizen to be effective, the approach to prioritization must be effectual. Otherwise, the team might go down the path of solving issues that have less impact on the overall value stream outcomes than other more important items.

5.1.1 Do not forget the other two components

When changing a process, be sure that the systems that employees use can support the process that is being changed. Workers naturally create workarounds when a system does not support a process. Likewise, when a system is being changed, make sure that the process is changed as well, or employees will find varying ways to work. In both scenarios, always train those working in the new process or with a new system. The goal is to optimize value by using automated systems and following a robust process (Figure 5-1 on page 55).

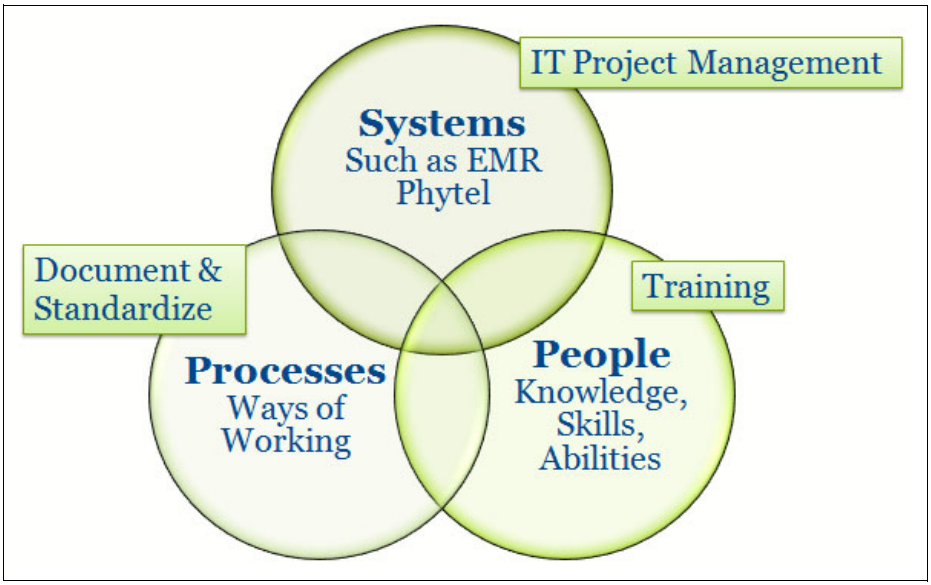

Figure 5-1 Interrelated system, processes, and people

5.1.2 Piloting when possible

Few processes begin with stable and robust outcomes. Use a smaller group to pilot the new process. They can help find areas of instability and things that were missed. When done, tweak the design and have those in the pilot group help train others. Their insight can be instrumental in helping others work through some of the issues that they, too, had to figure out.

5.1.3 Allowing patients to pull value

Never send a patient downstream until all resources, including supplies and equipment, and workers are ready and available.

Allowing patients to pull value refers to putting the patient at the center of the value-stream universe. It means building the value stream to respond to patient demand. The items that are listed in the Kano model exercise represent what to pull from a process design perspective, but step 4 goes beyond that. This is probably one of the toughest areas of change management in any organization, but it is especially difficult in healthcare where the patient is often viewed as a passive participant with the medical staff having the expert knowledge that on which the patient relies. For this reason, the patient has historically had to wait on getting the expert advice when the expert is ready and available. That thinking has created an industry-wide acceptable interrupted flow that directly impacts patient satisfaction and revenue.

Think about pull in healthcare as providing what the patient needs without any delay and without having excessive inventory or people (the medical staff), and having medical equipment, medication, supplies, and other items all available when the patient needs them without driving up costs by having excess inventory. The medical staff should be available for the patient always, which ensures that the patient never has to wait for someone or something. This is what an uninterrupted flow is. In order for this flow to occur, the value stream needs a *visual management system*.

5.1.4 Design in a visual management system

Kanban is a Japanese word that means *billboard*, and it is used in Lean to signal visually that something is needed. It is a visual alert for the workers in the value stream that something must be ordered or that the patient is ready for the next step in the process flow.

5.1.5 Using Kanban cards for supplies

Use reorder cards for all supplies that are used in the value stream to ensure that the office never runs out of any supplies, which results in a delay for the patient (Figure 5-2). Knowing the amount that is used daily for each supply and how long it takes to reorder helps you determine where to place the reorder alert to signify when more of something needs to be ordered. For example, knowing that three packs of an item are used daily and that they take two days to arrive, place the reorder card before or above the pack with about four days of supplies left. This action allows for about two days of float. A Kanban card signals when it is time to order more without having to keep excessive inventory that might expire and become waste. It ensures that the clinic orders only what is used, which is referred to in Lean as pull.

Figure 5-2 Kanban card

On the card, list at least the item name and its SKU along with any other information that you deem relevant to the item or the process. Be sure to communicate what to do with the card after it makes its way to the front, such as having a special box that is allocated for reorder cards that someone is assigned to check daily. Documenting the process proves helpful in standardizing the process and training of future employees.

5.1.6 Using a Kanban signal for the patient

Pull a patient through the process; never push. Moving a patient from the waiting room to the exam room provides no value for the patient or the clinic, and is termed a push in Lean (Figure 5-3 on page 57). Use a signal, such as a flag or marker, to denote when a room is empty, and pull the patient downstream only when all medical staff, equipment, and supplies are available and ready. For example, red might mean an occupied room and green might mean an empty room.

Figure 5-3 Ready or not ready signals

Schedule patient arrival times so that the patient can move through the process with as little wait time as possible. Use flexibility in work assignments, where legally allowable, so that resources can be balanced dynamically.

Reminder: Build in a buffer so that any value-add constraint is not waiting for the patient, but keep that wait time at a minimum and be sure to Lean the constraint first.

5.2 Following a robust change management process

The first three steps in Lean are the easiest to complete because everything from those steps is on paper. Influencing people to change represents the biggest obstacle to overcome regarding most process improvements. Demonstrating the compelling reasons for change, based on the work that is done in steps 1, 2, and 3, helps influence others to change. However, there is much more to change than merely showing evidence as a compelling reason. In order for change to occur, the project team must follow a robust change management approach. One of the most effective approaches to change that is often taught as part of Lean Six Sigma training program was developed by Harvard Professor John P. Kotter.

5.2.1 Kotter's eight steps for change

Professor John P. Kotter has written many books on change, including 12 New York Times best sellers. His eight-step approach has become an integrated component for business transformation in the Lean Six Sigma discipline. Kotter's publication *Our Iceberg Is Melting: Changing and Succeeding under Any Conditions*[1] specifically addresses change as being individually felt by penguins in a colony. Although changes to the iceberg affect the entire colony, each individual penguin perceives the problem of their iceberg melting differently because of personal beliefs, personal perceptions of loss, and personal past experiences. Likewise, although many organizations use the term organizational change, each person perceives a change from his or her own personal perspective; therefore, change is individual, not organizational. Remember the acronym *WIFM* (what's in it for me) as you go through the change management process because each person has his or her own personal thoughts about it, and a different implementation strategy might be needed for each person.

[1] Kotter, et al., *Our Iceberg Is Melting: Changing and Succeeding under Any Conditions*, St Martin's Press, 2005, ISBN 13: 9780312361983

For example, during a clinical change, one care coordinator might feel positive about a change because it allows her to do something she has always had a passion for, and another care coordinator might become stressed about the same change, as it requires him to give up an activity that he really enjoys doing. The same change affects each person differently depending on personal values, beliefs, and perceptions. Following Kotter's eight steps for change greatly increases the probability for project success. Therefore, as your team goes through step 4 of the Lean process, rely on Kotter's eight steps to help you get through what might prove to be the most difficult stage of the overall improvement process.

5.2.2 Professor Kotter's eight steps for change applied to Lean

This section covers the eight steps for change as applied to Lean:

- Create a sense of urgency.
- Form a guiding coalition.
- Create a vision of the future.
- Communicate the vision.
- Empower action.
- Create short-term wins.
- Do not let up.
- Make change stick.

Creating a sense of urgency

The key to driving change is through the support of a champion, which is defined as the individual who has the authority to release people and financial resources to work on the project. Talk to any experienced process improvement practitioner and they tell you that the single most important factor of any project success is having champion support. The champion communicates the urgency through talk and action and takes on the important role of removing barriers.

Use the first three steps of Lean to create and sustain a sense of urgency for the champion. This is the reason why using a visual style of maps can help gain support. A process that feels like a quagmire to those working in the value stream should look like a quagmire on the paper map, allowing those viewing it to understand the scope of the situation and necessity for fixing it. Collecting business and customer requirements and visually illustrating pain points on the map also goes far in gaining support up and down the organizational hierarchy. Use the voice of the patient to illustrate visually the activities in which requirements are not met. Align areas of patient non-satisfaction to activities in the map.

Forming a guiding coalition

To identify the guiding coalition, it is important to identify quickly the stakeholders who are for the change and those who are against it. It is beneficial to ask early adopters to help influence those who are in the skeptical majority. Because most changes are cross-functional, peer stakeholders can be more helpful than stakeholders in upper leadership positions. Peers can add another voice of influence and illustrate to the organization that the change benefits more than just the project leader's area of work. In addition, it becomes more difficult for negative stakeholders to resist a change when they become the minority.

Creating a vision of the future

Without understanding how the change improves patient satisfaction or business results that are important to them, members of an organization do not have a sense of urgency themselves. When employees do not understand how a change benefits them personally, resistance often results.

For any process improvement, creating a vision of the future really means demonstrating for stakeholders what the future will look like when the improvement is realized. A few examples follow:

- Patient satisfaction scores are expected to increase as wait times decrease. In addition, the front office staff spends less time at the copy machine and have only two patients at a time in the waiting room.
- Care coordinators spend less time downloading spreadsheets, which affords them more time to identify patients with chronic conditions.
- Schedulers spend less time per call without sacrificing the call quality, and the abandonment rate should decrease significantly.
- The IT department spends less time fixing issues on the weekend.
- Physicians have more value-added time to spend with their patients, resulting in increased patient engagement and patient satisfaction.

Communicating the vision

Communicating the vision cannot be overstated. Using the gap analysis from the Define, Measure, and Analyze phase can be useful in helping others visualize the future state. This visualization is the real purpose of those three phases; without them, articulating the future state becomes ambiguous and opinionated. The future state must be visualized with evidence, not just stated based on opinion. In addition, communication cannot be overdone. Phytel, Inc.® (an IBM Company) uses plasma televisions around the office, newsletters, emails, team huddles, and monthly *all hands on deck* meetings to communicate project visions. Most people accept a change after they understand the reasons behind it.

Empowering action

Projects fail when teams are not empowered to make the change. In addition to a lack of champion support, the second reason teams are not empowered to make a change is because there was a gap in team-member participation. For example, project teams struggle because IT was not represented when a systems change was necessary, clinical coordinators were not part of defining the criteria for working at the top of their license, or clinics decline involvement because they do not understand the reasons behind the proposed change.

Be sure that all process owners that are affected by the change have a voice on the project team. For example, we often establish an extended team in addition to the core team so process owners and SMEs can be brought in as needed. Better ideas are generated, and process owners that are affected by the change feel as though they are part of the solution, and thus more likely to facilitate the change within their own area.

Creating short-term wins

Creating a short-term win is directly tied to the guiding coalition. Improvements across the full value stream can take months to complete end-to-end. Even the most enthusiastic stakeholders lose interest over time when success is not quickly evident, and those against the change have fuel in persuading other stakeholders to not support it.

Thinking FISH

Although optimizing a value stream takes time, project teams often identify many things that need improvement within the end-to-end value stream. Jay Arthur, in his book *Lean Six Sigma for Hospitals: Simple Steps to Fast, Affordable, and Flawless Healthcare*[2], uses the acronym “FISH” as a way to encourage project teams to not get too diluted in multitasking across multiple projects. This approach ensures that process improvements follow the kaizen philosophy. FISH stands for:

- F: Focus on only one problem at a time.
- I: Improve in the focus area before moving on.
- S: Sustain the improvement until it becomes an unconscious habit.
- H: Honor through rewards.

This approach improves the velocity of the improvements by reducing process improvement work in process (WIP), and it helps ensure that positive stakeholders stay engaged and enthusiastic. This is tied directly to Professor Kotter's step 2, which is forming a guiding coalition. Keeping the coalition engaged is as important as forming it. A medium-impact improvement that took only 60 days to complete can have a much bigger impact on the sustainability than a high-impact improvement that took 12 months. Get the short-term win first, move on to the next improvement on the priority list, and celebrate along the way.

Do not let up

Engagement starts with the champion and flows to the project leader, and from the project leader it flows to the team. In the Accountable, Responsible, Consulted, and Informed (ARCI) model, sometimes referred to as RACI, the champion is the Accountable, and the project leader is Responsible to the Accountable. The project leader ensures that the champion's project is successfully closed, but the champion communicates the importance to the project leader with their level of engagement. A project in which the champion is not engaged should be canceled. However, the project leader should be replaced when the champion is fully engaged but the project is not moving forward. The champion must communicate importance through words and action, and the project leader must be relentless in moving the project on.

Making change stick

Very rarely does a new process start perfectly stable. Teams often struggle with the new ways of working, and unforeseen issues will likely surface. Before the project change goes into effect, the project leader must have a sound control plan in place. The control plan should include a daily monitoring of the three or four key success factors and mitigation plans for eliminating issues that interrupt the new process flow. Immediately swarming on issues is critical because it helps smooth out the process and shows the employees that the change is here to stay.

The champion and project leader cannot walk away after the change is launched. Each must stay engaged until the new process becomes the common way of working. It takes roughly 90 days before the team members feel fully comfortable with the change. This period varies depending on the complexity of the change. More complex changes might require more time for the change to stick than simpler changes.

[2] Arthur, *Lean Six Sigma for Hospitals: Simple Steps to Fast, Affordable, and Flawless Healthcare*, McGraw Hill, 2011, ISBN 9870171753258

5.3 Remapping the new process and documenting

Now that the new process is implemented with the changes in place, map the final version and document the new ways of working. Ensure version control by removing any old work instructions and replace with the new ones.

5.4 Training

Train everyone that is involved in the process and ensure that the new training material is available for new hires and for existing staff that might have questions.

5.5 Conclusion

Reminder: Align systems and processes so that value can be optimized. Train everyone on the new process before launch.

Be sure that the patient remains at the center of the universe in the value stream. Continually review the critical-to-quality elements from the patient's perspective and implement the process so that staff, equipment, and supplies are ready when the patient is pulled to the next process step.

Professor John P. Kotter had it correct all along with his eight-step change management process, and if it is used by organizations as part of their total quality management program, it helps increase the likelihood of continuous improvement success in driving positive organizational change.

Reminder: Update maps and work instructions, destroy old maps and work instructions, and then train all those directly or indirectly touched by the new way of working.

5.6 Tollgate 5: Reviewing the changes made to date

Set up a meeting with the team, champion, and other key stakeholders. Start with a summary of the reason for the project, bringing all stakeholders up to speed.

Show evidence that the process changes are in place. Discuss any impediments that are slowing down or causing resistance to the changes. Have the pilot team present their thoughts on the changes with additional ideas for continual improvement.

Reminder: Update your charter with the solutions.

6

Maintaining the gain and pursuing perfection

This chapter describes step 5 in the Lean process: Maintaining the gain and pursuing perfection.

This chapter covers the following topics:

- Monitoring important measures
- Pursuing perfection
- Tollgate 6: Holding periodic reviews for at least 90 days after full implementation
- Conclusion

6.1 Monitoring important measures

Maintaining the gain can occur only when everyone that is involved in the process knows that the value stream outcomes are monitored. The project team does not have to monitor every metric, but monitor only those measures that had high scores from the Quality Function Deployment (QFD) exercise, which is described at the following website:

http://asq.org/learn-about-quality/qfd-quality-function-deployment/overview/overview.html

6.1.1 Data: Determining what, who, how, and the duration

Sometimes data can be captured automatically through technology. If so, establish a data-collection cadence, and agree with the team about who collects the data and charts it.

When data must be captured manually, complete the following actions:

- Determine how the data is collected.
- Agree about who does the collecting.
- Agree about how long the data collection process continues.

Collecting the data manually on a sheet of paper or in a spreadsheet works fine, but at some point someone must enter the data into an electronic medium for charting. A simple data collection sheet should include only the minimum amount of data that is needed (Figure 6-1):

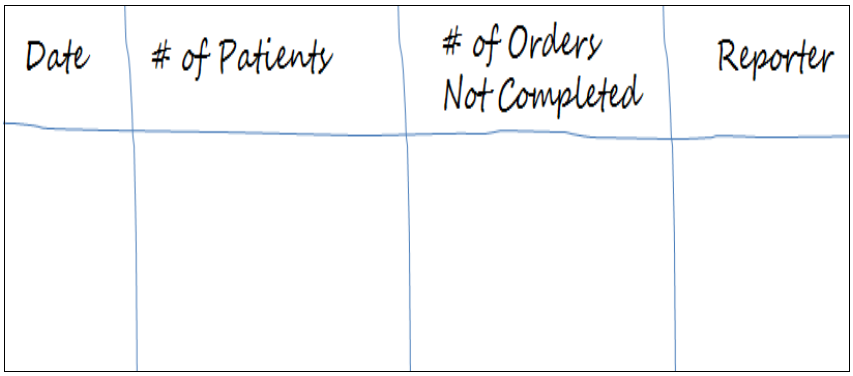

Figure 6-1 Data collection sheet

6.1.2 Using before-and-after comparisons

Use simple charts and graphs to show before versus after data. This approach encourages everyone to continue in the new process and provides evidence that the new process is working as planned. There are statistical tools that the team can use, such as a t-test, analysis of variance (ANOVA), capability analysis, and more. However, using those types of tools are not necessary. A simple line graph, bar chart, or box plot works in most cases.

Figure 6-2 on page 65 shows a run chart with before and after comparisons.

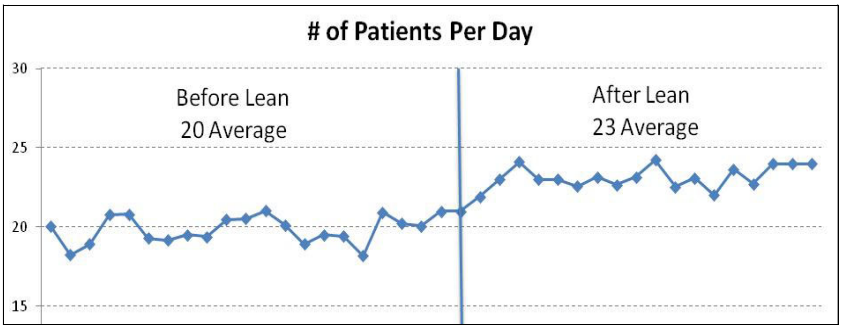

Figure 6-2 A run chart with before and after comparisons

Figure 6-3 shows a bar chart with before and after comparisons.

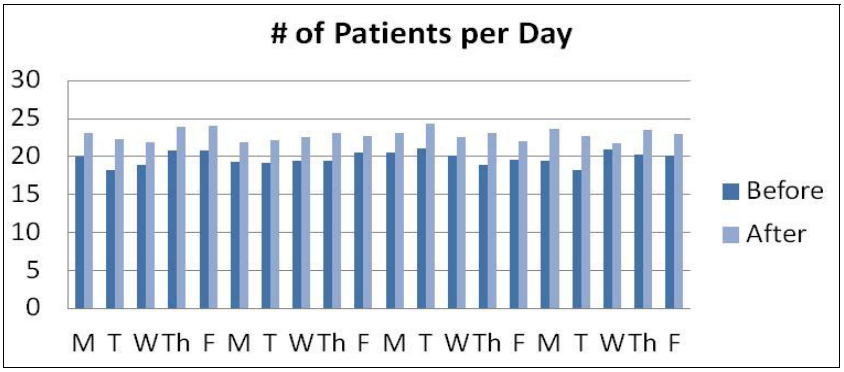

Figure 6-3 A bar chart with before and after comparisons

Figure 6-4 shows a box plot with a before and after comparison.

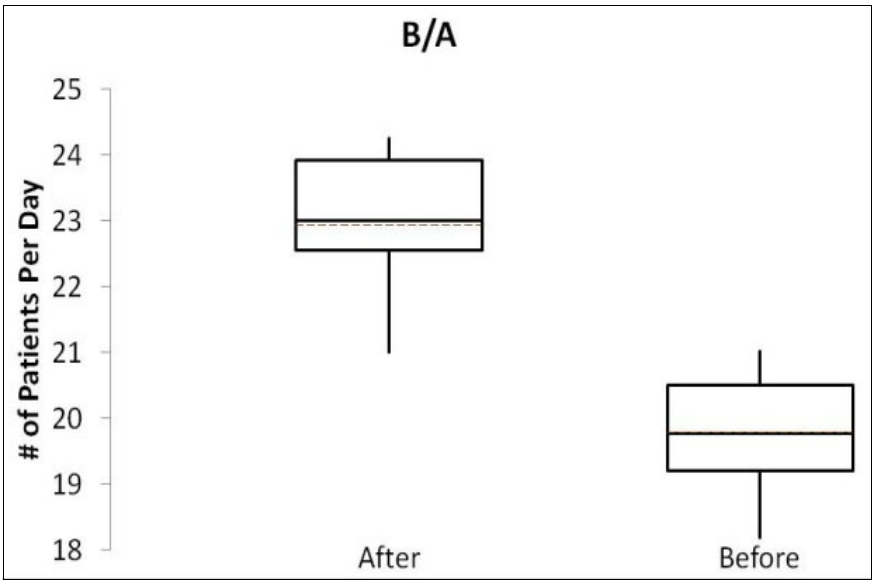

Figure 6-4 A box plot with a before and after comparison

6.2 Pursuing perfection

Go back to step 1 (Chapter 2, “Defining value from the patient's perspective” on page 5) and specify the value from the patient's perspective. Redefine newer and tougher targets. Continue until the champion feels that the process is good enough for now and that other processes need more attention. Continue to monitor the process to ensure that it does not degrade over time. Calibration and retraining are typically necessary.

6.3 Tollgate 6: Holding periodic reviews for at least 90 days after full implementation

Set up a series of meetings, at least monthly, with the team, champion, and other key stakeholders. As in your other update meetings, start with a summary of the reason for the project, bringing all stakeholders up to speed.

Discuss before-and-after results, issues of adoptability and successes, and next steps.

Continue to update the charter until the champion is ready to sign off on it, then close the charter.

6.4 Conclusion

We hope that this guide has assisted you in leading, facilitating, and mentoring your process improvement team. As stated at the beginning of this document, our experience has shown that most processes can be improved without having to rely on complex Six Sigma tools, such as hypothesis testing. Training a few high performers as Lean masters and empowering them to facilitate change allows them the ability to train other employees internally. This approach lowers training cost while speeding deployment of improvement efforts, thus reaping the benefits of higher revenue, profits, and overall organizational performance.

A

Lean guide

This appendix contains the steps to applying Lean to your environment.

A step-by-step Lean guide

The main steps to applying lean to your environment are as follows:

1. Define value from the patient's perspective:
   a. Select an area to investigate, and set specific and measurable objectives.
   b. Start the charter: problem statement, proposed champion, the benefit, and objectives.
   c. Get the champion: a manager one level higher than the process owners.
   d. Brainstorm 5Ms and P for the area under investigation.
   e. Develop a simple SIPOC map.
   f. Define customer value by using a Kano model.
2. Map the value stream, and identify issues and constraints:
   a. Value-stream map.
   b. Conduct a value-add flow analysis, and identify the number one and number two constraints.
   c. Categorize non-value-added time into DOWNTIME (the eight wastes).
   d. Optional: Use a Fishbone or Cause and Effect Matrix to filter issues to a critical few.
   e. Prepare a Failure Mode and Effects Analysis (FMEA) on the critical few.
   f. Conduct a 5-Why root-cause analysis for the causes in the FMEA.
   g. Create a priority matrix of the issues.
3. Continue to remove waste and make the value flow without interruption:
   a. Identify solution opportunities to eliminate, automate, or simplify.
   b. Consider 5S.
   c. Build a buffer around the constraint if it is a value-add.
4. Implement the solution, and allow patients to pull value:
   a. Follow a robust change management process (Kotter's eight steps recommended).
   b. Pilot, get feedback, and tweak.
   c. Launch.
5. Maintain the gain and pursue perfection
   a. Monitor for 90 days, and prepare a closure report with before-and-after data.
   b. Close.

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