

LEAN

Make Healthcare Lean

by **Anthony Manos, Mark Sattler and George Alukal**

Lean had its beginnings as the Toyota production system (TPS) at Toyota Motor Co. It is a continuous improvement methodology that started on the shop floor, then migrated to the whole enterprise and is now finding great benefit in purely service industries, including healthcare.

Taiichi Ohno, the father of TPS, believed in improving manufacturing and support processes at Toyota through working with the people who were intimately associated with each of these processes. He emphasized training, standardization and human creativity in his management philosophy. These ideas can easily apply to healthcare.

Joseph Juran linked manufacturing and health-

care even more directly. In his forward to *Curing Health Care*, Juran wrote: "As the health industry undertakes ... change, it is well advised to take into account the experience of other industries in order to understand what has worked and what has not. Of course, in the minds of many, the health industry is different. This is certainly true as to its history, technology and culture. However, the decisive factors in what works and what does not are the managerial processes, which are alike for all industries."¹

The managerial processes of lean are entirely as applicable in healthcare as they are in the auto industry. The functions at an automobile company include receiving, material management, fabrication, assembly, testing, delivery and logistics.

Hospital systems deal with functions such as emergency departments, routine checkups, imaging and other types of testing, admitting, surgery and hospital stays. Among the stakeholders in healthcare are administrators, nurses, doctors, support people and insurance companies.

Unlike manufacturing, healthcare management structures usually are not hierarchical. For example, doctors are not typically hospital employees, but are contractors. Hospitals are generally not-for-profit. Value adding for patients in healthcare is different than for customers in manufacturing because the main goal of healthcare is prevention or cure.

Wastes in Healthcare

Manufacturing has eight wastes, all of which also can apply to healthcare:

Overproduction. This is making more of something earlier or faster than the next process needs

In 50 Words Or Less

- Lean processes could contribute as much to the healthcare sector as they have to the auto industry.
- Lean's building blocks improve efficiency and eliminate errors.
- Two examples show how acceptance of lean can grow at healthcare organizations if they start with projects that get quick results.



it. This waste shows up most commonly in batching work—such as tests, paperwork or claims—in a hospital.

Inventory. A major cost to healthcare is for carrying inventory or supplies. Sometimes the cost of holding inventory is not fully understood. For example, when organizing a storeroom, one department found many overstocked, obsolete or incorrect items. Money was wasted on these items.

A major lesson the healthcare system could learn from lean manufacturing is that smaller, more frequent shipments are more desirable than a volume discount. Consider the overall cost, not just price.

Motion. The easiest way to think about motion waste is walking (or body movements). A lot of walking waste can arise from poor design of an area or lack of optimal working conditions that result in staff having to make multiple trips for things.

Transportation. In manufacturing this appears as moving parts around. In healthcare, transportation waste can show up when moving patients, tests, materials or information around.

Overprocessing. This is doing more than is required, especially from the customer's point of view. A simple example of overprocessing results in patients (customers) trying to figure out multiple claim forms, including the ones that state, "This is not a bill."

Defects. Defects, corrections, adjustments or inaccurate or incomplete information cause many problems. For example, a label on a blood tube that is misapplied, illegible or improperly aligned can cause errors or delays in processing.

Waiting. In any form, waiting is a waste. Examples include patients waiting in an emergency room for an inpatient bed to become available or staff waiting for an instrument to complete its run cycle, for a doctor or nurse to appear or for an operating room, test results, information or approvals to become available.

Underutilizing staff. Failing to tap into the knowledge, skills, education and creativity employees possess is a serious waste. Underuse typically shows up as silo mentality, hierarchical structures and not using teams.

The people closest to the work know it best. They are the process experts, and they just have to be trained in problem solving and lean techniques. One of the advantages of lean techniques is that staff members directly involved with the process are the ones who work to improve it.

Relying on internal or external consultants does not develop the internal knowledge or skill base needed to sustain lean. Both individuals and teams are a hidden treasure many organizations do not tap into.

Lean Tools and Techniques

Just as lean manufacturing has its building blocks, there are 18 building blocks of lean healthcare, as shown in Figure 1. The bottom blocks are the foundation on which lean healthcare rests and the other blocks are then built to more complex ones.

5S workplace organization refers to five words or phrases—sort, set in order, shine, standardize and sustain—used for workplace organization and standardization. The five words or phrases are derived from Japanese words. They deal with neat and organized individual workspaces. They go far beyond the cleanliness of an area to getting everyone involved in keeping the work space organized. “A place for everything and everything in its place” best summarizes the 5S’s.

Visual workplace systems such as signs, lines, labels and color coding eliminate guessing, searching and hoarding of information. Remember your audience when applying these principles.

In a children’s hospital, the path to the elevators (which had been around a corner and not in plain sight—a poor layout) was a set of railroad tracks painted on the floor. The children love the idea of following the tracks to see where they lead, which makes it easier for the parents to guide their children.

Layout is important because good physical arrangement can eliminate a lot of waste—including

motion and transportation—by getting important things closer together. Consider that the work area and output of one process is the input to the next process and should be arranged in sequential order. In other words, can you see your internal supplier and internal customer? Do you have line of sight?

Standardized work (SW) goes far beyond normal SOPs or policies. Most SOPs seem to be stored away from the work area, so workers rarely refer to them. In addition, there is usually no time expectation associated with the process steps. A standard time element allows for workload balancing. Using SW for repeatable tasks will improve quality because everyone will be trained to follow SW.

Point of use storage (POUS) means keeping the items used most often in the space where they are used. POUS also allows for supplies and materials to be delivered directly to the work area instead of to a centralized storeroom. POUS minimizes the waste of searching for items or walking to get needed items.

Batch size reduction of items such as tests, computer records and requisitions is desirable. At first, this may seem counterintuitive, but while batching may be efficient for a single process or function, it is not efficient for a system.

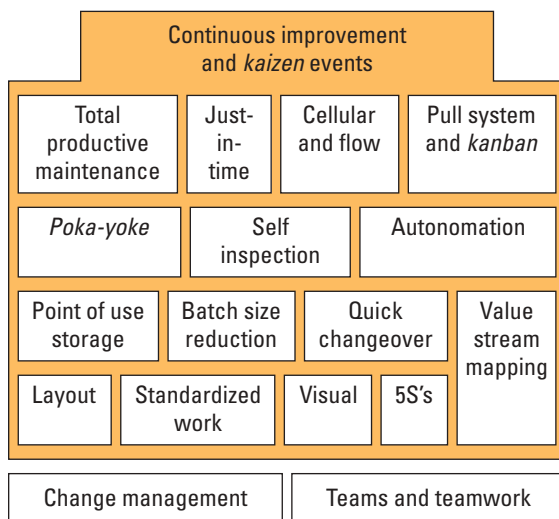
While waiting to batch work, you have no flow, and items sit and wait. For instance, when you ask an accounting department staffer to process one check, he or she might tell you, “No, we run all our checks at the same time. That way we are more efficient.”

This method might work well for the accounting department, but if you are waiting for the check, it does not meet your needs as a customer. The point is to figure out a simple way to print out one check at a time efficiently. Then you have reached the ultimate batch size to optimize system efficiency.

Quick changeover (QCO) is the ability to convert something very rapidly. QCO can be applied to areas such as operating rooms, patient rooms or examining rooms. Being able to change an operating room from the last surgery to the next surgery in a short time allows more surgeries, thus allowing more patients to be treated.

One of the biggest dissatisfiers for a patient in an emergency room is waiting for an inpatient bed. In manufacturing, a pit crew approach is sometimes deployed. If hospitals were to use this approach for room cleaning, we might see emergency rooms changeovers decompressed so

FIGURE 1 Building Blocks Of Lean Healthcare



patients could reach their beds sooner.

Poka-yoke (pronounced poka yokay) is a Japanese term for error proofing a process to eliminate a chance for a mistake. Error proofing becomes extremely important in situations in which people can cause errors.

Some healthcare organizations conduct in-service training and retraining when there is a problem and believe this will solve the situation. Because many healthcare workers are bombarded with training, it is understandable they may forget a new—or old—procedure.

The key is to set up the system so there is no chance for error. Simple examples include using bar codes or computerized physician order entry to eliminate the chance of not being able to read someone's handwriting.

Self-inspection is having people inspect their own work. Making this happen requires four things:

1. Training on how to inspect and what to inspect.
2. Standards to inspect to.
3. Equipment or other means to make the inspection.
4. Time to perform the inspection.

The purpose of self-inspection is to ensure no errors are passed along to the next step, because the effort required to correct an error increases dramatically at each successive step in the process.

Autonomation means automation with a human touch. A machine will sense an error and shut down automatically or call for operator intervention to correct the problem. A healthcare example of autonomation is a pulse oximeter becoming loose or disconnected from the patient. The reading deviates from the expected range and sets off an alarm, requiring intervention to silence the signal and replace the sensor on the patient's finger.

Pull systems and *kanban* refer to items being replenished at the request or pull of the customer or user. *Kanban* (Japanese for sign or signboard) is an information system that informs us when to make (production), move (withdrawal) or get materials from the external supplier. Items in storerooms or even surgical trays can be replenished using a pull or *kanban* system.

Cellular and flow refer to the physical linking of manpower and equipment so the next process gets the inputs from the previous process just in time, without excess work piling up in between

or work stations having to wait.

Henry Ford is widely quoted as having said in 1926, "The longer an article is in the process of manufacture and the more it is moved about, the greater its ultimate cost."

To put it another way, anytime you set something

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down or have a patient wait, you are reducing system efficiency and costing your organization more money. The idea is to have continuous flow.

Just-in-time (JIT), or delivering items just before they run out, should not only be applied to your external suppliers but to your own work system. For instance, transporting patients from their rooms to ancillary departments where they must wait an hour for their testing creates dissatisfaction. Think how healthcare organizations could delight the customer through JIT services.

Total productive maintenance (TPM) is keeping equipment in good working order so it is available and ready to use whenever needed. Many healthcare systems already have a biomedical engineering department to maintain their clinical equipment. A TPM program involves maintenance, operators, engineers and management in keeping all equipment in good operating order, resulting in the optimum overall equipment effectiveness.

Value stream mapping (VSM) is one of the most powerful tools used in lean to identify waste and create a plan to improve your processes. VSM uses icons or symbols to describe a value stream.

The four step process for using VSM includes:

1. Determine your process families.

2. Draw your current state map.
3. Create a future state map.
4. Create the plan to get to your future state.

A simple example of initiating a current state map for an emergency room is shown in Figure 2. If you'd like more information on VSM, see the "Lean Lessons" column in the June issue of *QP*.²

Continuous improvement or *kaizen* is needed because we never reach our goal of perfection. The Japanese word *kaizen* is loosely translated as continuous improvement.

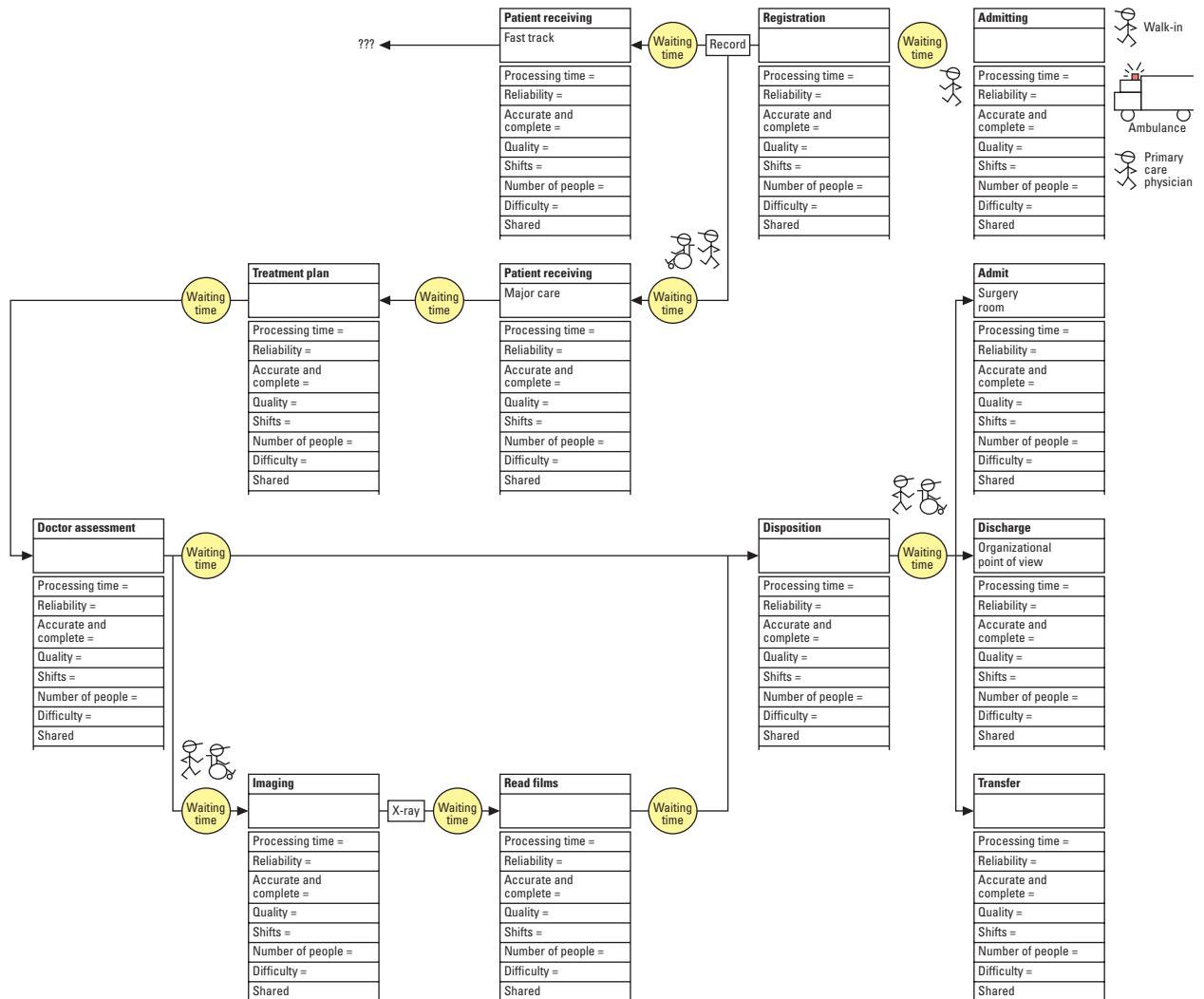
Just as in other industries, any planned change in a healthcare environment, whether incremental

or breakthrough, can be implemented using the tried and proven plan-do-study-act cycle.

There is always room for further improvements, or more *kaizens*, because technology, regulations, competition for patients, methods, procedures and cures continuously change.

Change management is how we deal with the change required to implement lean. Progress cannot be achieved without change. However, the way most people respond to imposed change is resistance. If the change leaders do not manage the change properly, it may require repeated intervention and the change ultimately may not be sustained.

FIGURE 2 Sample Emergency Room Current State Map



One of the most effective ways to implement and sustain change is to help all affected staff members understand WIIFM—what’s in it for me—and directly involve them in the change. If staff members help craft and implement change, the final product will be better because the people closest to the work know it best. Also, the change will be sustained because it is the staff members’ own work product.

Teams and teamwork can benefit healthcare and other organizations just as they have Toyota production. Healthcare organizations can also use the two types of improvement teams: project based *kaizen* or daily work teams.

The human side of lean is at least as or more critical in a hospital as on the shop floor because the inventory we are dealing with is other human beings, whose health and safety are paramount considerations.

Storeroom Example—a Good Start

Storeroom 5S projects have been a great benefit to all the staff members at one clinical laboratory. On numerous occasions, staff members had noted they were cramped for space and therefore did not have enough room to store key inventory items. It was hard to locate supplies quickly, and the inventory and ordering process took a long time.

The overall goal for both storerooms was ease of use, and the results have been a resounding success. Now someone who has never seen the storeroom can find an item within the constraints of a 30-second rule.

A labeling system implemented in each of the storerooms proved through testing to be the reason for this improvement. There is something in lean terminology called a “one-point lesson”—a highly visual instruction of how to quickly locate any supply item.

In addition to this labeling system, a stock locator list of all of the supply items in alphabetical order now is posted on the doorway. The locator sheet details the rack and shelf on which an item is located. The locations are clearly identified, allowing a staff person to walk straight to the location to retrieve the desired items.

An improvement team was able to reduce the inventory carried by limiting the stock of items that didn’t turn over quickly and by eliminating obsolete ones. This contributed to an increase in available space.

The team also changed the timing of the in-system distribution center’s supply deliveries. While not JIT yet, the frequency of deliveries has been increased so the lab can carry a smaller amount of inventory without risk of running out.

The 5S event’s results included making supplies easier to locate and a 17% increase in available storage space.

The team now is working with its major clinical lab vendors to get to more frequent deliveries of the same sequestered smaller quantities with the assigned lot number, which also will result in a significant inventory reduction.

One of the ways to reduce inventories and to make them more visible is to have them located at the point of use. The best method is to try to ensure there are enough supplies at each workstation to carry out tasks for a reasonable amount of time—hours or days, not weeks or months.

Consider having to restock the workstation only one time at the end of each shift. Otherwise, the process must be interrupted to restock, which wastes time. On the other hand, if a week’s worth of supplies is stored at the workstation, it clutters the work area and wastes valuable space.

Rarely used materials often take up space in a drawer or on shelves. If staff members hold their arms out from their sides, the area they can reach without moving out of their chairs is valuable space and should be populated only with things used most frequently.

Having just enough supplies on hand at the workstation (point of use) to last for the shift makes a workspace much less cluttered.

Upon completion of the clinical lab’s 5S project, several individuals from an anatomic pathology department were at the lab for a meeting and toured the completed storeroom. Once they saw what the team was able to achieve, they requested the team’s assistance and expertise in gaining similar results in their anatomic storeroom.

The 5S team then proceeded to work on the overcrowded anatomic pathology lab storeroom and freed 40% of the space there by using methods similar to those employed in the clinical lab.

Staff Break Room Example

With the great improvements made in storerooms and other areas, the 5S team decided to focus on another area in the hospital used by everyone,

believing this would encourage the lean efforts throughout the organization. The team picked the staff break room that services more than 200 staff members on three shifts.

The break room was cluttered, disorganized and dirty. No one owned the area. As a result, it was considered a no man's land, and its care fell to the few brave individuals who would undertake trying to keep it clean, neat and organized.

In addition to providing a place for staff members to enjoy their breaks, the area also served as a place for work related meetings and conferences because it was one of the areas of the lab with enough room to accommodate larger groups. Reference materials were stored in the break room.

The use of the area for work related activities was a complaint of staff members, who felt like intruders when a meeting was taking place. The 5S team located another area of the lab for work related activities and removed the reference materials. This allowed the team to rearrange the break room to accommodate more seating and decrease congestion around key areas during peak hours. Now the break room functions as it should, providing an orderly, uncluttered and clean space for employees to enjoy time away from their tasks.

Where To Start

The ways to start your lean journey include:

- Performing a gap analysis.
- Conducting lean training.
- Doing value stream mapping.
- Practicing change management.
- Starting with one of the basic building blocks of lean.

Organizing a storeroom or break room is a 5S example that is probably applicable to all health-care organizations. Both have the potential to lead to substantial progress in lean acceptance because results can be achieved quickly.

A vital lesson learned is never to underestimate the importance of communication. As with any change in an organization, leaders typically under-communicate by a factor of 10.

Make sure everyone involved in a work area is informed about upcoming lean projects and is familiar with the concepts and principles of 5S before the project starts. Also, be certain people from the work area are part of the team.

Healthcare professionals, in the past, have not

considered that lean could apply to their industry. Typical comments were "That may work for manufacturing or Toyota, but we're not building cars—we're a hospital!"

The Institute of Medicine identifies the enormous yearly cost in lives and dollars due to preventable errors.³ The application of proven lean techniques will be a start in improving this situation.

But it is becoming extremely evident the elimination of waste is a vital component of improving healthcare systems. Even starting with basic ideas such as 5S or visual controls will improve patient and employee satisfaction. The key is to roll up your sleeves and do it.

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