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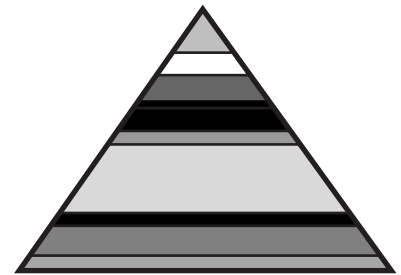
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**Innovation Series 2005**



# Going Lean in Health Care

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## **Executive Summary**

Lean management principles have been used effectively in manufacturing companies for decades, particularly in Japan. The Institute for Healthcare Improvement believes that lean principles can be — indeed, already are being — successfully applied to the delivery of health care.

Lean thinking begins with driving out waste so that all work adds value and serves the customer's needs. Identifying value-added and non-value-added steps in every process is the beginning of the journey toward lean operations.

In order for lean principles to take root, leaders must first work to create an organizational culture that is receptive to lean thinking. The commitment to lean must start at the very top of the organization, and all staff should be involved in helping to redesign processes to improve flow and reduce waste.

Although health care differs in many ways from manufacturing, there are also surprising similarities: Whether building a car or providing health care for a patient, workers must rely on multiple, complex processes to accomplish their tasks and provide value to the customer or patient. Waste — of money, time, supplies, or good will — decreases value.

Examples in this paper of lean thinking in health care demonstrate that, when applied rigorously and throughout an entire organization, lean principles can have a positive impact on productivity, cost, quality, and timely delivery of services.

## Introduction

The concept called “lean management” or “lean thinking” is most commonly associated with Japanese manufacturing, particularly the Toyota Production System (TPS). Much of the TPS way of thinking is based on the work of quality guru W. Edwards Deming, who taught, among other things, that managers should stop depending on mass inspection to achieve quality and, instead, focus on improving the production process and building quality into the product in the first place.

So what is meant by “lean thinking”? Simply put, lean means using less to do more.

Lean thinking is not typically associated with health care, where waste — of time, money, supplies, and good will — is a common problem. But the principles of lean management can, in fact, work in health care in much the same way they do in other industries. This paper presents a brief overview of lean management principles, and provides examples of two health care organizations that are successfully using lean thinking to streamline processes, reduce cost, and improve quality and timely delivery of products and services.

Lean thinking is not a manufacturing tactic or a cost-reduction program, but a management strategy that is applicable to all organizations because it has to do with improving processes. All organizations — including health care organizations — are composed of a series of processes, or sets of actions intended to create value for those who use or depend on them (customers/patients).

The core idea of lean involves determining the value of any given process by distinguishing value-added steps from non-value-added steps, and eliminating waste (or *muda* in Japanese) so that ultimately every step adds value to the process.

To maximize value and eliminate waste, leaders in health care, as in other organizations, must evaluate processes by accurately specifying the value desired by the user; identifying every step in the process (or “value stream,” in the language of lean) and eliminating non-value-added steps; and making value flow from beginning to end based on the pull — the expressed needs — of the customer/patient.

When applied rigorously and throughout an entire organization, lean principles can have a dramatic affect on productivity, cost, and quality. Figure 1 presents some statistics that testify to the power of lean thinking in industry. There is no *a priori* reason why much of this same effect can't be realized in health care.

Figure 1. The Impact of Lean Principles in Industry

Validated Industry Averages*	
Direct Labor/Productivity Improved	45–75%
Cost Reduced	25–55%
Throughput/Flow Increased	60–90%
Quality (Defects/Scrap) Reduced	50–90%
Inventory Reduced	60–90%
Space Reduced	35–50%
Lead Time Reduced	50–90%

\*Summarized results, subsequent to a five-year evaluation, from numerous companies (more than 15 aerospace-related). Companies ranged from 1 to >7 years in lean principles application/execution.

Source: Virginia Mason Medical Center

Agreement is growing among health care leaders that lean principles can reduce the waste that is pervasive in the US health care system. The Institute for Healthcare Improvement believes that adoption of lean management strategies — while not a simple task — can help health care organizations improve processes and outcomes, reduce cost, and increase satisfaction among patients, providers and staff.

### The Power of Lean in Health Care

Virginia Mason Medical Center in Seattle, Washington, has been using lean management principles since 2002. By working to eliminate waste, Virginia Mason created more capacity in existing programs and practices so that planned expansions were scrapped, saving significant capital expenses: \$1 million for an additional hyperbaric chamber that was no longer needed; \$1 to \$3 million for endoscopy suites that no longer needed to be relocated; \$6 million for new surgery suites that were no longer necessary.

Despite a “no-layoff policy,” a key tenet of lean management, staffing trends at Virginia Mason show a decrease in 2003 and 2004, after six years of annual increases in the number of full-time equivalents (FTEs). Using lean principles, staff, providers and patients have continuously improved or redesigned processes to eliminate waste, requiring fewer staff members and less rework, and resulting in better quality. Consequently, as employees retire or leave for other reasons, improved productivity allows for them not to be replaced.

All 5,000 Virginia Mason employees are required to attend an “Introduction to Lean” course, and many have participated in Rapid Process Improvement Weeks (RPIW). RPIWs are intensive week-long sessions in which teams analyze processes and propose, test, and implement improvements. The results from the 175 RPIWs that were conducted from January 2002 through March 2004 are shown in Figure 2.

How did Virginia Mason achieve these striking results?

Figure 2. Results of 175 Rapid Process Improvement Weeks at Virginia Mason Medical Center

Category	2004 Results (after 2 years of “lean”)	Metric	Change from 2002
Inventory	\$1,350,000	Dollars	Down 53%
Productivity	158	FTEs	36% redeployed to other open positions
Floor Space	22,324	Sq. Ft.	Down 41%
Lead Time	23,082	Hours	Down 65%
People Distance	Traveled 267,793	Feet	Down 44%
Product Distance	Traveled 272,262	Feet	Down 72%
Setup Time	7,744	Hours	Down 82%

Source: Virginia Mason Medical Center

**Key Concepts in Lean Thinking: Lessons from the Experience in Industry**

Virginia Mason’s achievements were based on lean thinking, the major precepts of which are as follows:

**Leadership:** Introducing lean thinking in an organization is, in the words of those who have done it, not for the faint of heart. It cannot be done piecemeal, but must be a whole-system strategy. There is no single “silver bullet” solution such as a new computer system or automated equipment that will achieve the same results. And it cannot be done only by middle managers or frontline workers. Those at the very top of the organization must lead it.

Implementing lean thinking requires major change management throughout an entire organization, which can be traumatic and difficult. Strong commitment and inspiring leadership from senior leaders is essential to the success of an effort this challenging. The CEO must be a vocal, visible champion of lean management, create an environment where it is permissible to fail, set stretch goals, and encourage “leaps of faith.” A senior management team that is aligned in its vision and understanding of lean is a critical foundation for “going lean.”

**Culture:** A lean culture is the backdrop against which lean tools and techniques are implemented. That culture differs in some significant ways from a traditional culture in business, as well as in health care. Figure 3 offers some examples.

Figure 3. Traditional Culture vs. Lean Culture

Traditional Culture	Lean Culture
Function Silos	Interdisciplinary teams
Managers direct	Managers teach/enable
Benchmark to justify not improving: “just as good”	Seek the ultimate performance, the absence of waste
Blame people	Root cause analysis
Rewards: individual	Rewards: group sharing
Supplier is enemy	Supplier is ally
Guard information	Share information
Volume lowers cost	Removing waste lowers cost
Internal focus	Customer focus
Expert driven	Process driven

Source: A.P. Byrne, O.J. Fiume

An organization’s culture is the set of values and beliefs that cause people to behave in certain ways. When they behave that way and get the results they expect, it reinforces those values and beliefs. This self-reinforcing cycle creates a culture.

Leaders who wish to change their organizational culture cannot do so by edict. They must intervene and require people to behave differently, allowing them to experience a better set of results. As this process is repeated, a different set of values and beliefs — a new culture — will evolve.

One of the challenges of implementing lean in health care is that it requires people to identify waste in the work in which they are so invested. All workers want to feel their work is valuable, perhaps most especially health care workers. Recognizing that much about their daily tasks is wasteful and does not add value can be difficult for health care professionals. A nurse who is hunting for supplies is doing it to serve the needs of patients. Nurses may not see this as wasted time, and may not stop to wonder why those supplies aren’t where they need them every time they need them. But if the supplies were always readily available, the time nurses spend hunting for them would instead be devoted to something more appropriate to their skills and expertise.

To help staff see and embrace the promise of lean, leaders must create a clear vision statement that guides people to make the right choices. They must evaluate the organizational structure and work to flatten it, eliminating hierarchical layers and organizing staff into operational teams based on products or services.

**Process:** A process is a set of actions or steps, each of which must be accomplished properly in the proper sequence at the proper time to create value for a customer or patient. *Primary* processes serve the external customer (in health care, patients and their families). *Internal* processes serve internal



customers/staff in support of the primary process. Primary processes are easier to see, but internal processes are necessary to create value in the primary process.

Compared to other industries, health care has been slow to identify who the customer really is. Because of the complexity of the health care system, internal customers — physicians, hospitals, insurers, government, payers — have often driven processes. It is critically important that value be defined by the primary customer: the patient.

A perfect process creates precisely the right value for the customer. In a perfect process, every step is *valuable* (creates value for the customer), *capable* (produces a good result every time), *available* (produces the desired output, not just the desired quality, every time), *adequate* (does not cause delay), *flexible*, and *linked by continuous flow*. Failure in any of these dimensions produces some type of waste. The Toyota Production System (TPS) identifies seven categories of waste: overproduction, waiting, transporting, processing, inventory, motion, and correction.

A perfect process not only creates value, but it is also satisfying for people to perform, managers to manage, and customers to experience.

## **Getting Started**

To create the perfect process, begin by identifying the key processes (value streams) in your organization. Key processes are those that support core “products.” In health care, a core product might be an office visit, or an inpatient stay, or a visit to the emergency department.

For each of those core products, identify key processes, both primary and internal, that support them. Identify the person responsible for thinking about each process as a whole, how it works, and how to make it better. In most organizations, there is no one performing that role. Leaders should appoint someone who is widely respected within the organization to “own” each process in its entirety. This is not a full-time job, should not require reorganization, and needn't involve a supervisory role over those who work within the process. It does require attention to relentless pursuit of driving waste out of the process.

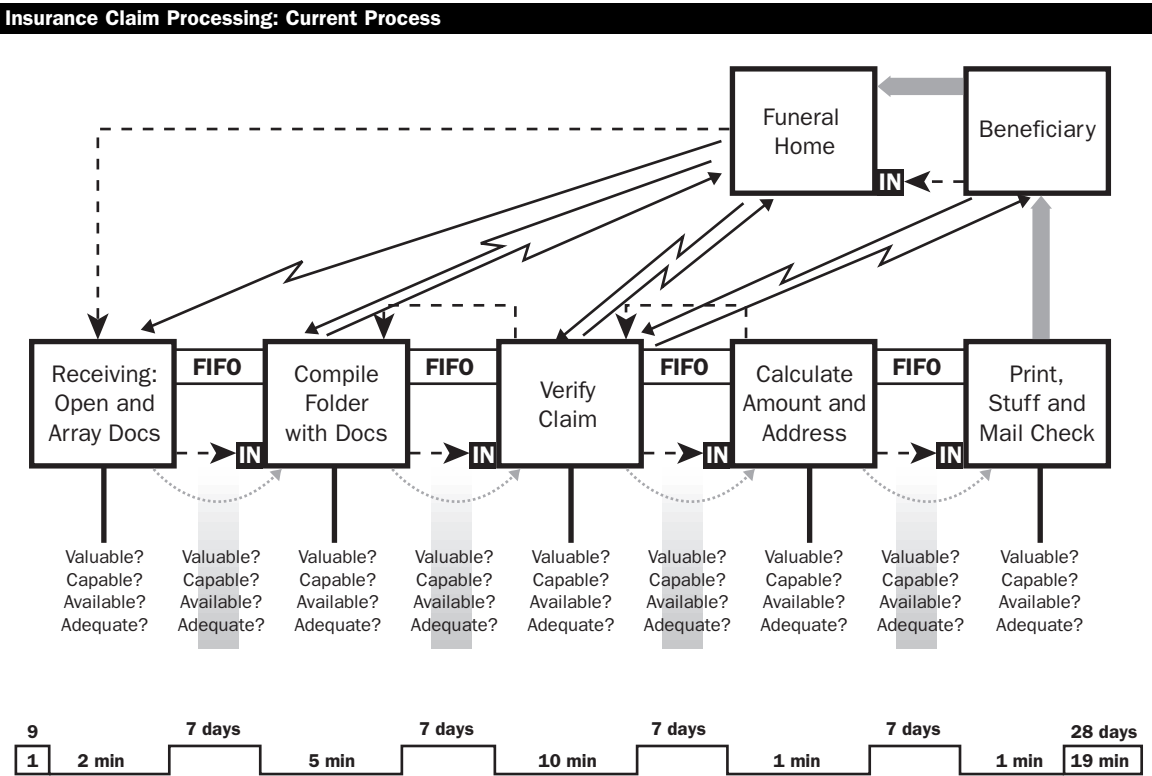
Lean experts note that the only sustainable process is one that participants believe in. The best way to create belief in a process is for participants to be able to see it in its entirety and to understand its logic. The best way to create vision and understanding is to directly involve participants in improving the process.

This is most often done by bringing together key participants from a chosen process in a *kaizen* event, an intensive four- or five-day session focused solely on analyzing current processes and implementing changes. (*Kaizen* means continuous, incremental improvement of an activity to create more value with less *muda*.) Large lean organizations typically conduct hundreds of *kaizen*

events every year; employees know they are expected to participate, either directly on the team or testing and continuing the daily work while others participate. Some companies develop compensation mechanisms tied to *kaizen* events, or use a productivity-based compensation system so that participants feel a measure of personal investment.

For each key process identified, a *kaizen* team begins by mapping the process as it actually operates (not how it is supposed to operate), specifying value from the standpoint of the customer (external or internal), as well as waste in steps or between steps. Physically walking through the process steps — following the route of a referral form or insurance claim, for example — can be very illuminating. An example of a value stream map — in this example, for processing an insurance claim — is shown in Figure 4. The map depicts the current process containing nine steps (as indicated in the lower left corner), with the actual required work time and elapsed process time indicated below each step in the process. Note in the lower right corner that, because of excessive delays between steps, the 19 minutes of actual work required to complete the process takes place over a 28-day period.

Figure 4. Example of a Value Stream Map

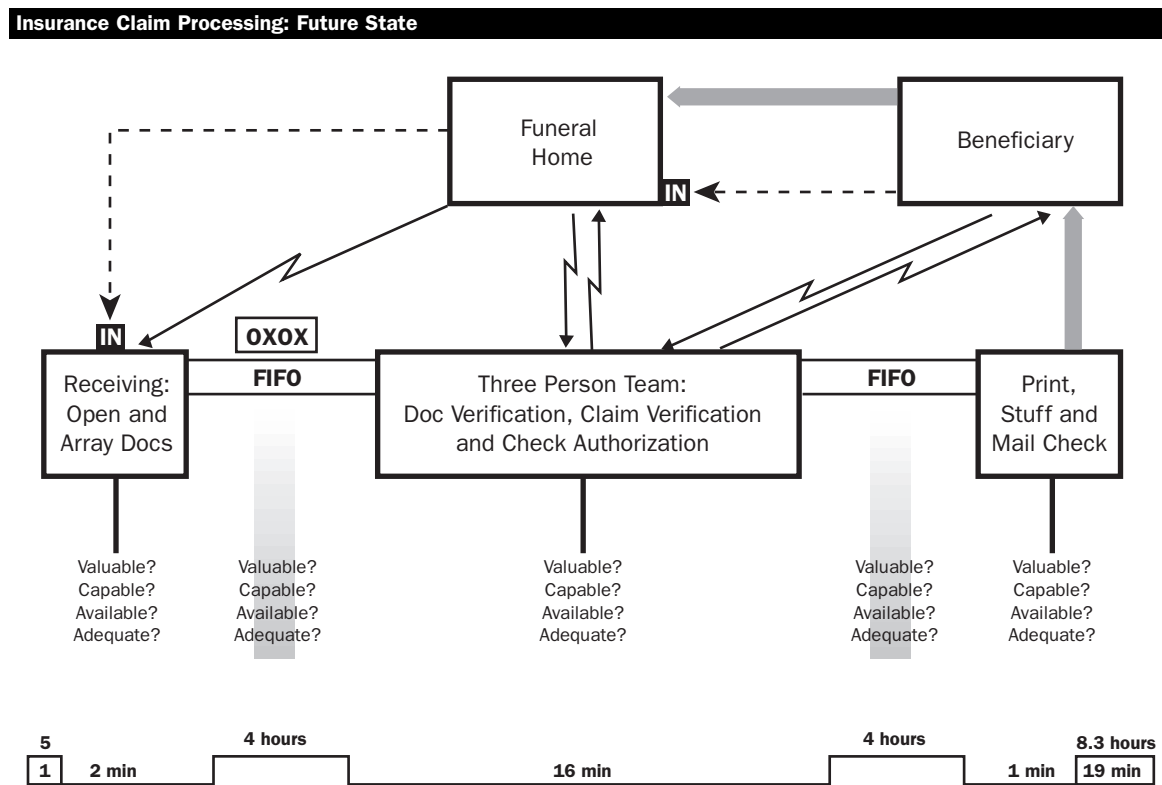


Source: Lean Enterprise Institute

Next, the group envisions and maps the future state (typically within the next 12 months) by asking how the process should be changed to move toward perfection. This is known as a “future state value stream map.” Figure 5 shows a future state value stream map for the same process mapped in Figure 4, now with only five steps in the process. Note that in the ideal future state most of the wasted time between steps is eliminated, allowing workers to complete the same 19 minutes of work in 8.3 hours instead of 28 days.

The details of these sample maps are less important than the ideas they represent. The format of a value stream map can vary according to the mapmakers’ preferences. The important thing about a value stream map is that it is explicit about the flow and value of the process.

Figure 5. Example of a Future State Value Stream Map



Source: Lean Enterprise Institute

Using the future state value stream map, the group reorganizes staff if necessary to match the requirements of the process. Notice that most processes flow horizontally, while most organizations are organized vertically. This is a fundamental challenge, because the process must flow across organizational impediments and boundaries. A patient's journey from a diagnostic center to a treatment facility would be an example of this.

Like other quality improvement initiatives, implementing and sustaining the future state of a process involves Plan-Do-Study-Act (PDSA) cycles in which small tests of change are carried out, the results assessed and analyzed, adjustments made, and successes spread. In trying to create a perfect process, teams should design small tests of change ("Plan"); implement the tests on a small scale ("Do"); measure the performance compared with the current state and reflect on how it could be better ("Study"); introduce the necessary changes to adjust the process ("Act"); and determine whether the adjusted process is stable and sustainable.

Continuous measurement of processes is important, as is the choice of measures, because what gets measured influences behavior. People may have an incentive to do the wrong thing if it will improve the metric. For example, a measure that focuses on the purchase price of an item might create the incentive for a purchasing manager to buy large quantities at a discount. But whether it's carburetors or catheters, excess inventory and carrying costs, along with the possibility that technical advances might render the items obsolete, create waste. "Just-in-Time" inventory is an important lean principle.

A good performance measurement system for lean processes is simple and does not include too many metrics. It supports the strategy to implement lean; motivates the desired behavior; is not overly focused on financial metrics; measures the process not the people; does not include ratios, which most people find confusing; is timely (hourly, daily, weekly) so that corrective action can be taken when the process is not going well; and uses visual displays so that people can see trends over time.

There are many additional aspects to lean thinking, more than can be covered in this paper. Readers interested in delving deeper into lean thinking are encouraged to see the list of additional resources at the end of this paper.

## **Applying Lean Thinking to Health Care**

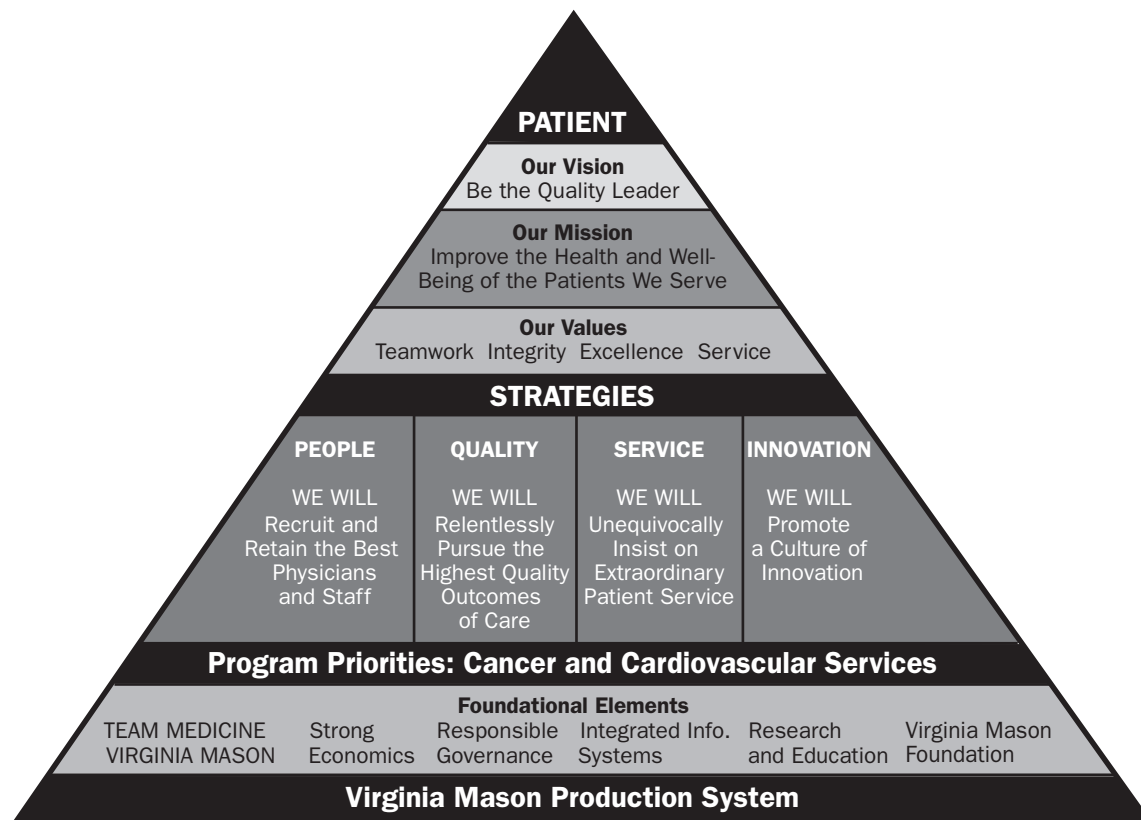
### **Virginia Mason Medical Center**

Seattle's Virginia Mason Medical Center is an integrated health care system that includes a 336-bed hospital, nine locations, 400 physicians and 5,000 employees. In 2000, following a period of economic stress and a general malaise in the organizational culture, the Board of Directors issued a broad mandate for change. Under new leadership, Virginia Mason developed a new strategic plan that called for, among other things, a sharper business focus and more accountability.

The Virginia Mason Strategic Plan is more than just words. It is mapped out in graphic form as a triangle divided into sections like the food pyramid, with the primary customer — the patient — at the top, supported equally by four “pillars”: people (recruiting and retaining the best staff), quality (a focus on achieving best outcomes), service (to internal and external “customers”), and innovation (supported by the culture). The goal at Virginia Mason is to design the system and its processes around the patients’ needs rather than around the needs of providers and staff. The reality is that, in lean companies, this focus on the customer also supports the staff.

The organization’s vision is to be the quality leader in health care. The method that leadership chose to pursue that vision is the Virginia Mason Production System (VMPS), modeled on the Toyota Production System. The VMPS forms the foundation for the organization’s strategic plan (see Figure 6).

Figure 6. The Virginia Mason Medical Center Strategic Plan



Source: Virginia Mason Medical Center

Creating this strategic plan, with its clear and unequivocal focus on the patient, was the first step in changing the culture at Virginia Mason. When it was introduced in late 2001 and to this date, leaders referred to it in every presentation, relating all work to the strategic plan. Graphic images of the plan were posted in visible places throughout the organization.

In a lean environment, roles and expectations are explicit. So Virginia Mason leaders sought to clarify expectations, responsibilities, and accountabilities. In the spirit of transparency, feedback, and trust that underlies both the Toyota Production System and the Virginia Mason Production System, Virginia Mason leaders created “compacts” for leaders, for the Board of Directors, and for physicians, spelling out expectations and responsibilities for each, as well as what they can expect from the organization. This is another way that Virginia Mason laid the cultural foundation for lean.

### *The Virginia Mason Production System*

To get all the senior leaders “on the same page” and help them immerse themselves in lean principles, in 2002 Virginia Mason sent all its senior executives to Japan to “see with their own eyes” how lean management really works. Working on the production line in the Hitachi Air Conditioning plant, executive leaders recorded workflow, measured cycle times, and documented process flow. According to senior leaders, they learned that health care has many steps and concepts in common with the production of goods.

Like health care, Japanese manufacturing processes involve concepts of quality, safety, customer satisfaction, staff satisfaction, and cost-effectiveness. The completion of the product — or the service — involves thousands of processes, many of them very complex. As in health care, the stakes are high: A product failure can cause fatalities.

Senior leaders developed the Virginia Mason Production System (VMPS), based on the principles of the Toyota Production System, following that first trip to Japan (there have been many trips since that first visit including managers, physicians, nurses and front-line staff). The idea behind VMPS is to achieve continuous improvement by adding value without adding money, people, large machines, space or inventory, all toward a single overarching goal — no waste.

VMPS has six areas of focus:

1. “Patient First” as the driver for all processes
2. The creation of an environment in which people feel safe and free to engage in improvement — including the adoption of a “No-Layoff Policy”
3. Implementation of a company-wide defect alert system called “The Patient Safety Alert System”

4. Encouragement of innovation and “trystorming” (beyond brainstorming, trystorming involves quickly trying new ideas or models of new ideas)
5. Creating a prosperous economic organization primarily by eliminating waste
6. Accountable leadership

Two details on this list bear further explanation. The No-Layoff Policy is critical to the success of implementing lean management. People will more fully commit and engage in improvement work if they are not worried about improving themselves out of a job. Attrition, typically steady in health care, will enable most organizations to reassign staff to other necessary work. A culture shift is important here as well: Staff, especially in health care, do not typically view themselves as working for the organization, but for their individual department and/or care team. In lean thinking, the patient/customer drives all processes, and staff/providers must come to understand that they work for the patient. This means they may be reassigned depending on the needs of the patients.

Secondly, the defect alert system is a fundamental element of the TPS, known as “stopping the line.” Every worker in the Toyota plant has the power and the obligation to stop the assembly line when a defect or error is identified or even suspected. Workers pull a cord, a light goes on, music plays as a signal for supervisors to come and help, and the entire assembly line either slows or stops (depending on the degree of the defect resolution time) while line workers and supervisors assess and fix the problem, often preventing an error from becoming embedded in the final product. This typically happens many times a day.

The theory behind stopping the line is that mistakes are inevitable, but reversible. Defects are mistakes that were not fixed at the source, passed on to another process, or not detected soon enough and are now relatively permanent. If you fix mistakes early enough in the process, your product will have zero defects. Mistakes are least harmful and easiest to fix the closer you get to the time and place they arise. The reverse is also true.

At Virginia Mason, the Patient Safety Alert System is part of a culture in which anyone can, and indeed must, “stop the line,” or stop the care process if they feel something is not right. The person who activates the alert calls the patient safety department (or submits the alert via the website) and an administrator or other relevant manager and the appropriate process stakeholders come immediately to assess the situation and conduct a root cause analysis.

In 2002 there were an average of three alerts per month at Virginia Mason; by the end of 2004 that number had risen to 17. The alerts predominately identify systems issues, medication errors, and problems with equipment and/or facilities.

*An Example of a Patient Safety Alert at Virginia Mason Hospital*

A Virginia Mason staff nurse noticed that a new patient had a pink wristband. A pink wristband signifies “No Code 4,” meaning all resuscitation is withheld. The nurse felt this was odd because the patient had a new diagnosis of operable lung cancer, so she asked the patient what the wristband meant. The patient indicated it signified his allergy to certain medications.

The nurse replaced the wristband with the correct one — an orange one that signifies drug allergies — and reported the incident to her manager who called a Patient Safety Alert. That same day a new procedure was developed to print “Allergy Alert” on the orange wristbands.

Leadership accountability is a key component in the Patient Safety Alert System. In this instance, the Chief Nursing Officer and the Vice President of Information Systems facilitated the hospital-wide change in the wristband printing process by the following morning. When leadership goes to the *gemba*, or shop floor, changes can happen quickly.

*More about the VMPS Structure and Functional Elements*

The VMPS is an integrated system of processes and approaches that tie together, and must be thought of in an integrated way. A major component of the system is value stream mapping. Nearly every area in the medical center has a high-level value stream map and a detailed process flow diagram.

*Kaizen* events, or Rapid Process Improvement Workshops at Virginia Mason, are held weekly, bringing people together to use the tools of lean to achieve immediate results in the elimination of waste.

Other tools of VMPS include 5-S and 3-P, shorthand for organizing frameworks. 5-S (sort, simplify, standardize, sweep and self-discipline) is a method for organizing work areas to maximize smooth and efficient flow of activities and reduce wasted time and effort. 3-P (production, preparation, process) focuses on the design of new processes or workspaces.

*A Sobering Reminder*

In addition to the financial and efficiency gains cited earlier, the lean culture has also advanced clinical improvements at Virginia Mason. For example, because lean promotes the consistent and reliable use of standardized processes, the groundwork was laid for introduction of the “ventilator bundle,” a set of specific steps proven to reduce the incidence of ventilator-associated pneumonia (VAP). In 2002, Virginia Mason had 34 cases of VAP, at an estimated cost of \$500,000. In 2004, after implementing the ventilator bundle, Virginia Mason had only four cases of VAP, at an estimated cost of \$60,000.

Even with these successes, leaders there say that the work of implementing lean thinking throughout the organization remains challenging, requiring considerable focus and commitment, and that despite



steady progress, they are still on the journey to lean, defect-free care. This was made painfully clear in November 2004 when a Virginia Mason patient died as a result of a medical error.

Senior management, then in the process of setting its executive leadership goals for the coming year, used the tragedy as a guide in its work and reduced the proposed five executive leadership goals to just one: Ensure the Safety of Our Patients. Virginia Mason leaders believe that the Virginia Mason Production System is the means by which they can achieve this goal.

**ThedaCare, Inc.**

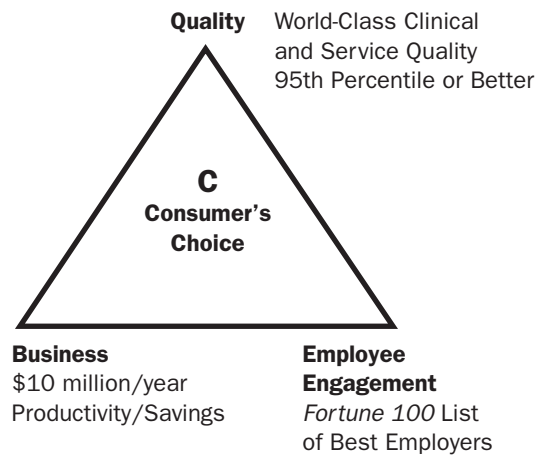
ThedaCare, Inc., is a health delivery system with three hospitals, 27 physician clinics, and a 300,000-member health plan, based in northeast Wisconsin. Nationally recognized for its quality performance results, ThedaCare is also among the nation’s “most wired,” or computer-savvy, health care institutions. With 5,000 employees, it is northeast Wisconsin’s second largest employer.

Though some of the details differ, the “lean story” at ThedaCare is very similar to Virginia Mason’s. While it is helpful to see the principles in use, it is not necessary to visit a Japanese company to gain a clear understanding of lean thinking; manufacturing companies in the US are using lean principles as well. ThedaCare leaders consulted with a nearby Wisconsin-based business, Ariens Outdoor Power Equipment Company, that has very successfully employed lean management for several years.

ThedaCare leaders set ambitious and specific goals to kindle a culture change: Improve quality to “world-class” levels (95th percentile or greater); become the health care employer of choice, making the *Fortune 100* list of best employers; and lower costs in order to lower the price paid for services, gaining \$10 million a year through cost savings and increased productivity. The patient is at the center of these goals.

ThedaCare represents the goals graphically to help all staff visualize them (Figure 7).

Figure 7. ThedaCare’s Lean Goals and Metrics



Source: ThedaCare, Inc.

The culture ThedaCare leaders and staff are working to create is one in which constant improvement is seen as a never-ending journey, relying on the organization’s most important attribute: the brain-power of its staff.

ThedaCare leaders recognize that a great deal of waste is the result of time the staff spend “putting out fires,” and that designing processes that work better reduces waste and enables staff to better meet the needs of patients. Like Virginia Mason, ThedaCare engages staff in intensive process improvement efforts, which they call Event Weeks. Participation in at least one Event Week is mandatory for all staff members (staff can choose from six different Event Week topics each week).

The groups that come together for Event Weeks use the ThedaCare Improvement System, which includes three tenets for change, as a framework for their work. These tenets are:

1. Respect for people
2. Teaching through experience
3. Focus on world-class performance

The details of these tenets are spelled out so that leaders and staff can use them in their process improvement work. For example, Figure 8 shows how the organization defines the first tenet.

Figure 8. ThedaCare’s First Tenet for Change: Respect for People

What It Is:	What It Isn’t:
Error-free practice	Long wait times
Timely service	Creating/doing non-value-added work
No waste	Wasted time
No-layoff philosophy	Wasted materials
Professionals who work together to improve performance	People focused on tasks rather than patient outcomes

Source: ThedaCare, Inc.

Teaching through experience is important because people learn best when they are directly involved. The rapid results of the work — “What gets designed on Wednesday is implemented on Friday,” says one ThedaCare leader — demonstrates for participants the power of their work and helps to build momentum.

The three goals of the ThedaCare Improvement System are:

1. Improved staff morale
2. Improved quality (reduction of defects)
3. Improved productivity

Every Event Week must focus specifically on these three goals.

ThedaCare leaders have acknowledged to staff that the new culture of lean will feel counter-intuitive for a while, with its emphasis on reducing waste and non-value-added work, as opposed to adding technology, buildings, or manpower. Lean also has a penchant for redeploying the *best* employees when productivity improves, not the poor or marginal performers; moving an accomplished lean thinker to a new department is an effective way to spread change.

The new culture requires new behaviors, including the use of smaller, “right-sized” groups of workers or technologies in “cells” rather than large, cumbersome processes; strong, sometimes directive leadership, augmenting more traditional team approaches; and less batching of work in favor of “right now” real-time action.

The new culture of lean also means that some roles change. For example, managers become teachers, mentors, and facilitators rather than simply directors or controllers.

#### *Results at ThedaCare*

On a monthly basis, ThedaCare tracks a range of outcomes related to lean management, including number of Event Weeks, number of employees who have participated in at least one Event Week, significant quality improvements, and financial measures.

With about six rapid improvement Event Week topics every week, by the end of 2004 ThedaCare had involved more than 600 employees directly in learning about lean thinking.

Examples of results at ThedaCare include the following:

- \$3.3 million in savings in 2004
- Saved \$154,000 in the Catheterization Lab supply procurement processes
- In 2004, reduced accounts receivable from 56 to 44 days equating to about \$12 million in cash flow
- Redeployed staff in several areas saving the equivalent of 33 FTEs

- Improved ThedaCare Physicians phone triage times by 35 percent, reducing hold time from 89 to 58 seconds
- Reduced ThedaCare Physicians phone triage abandonment rates by 48 percent (from 11.6 percent to 6.0 percent)
- Reduced by 50 percent the time it takes to complete clinical paperwork on admission
- Appleton Medical Center Med/Surg decreased medication distribution time from 15 minute/medication pass (the amount of time it takes to pass one medication to one patient) to 8 min/medication pass impacting 4.1 FTEs of staff time.

### **Conclusion**

Lean management is not a new concept, but it is relatively new to health care. While skeptics are right when they say, “Patients are not cars,” medical care is, in fact, delivered in extraordinarily complex organizations, with thousands of interacting processes, much like the manufacturing industry. Many aspects of the Toyota Production System and other lean tools therefore can and do apply to the processes of delivering care.

Courageous, forward-thinking health care organizations such as Virginia Mason and ThedaCare, along with others, are leading the way by demonstrating that lean management can reduce waste in health care with results comparable to other industries. Leaders of these organizations emphasize the importance of creating an organizational culture that is ready and willing to accept lean thinking. Without a receptive culture the principles of lean will fail.

The Institute for Healthcare Improvement believes that many management and operations tools in other industries can be applied successfully to health care. Lean principles hold the promise of reducing or eliminating wasted time, money, and energy in health care, creating a system that is efficient, effective, and truly responsive to the needs of patients — the “customers” at the heart of it all.

## Glossary of Lean Terms

**5-S:** Sort, Simplify, Sweep, Standardize, Self-Discipline: a visually-oriented system for organizing the workplace to minimize the waste of time.

**Adequate:** In value stream mapping, the capacity for any given step in a process is adequate if the process is not delayed at that step.

**Available:** In value stream mapping, a step in a process is available if it produces the desired output, not just the desired quality, every time.

**Batch-and-queue:** The mass-production practice of making large lots of a part then sending the batch to wait in the queue before the next operation in the production process. Contrast with single-piece flow.

**Capable:** In value stream mapping, a step in a process is capable if it produces a good result every time.

**Cycle time:** The time required for completing one step of a process.

**Flow:** The progressive achievement of tasks along the value stream so that a product proceeds from design to launch, order to delivery, and raw materials into the hands of the customer with no stoppages, scrap, or backflows.

**Just-in-Time:** A system for producing and delivering the right items at the right time in the right amounts. Just-in-Time approaches just-on-time when upstream activities occur minutes or seconds before downstream activities, so single-piece flow is possible. The key elements of Just-in-Time are flow, pull, standard work (with standard in-process inventories), and *takt* time.

**Kaizen:** Continuous, incremental improvement of an activity to create more value with less *muda*.

**Kanban:** A signal, often a card attached to supplies or equipment that regulates pull by signaling upstream production and delivery.

**Lead time:** The total time a customer must wait to receive a product after requesting the product or service. In service sectors, it is the time from the beginning of the process to the end (e.g., from when a patient arrives until he or she leaves the hospital).

**Muda:** Waste.

**People distance:** The distance staff must travel to accomplish their tasks.

**Product distance:** The distance products must travel to meet the customers' needs.

**Pull:** A system of cascading production and delivery instructions from downstream to upstream activities in which nothing is produced by the upstream supplier until the downstream customer signals a need; the opposite of push.

**Set-up time:** All time spent getting ready to add value (e.g., time preparing a room for an office visit).

**Single-piece flow:** A situation in which products proceed, one complete product at a time, through various operations in design, order-taking, and production, without interruptions, backflows or scrap. Contrast with batch-and-queue.

**Standard work:** A precise description of each work activity specifying cycle time, takt time, the work sequence of specific tasks for each team member, and the minimum inventory of parts on hand needed to conduct the activity.

**Takt time:** The available production time divided by the rate of customer demand. For example, if customers demand 240 widgets per day and the factory operates 480 minutes per day, *takt* time is two minutes. *Takt* time sets the pace of production to match the rate of customer demand and becomes the heartbeat of any lean system.

**Throughput time:** The time required for a product to proceed from concept to launch, order to delivery, or raw materials into the hands of the customer. This includes both processing and queue time.

**Trystorm:** To generate and quickly try ideas, or models of ideas, rather than simply discuss them, as in brainstorming.

**Value:** A capability provided to the customer at the right time at an appropriate price, as defined in each case by the customer.

**Value stream:** The specific activities required to design, order, and provide a specific product (or service) — from concept launch to order to delivery into the hands of the customer.

**Value stream mapping:** Identification of all the specific activities occurring along a value stream for a product or product family (or service).

**Valuable:** In value stream mapping, a step in a process is valuable if it creates value for the customer.

**Waste:** Anything that does not add value to the final product or service, in the eyes of the customer; an activity the customer wouldn't want to pay for if they knew it was happening.

### Lean Resources

Womack JP, Jones DT. *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*. New York: Simon and Schuster, Inc.; 1996, Second Edition 2003.

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