

Seeking Perfection in Health Care: Applying the Toyota Production System to Medicine

By Christina Saint Martin

Virginia Mason Medical Center's journey towards perfection began in 2001 with the creation of a new strategic vision: *To become the quality leader in health care*. Since that time, Virginia Mason has been creating a better product. Perhaps when the industry looks back, later on, Virginia Mason will be viewed as one system that helped to lead a revolution in health care. Some of the best lessons learned along the way have been:

- The incredible importance of focusing on the customer first (the patient), a lesson that we definitely learned from Toyota;
- The possibilities and implications of pursuing zero defects; and
- The need for adopting a new management paradigm, which is especially necessary in health care, as it tends to have a fairly defective management system.

“If you are dreaming about it, you can do it”

Chihiro Nakao, President & CEO, Shingijutsu International

Chihiro Nakao is the President and CEO of the consulting organization Shingijutsu International, and he is also one of the remaining surviving students of Taiichi Ohno, the father of the Toyota Production System. Sensei Nakao is one of our teachers who helped us to understand the Toyota Production System. On our first trip to Japan with the executive team, he said to us “If you are dreaming about it, you can do it.” This statement continues to underscore the importance of having a vision and then driving all we can towards achieving that vision. At Virginia Mason, we have a dream about what we can produce for our customers —

perfection, zero defects, higher quality and lower-cost health care.

Health care is a poor product

Health care produces an embarrassingly poor product. While this has been fairly well understood in health care journals, it was not widely known until six years ago. There have been articles in the lay press that talk about doctors working drunk and stories about tragic and avoidable medical errors such as surgical sponges and gauze left in a breast after an operation, or even a kidney transplant performed on the wrong side. There are things that seem impossible to accept, yet these things happen in health care.

The Institute of Medicine study in 1999 showed that anywhere from 50,000 to 100,000 people die in hospitals each year as the result of medical errors. Later studies have shown that number to be twice as high. Even at Virginia Mason, which is highly recognized as a center for excellence in the region, we caused the death of a patient in 2004. So even in systems that are supposed to be very good, errors occur. We believe this is all the more reason to create a system that is defect free.

Statistics are not meaningful at the individual level

Some examples of defects across industries at 99.9 percent quality levels:

- 22,000 checks deducted from the wrong bank accounts every day;
- 16,000 pieces of mail lost by the postal service every hour;
- 2,000 unsafe airplane landings made every day; and

- 500 incorrect surgeries completed every week.

This is not a good story, and these are near defect-free systems. Health care has approximately 97 percent quality levels with a 3 percent defect rate. That might be pretty good, but for the person who's had the wrong kidney removed, that's a 100 percent defect. That person does not really care about industry statistics.

Health care is expensive

Not only are devastating things happening to patients in the current health care system, but the system itself is extremely expensive. Annual health care per capita premium costs in the United States are now in excess of \$7,000 per person. Employers and patients are saying that health care is unaffordable. Errors and defects add greatly to the expense of care, and everyone picks up the cost of inefficiencies. In fact, health care can barely afford to stay afloat with shrinking margins and increased expenses.

Investigating a solution — the Toyota Production System

In our quest to provide a better product and the need to execute on our strategic vision, we decided to learn more about management methods that were effective in other industries because our methods didn't seem to be changing the outcomes of our services or cost and performance.

We began learning about the Toyota Production System from John Black, a longtime leader in quality improvement at the Boeing Company who had been instrumental in bringing the Toyota Production System to them as their method. He and others introduced us to the teachings of Taiichi Ohno and

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education, integration and then application. For example:

- All 5,000 staff have been required to attend the four-hour Introduction to VMPS course as a condition of employment.
- Nearly half of our workforce has been involved in a Rapid Process Improvement Workshop or Kaizen (Japanese term that means continuous improvement) Event, our main vehicles for improvement. We have held nearly 500 events since 2002.
- All top leaders (executives and directors) are required to maintain certification to run workshops and teach others on the shop floor (the “gemba”). The certification process is approximately eight months in length and requires reading, testing and application.
- We have developed the Kaizen Fellowship, a 14-month intensive course that serves as our formal succession planning and training program for future physician and executive leaders of the organization. So far we have graduated eight fellows, with seven more currently in coursework and 10 more beginning in 2007.
- We have led 10 teams (more than 150 people) of board members, physicians, nurses, management and staff to Japan for Gemba Kaizen training and Flow Tours. Participants are required to present a current state Value Stream Map (Value stream mapping is a paper and pencil tool that helps you to see and understand the flow of material and information as a product or service makes its way through the value stream) for a process in their area prior to the trip and work to develop a future state while in Japan. The expectation is that the participant will work with their teams to achieve the future state within 12 months of returning from Japan.

- More than 150 managers have attended the VMPS for Leaders course, which includes intensive training for middle managers to help them lead with VMPS every day.
- We have set the expectation that we will manage by Value Stream and target areas for improvement based on the needs of the customer.

The VMPS as our management method — Results come from execution

As our journey has continued, we have learned the importance of execution and staying the course during difficult changes. We have made mistakes, we have failed to implement the ideas from our staff, and we have learned more of what it means to be a leader as individuals and as a company. We knew after our first few years that maintaining the gains was key to the success of the hard work our people have done. We also knew that 100 percent execution of the changes was important to realizing results that impact company performance.

During an assessment in late 2004 that reviewed and remeasured all improvement efforts to date, we were only holding the gains on about 40 percent of those changes, partially because it is easy to slip back into old ways of doing things if there is a lack of accountability and follow-through. But we have also demonstrated to ourselves, to the staff and to the community the great things that can happen when we stay the course, pursue perfection, and execute. For example:

- After 12 Rapid Process Improvement Workshops in the section of gastroenterology, we were able to:
 - Achieve and sustain 51 percent more capacity to fill patient demand for GI services;
 - Reduce staff, patient travel and waiting time;

- Add an additional \$2.1 million dollars in net contribution margin to the organization; and
- Increase patient and staff satisfaction — all without adding any additional expensive procedure rooms.

- After a 3P (production, preparation process — a tool of the Toyota Production System), numerous Rapid Process Improvement Workshops and the establishment of our Cancer Model Line, we were able to:
 - Reduce the lead time for the cancer treatment day by 63 percent for our sickest patients;
 - Colocate services in cellular design, which significantly reduced the patient walking distance and wait times; and
 - Reduced the lead time from diagnosis of breast cancer to treatment by more than 50 percent.
- After a 3P, numerous workshops and establishment of the Hyperbaric Model Line, we were able to:
 - Increase capacity and accommodate 48 percent more demand in 50 percent less time;
 - Reduce staffing costs;
 - Eliminate the use of external oxygen sources and ambulance transportation costs;
 - Increase the margin of the section by 300 percent; and
 - Create a “pull” system for our patients, so that the patient pulls the services and staff at their pace rather than ours.
- By implementing in-room devices for physicians in exam rooms, we have reduced errors, reduced the lead time for documentation (single piece flow), and have reduced the cost of transcription for every patient from \$2.56 per patient to \$0.24 per patient.
- By eliminating non-value-added activities from the primary care team with Flow Stations (see Figure II.1), we have enabled the team to conduct 284 additional screening mammograms at our Kirkland site.

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Shigeo Shingo. What we learned in our studies and what many already knew was that half of everything we do is waste. We have found this to be true over and over again in every process we have examined.

To get started on our journey, we took our executive leadership group (physician and administrative executives) to Japan in June of 2002 for two weeks to study Toyota and to work on the shop floor at Hitachi using the tools and methods of the Toyota Production System. We learned very quickly that we didn't know everything. We also realized what a wonderful opportunity we had to change health care delivery for the good of our patients by using the Toyota Production System as our method. Just as in manufacturing, health care is full of processes that involve quality, safety, customer satisfaction and staff satisfaction. Manufacturing, just like health care, is very complex. If they fail, their products, just like ours, can cause fatalities to the customers who trust in the product they are purchasing.

We decided while still in Japan that we would adopt the Toyota Production System as our method for managing our company. We sent back a 7-point plan to all 5,000 of our employees — who, by the way, thought we had been drinking too much sake. What we said to them was that we have always thought of ourselves as being a patient-first organization, but we really were not. We had not been exclusively driven by the customer's needs or requirements. "Just in Time" meant just in time for us, not for the customer, and we were committed to changing that paradigm.

The 7-point plan is as follows:

- "Patient First" will be the driver of all we do;
- The Virginia Mason Production System (VMPS) will be our management method (mirroring exactly the Toyota Production System);

- We will create an environment in which our people feel safe and free to engage in improvement, develop a reassignment process, and institute a no-layoff philosophy;
- We will implement a company-wide defect alert system called the Patient Safety Alert process;
- We will encourage innovation with plan and structure;
- We will create a prosperous economic organization primarily by the elimination of waste; and
- Our leadership will be accountable.

The "no layoffs" policy and patient safety alerts were major components of the plan. We also included a Shared Success plan in case we actually did better economically than our plan, so that our staff would share in the success of the company.

Five years later...

Much has happened at Virginia Mason since that first trip to Japan and the declaration and the implementation of the VMPS. It has been, and will continue to be, a journey of constant evolution and changing the culture of the organization. Much of the journey has been full of challenge by changing the way we do and think about things.

"Patient first" and patient safety

The Patient Safety Alert process is a process by which any staff member can "stop the line" if an error is found or suspected. When we designed and implemented this process, the executive leaders thought, "How can we possibly do this? The company will come to a complete stop." But how can we not stop process errors from being passed on to the customer, regardless of the business consequences? Our commitment is to our customers.

To date, we have had more than 4500 patient safety alerts and, much to our amazement, the company has

not come to a complete stop. We actually want more alerts — because the more we have, the more we are preventing errors from becoming a defect for the customer.

What we had to do was put in the system and education required to have a drop-and-run commitment from executives, physicians and staff to investigate and fix problems in real time. We taught our people how to use 100 percent in-line inspection, Poka-Yoke (The Japanese term Poka-Yoke can roughly be translated as mistake or fool proofing. It is derived from 'Poka' — inadvertent mistake and 'yoke' — avoid) and successive checks. Fix it today and you will not need to revisit the problem over and over again — wasting time, energy, resources and continually putting our patients' safety at risk.

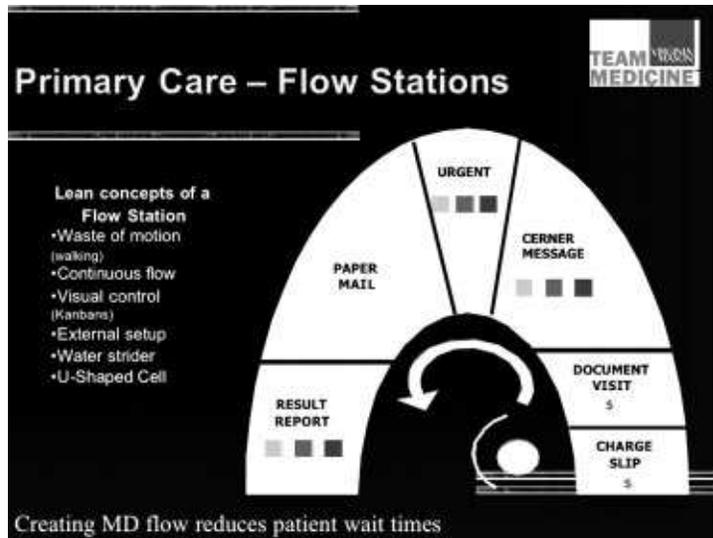
Patient safety alerts are sorted based on severity and, depending upon the issue, are required to be investigated and solved within a 24-hour time period. Some issues demand immediate action, for instance danger to patients, staff behavior, or violation of policy or clinical information system downtime. We know that our Patient Safety Alert System has saved lives at Virginia Mason. We also know that our culture is changing for the better and becoming more transparent because of it.

The VMPS as our management method — training and requirements of our people

Changing the way we manage the company day to day has probably been our biggest challenge. There is no argument that the Toyota Production System can be applied to health care management and operations. We've demonstrated that it can. We have spent time and resources training our people to manage this way, from the board down to the front line. We are making strides primarily through

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Figure 11.1 Primary care — flow stations



This adds up to an additional 568 screenings for the whole team and the diagnosis of three additional cancers per year.

- By implementation of Standard Work for Ventilator Acquired Pneumonia (VAP) and the VAP bundle, we have virtually eliminated VAP in our hospital, saving an estimated 32 lives and more than \$1,400,000 in VAP associated costs.
- By implementation of nursing cells in the hospital, we have not only improved patient satisfaction by having “zero call lights”, we have also increased RN patient contact time from a pitiful 32 percent to nearly 90 percent without adding nurses. By creating the “nursing cells” we have in essence more than doubled our direct patient care nursing workforce time without adding a single new nurse, and in addition, there is a waiting list of nurses hoping to be assigned to a floor with cells.

- By implementation of a flow line in central services utilizing 100 percent in-line inspection for surgical case cart assembly, we have achieved zero defects in missing, broken or wrong instruments.

These examples provide just a few results of what we have seen after implementing the VMPS. Although these are mostly clinical examples, we have just as many great results in our administrative and corporate areas. For example:

- We have sustained 100 percent compliance on performance evaluation completion for all staff through standard work;
- We have sustained a 90 percent lead time reduction for executive appointment scheduling (more than 10,000 appointments scheduled per year); and
- We saved more than \$11 million capital dollars by reengineering the capital budget process and using 3P prior to spending money.

And the list goes on. No process or department at Virginia Mason has gone untouched by VMPS, yet there are still decades of work to do to achieve our vision.

Leadership and challenges

Certainly we have faced challenges along the way and we have learned many lessons. We have had to change our culture. When we take the focus off of ourselves and focus on the customer, we learn to change and we learn to see things from the customer perspective. We learn to be intolerant of the status quo and of wasteful systems, and we learn to work better as teams.

The leadership and commitment required for what we have done at Virginia Mason is rarely found at all levels, but we are fortunate. We have a passionate board — a board that serves as the eyes and ears of our customers, constantly reminding us of what is important. We have an exceptionally talented and innovative executive team that leads this work in uncharted territory in spite of daily challenges, politics and fatigue. And, most importantly, we have a staff of hard working, intelligent, creative and tireless professionals that make it happen by coming to work each day to make a difference in the lives of our patients.

Sensei Nakao once told us that “It is not by accident that you have been chosen as a leader, it is your destiny.” Some of us have been thinking about what that opportunity means. The leaders are the only ones who can enable change. It has been our destiny to change the way we deliver health care at Virginia Mason. All of health care should have this destiny.

About the organization

Virginia Mason is an Integrated Delivery System in Seattle, Washington, a 501c3 Not for Profit. Virginia Mason has a 336-bed hospital, eight locations and a downtown main campus, 400 employed physicians, 5000 staff, a Graduate Medical Education Program, Research Institute, Foundation and \$650 million annually in net revenues.