

The Virginia Mason Production System (VMPS)

By Jay Arthur

Everybody in health care says the patient comes first. The number one thing that is evident here at Virginia Mason is that we actually do put the patient first. – Kate Reed RN

I read a lot of books, but I have found that most people are too busy to buy and read books that might help them. I don't blame them; most books are thin on content. But every so often I find a book that's so meaty that I have to add it to my library. I realized that there are no "Cliff Notes" for these kinds of books. So, as I find them and have time, I'm going to create a synopsis of each book and post it on www.qimacros.com.

I recently read *Transforming Health Care*, by Charles Kenny, CRC Press, San Francisco, 2011. This book is a dense and detailed review of Virginia Mason Medical Center's (VMMC) ongoing journey from "physician-centered" to "patient-centered" healthcare. It explains how VM adapted the Toyota Production System (TPS) for use in healthcare. It became known as the Virginia Mason Production System (VMPS). The following are what I consider some of the key insights from this book. If you work in healthcare and are attempting the physician-to-patient centered transformation, I highly recommend this book.

Kenney writes at the beginning of Chapter 7, "Hospitals are now widely considered to be dangerous places to be avoided if at all possible. Hospitals are fall factories where infections rage, readmissions are common and medication mistakes happen again and again. American hospitals are paid hundreds of billions of dollars each year and while they produce an epidemic of injuries, they are wasting tens of billions if not more." Current estimates for healthcare waste and rework run from \$750 billion to a trillion dollars a year.

As Dr. Donald Berwick writes in the foreword, healthcare is "staggering under the burden of too many defects, too much cost, and too much variation in care." To combat these issues, VMMC began its journey in 2000 and continues to improve every year.

The Transformation

After the 1999 IOM Report, *To Err is Human*, stated that a third of the U.S. healthcare spending was wasted, VMMC's CEO, Dr. Gary Kaplan decided it was time to find a way to start systematically making the improvements necessary to achieve the outcomes desired.

- Nurses went from spending 35% of their time with patients to 90%.
- VMMC went from losing money in 1998-1999, to earning positive margins every year. In 2009, VMMC achieved a 5.9% operating margin worth \$47 million.
- Operating room throughput increased from 100 to 140 surgeries per week for four rooms.
- Liability insurance costs declined by 74%.
- Doctors in the clinic were able to see 25-28 patients per day, up from less than 21.

The leadership team at VMMC made several trips to Japan to study the Toyota Production System. Diane Miller came away “convinced that there wasn’t anything she saw that *wasn’t* applicable to health care.”

The leadership team also brought senseis from Japan. One sensei looked at the hospital layout and asked about all of the waiting areas. He said: “You have one hundred waiting areas where patients wait an average of 45 minutes for a doctor?” Then he said: “Aren’t you ashamed?” The leadership team immediately realized that waiting rooms aren’t patient-focused; they are provider-focused. A full waiting room makes both doctors and patients less efficient and effective.

Key Tools

The most commonly used tools in VMPS are:

- Value Stream Mapping to expose the delays, unnecessary wait time and other wastes in any process. Eliminating delays can reduce patient length of stay (LOS) by one or two days.
- Mistake-proofing to prevent medical mistakes
- Standardizing work for every employee to improve quality and reduce defects and deviation in care delivery

Key VMPS Concepts

- **The *system* is the problem, not the employees.** The healthcare delivery system *allows* and even *encourages* employees to make mistakes. When you mistake-proof the system, employees cannot make the mistake.
- **Reduce waste while increasing speed, quality and profitability.**
- **Walking is waste.** “If you reduce the distance traveled by the patient, you reduce the distances traveled by all those other elements of care and hence maximize the improvement in efficiency.”

Rapid Process Improvement Workshops

VMMC uses Rapid Process Improvement Workshops (RPIW) to analyze and reduce waste. Some successes include:

- An early RPIW analyzed the journey of a cancer patient to receive chemotherapy and radiation. The patient had to travel to multiple locations (lab, radiology, clinic, infusion center and radiation) on multiple floors. It took a full day and almost two football fields of walking. During the RPIW, one nurse said: “Let’s design it so we bring everything to the patient rather than having the patient chase around the medical center.”

The team designed a cancer center where patients arrived in a comfortable room and care was brought to them. **It cut the time a patient spent at VMMC by half without affecting quality of care.** Waiting and preparation time can be reduced without changing the clinician's time with the patient. Patient walking was reduced to 181 feet from 564. Patient satisfaction climbed from 70% to 90%. Staff satisfaction climbed to 90%. It also increased revenue by allowing 1,100 additional patient visits per year with no increase in staffing.

- A laparoscopic setup team reduced the number of surgical instruments from 74 to 54 which cut patient wait time by 69% and saved \$26,880/year.
- A surgical team redesigned the anesthesia cart using a shadow board to show where everything belonged. Gaps immediately revealed missing supplies and instruments.
- Ambulatory patients suffered delays of up to 47 days for appointments and 45 minutes of wait time to see a doctor. Doctors had to leave the exam room half the time to find supplies. Patients are now seen the same day without wait time.

Stop the Line – Patient Safety Alerts

One of the techniques VMMC implemented from TPS is stopping the line whenever patient safety is at risk. Every one of VMMC's 5,000 employees can stop the line. As of 2011, there were 15,000 Patient Safety Alerts (PSAs). As a result, liability insurance dropped 26% from 2007 to 2008 and another 12% the following year. There is "a direct correlation between the number of alerts we have and our cost for liability insurance. As the number of alerts rises, the number of claims and lawsuits goes down," said Cathie Furman, Senior VP of Quality and Conformance (*The Doctor Crisis*, Jack Cochran & Charles Kenney, Perseus Books, 2014).

Initially, most employees believed that they would be punished for reporting medical mistakes. Employees also failed to report mistakes because they had reported in the past, but nothing was done about it.

One of the turning points occurred when an oncology nurse called a PSA when a doctor demanded she start a patient's chemotherapy before two required tests had been done. The doctor berated her, but the leadership team backed her 100%. This, of course, was unheard of prior to VMPS.

The openness of the PSA system reduced malpractice lawsuits and insurance costs by 74%.

Ambulatory Surgical Care

In 2007, VMMC was facing a shortage of operating rooms. Redesigning the operating rooms used VMPS to simplify and streamline each of the processes, including the overall process. The first element was *setup reduction*. The team separated the internal (in the operating room) from external setup processes.

Having different preparation beds and operating beds caused unnecessary movement of the patient. So the team found a bed that could be used for surgery preparation, the operation and recovery. This reduced internal setup time in the OR.

Setting up the back table for surgical instruments also took time away from the OR, so the team designed a separate, but adjacent, sterile anteroom to setup for the next surgery. Once the OR was cleaned, the back table could be rolled in. This also reduced internal setup time for each operating room.

Disconnecting and reconnecting monitoring leads and other equipment took additional time. The team found a plug-and-play “brick” that allowed easy connect and disconnect of the patient as they moved from preparation to operation to recovery. It worked like a docking station for a laptop and further reduced setup time.

These changes increased the number of operations from 5 to 7 per day; reduced case setup time from 30 to 15 minutes; and reduced surgery prep time to suture from 106 minutes to 85 minutes. It also reduced patient travel distance by 82% and time in process by 40%.

General Internal Medicine

While VMMC was doing well, the general internal medicine (GIM) site was not doing so well. There were many silos and poor skill/task alignment. Patient wait times of 45 minutes were typical.

Spaghetti diagram analysis of the clinic showed that doctors were commuting 30-40 feet from their offices to exam rooms and back which increased wait times.

The team used 5S to reorganize all 52 exam rooms over a weekend. They put all supplies in containers in similar locations in every exam room—no more searching for supplies.

They put the MAs in charge of the overall flow and added flow stations for immediate documentation of patient’s visits and scheduling of needed services. They selected two doctors as champions to lead the effort. Their success created a buzz of excitement that spread to the other doctors.

After the transformation, patients waited only a few moments before being called. “Doctors shuttle seamlessly from flow stations to exam rooms. Doctor access increased from 30% to 70%. Patients increased from 2,800 a year to 4,000. Lab turnaround times decreased from two weeks to next day. All of these improvements also decreased incoming patient calls.

Financially, GIM went from losing money for three decades to making money.

In Patient Care

Nurses in the U.S. spend barely 1/3rd of their time with the patient; the rest of the time is spent in search for supplies. Most of the time is for one of seven supplies: prefilled saline and 5cc syringes (without needles), tape, specimen containers, mouth swabs, male syringe caps and socks.

The RPIW team had a plastics manufacturer design a clear plastic wall-mounted container for these supplies. Supplies are replenished each day. The same system was applied to bed linens; a change was stocked in every room.

The RPIW team also analyzed change-of-shift the report/handoff process. Reports/handoffs occurred in a conference room, not at the bedside and took 45-60 minutes. By then, many call lights had to be answered and it could take two hours or more for the incoming nurse to see every patient. VMMC shifted to bedside reports and handoffs that allowed the patient and family to weigh in on the patient's condition which dramatically reduced handoff time.

Nurses also shifted from an end-of-shift "batch" form of documentation to an in-room, one-piece-flow documentation using computers on wheels. This improved accuracy of charting and reduced end-of-day overtime.

The team also used 5S to establish a "place for everything and everything in its place." The existing search for supplies was transformed into a system where everything was easily accessible.

VMMC also set a new standard that required nurses to call a Medical Emergency Team (MET, known elsewhere as a rapid response team) anytime they are worried about a patient. As MET's increased, avoidable codes decreased.

Teams also implemented hourly nurse rounds. They began to consider a call light as a type of defect—the nursing staff had failed to anticipate and respond to the patient's needs.

After all of these changes, nurses were spending 90% of their time with patients. Nurse travel was reduced from 5 down to 0.6 miles per day saving hours. And length of stay reduced by ½ a day. This made patients safer and increased hospital capacity.

But it was difficult to sustain and required ongoing attention to achieve universal application. The leadership team would analyze why improvements weren't sustained and how to fix the problem.

Insurance Companies and Businesses as Customers

In 2004, Aetna considered dropping VMMC as a supplier because of higher costs and long lead times for their customers like Starbucks, Costco and Alaska Airlines. VMMC realized that they

couldn't only consider the patient as a customer; they had to include insurers and their companies as customers as well.

VMMC embarked on understanding the Voice of the Customer. Starbucks had issues with the costs and delays in back pain treatment. It took too long to answer the phone. Employees often waited up to 45 days for an appointment. By then the back pain took longer to treat and cost more.

An RPIW team of companies, insurers and VMMC used Value Stream Mapping to analyze and remove waste for these types of complaints. An important first step was to separate uncomplicated and complicated back pain. Uncomplicated back pain accounted for 80% of patient issues and could be treated directly by physical therapists. Complicated back pain would require the attention of doctors and surgeons.

In the existing process, all were seen by a doctor who often ordered a \$1,200 MRI even when the patient's symptoms did not require one and provided little or no value. And "it wasn't just the MRI that had no value;" the only thing that showed evidence of providing value was physical therapy.

The RPIW decided to go for *same day appointments* which eliminated missed appointments. The patient would meet with a physical therapist initially and doctor would join them to separate the uncomplicated from the complicated back pain patients. Uncomplicated back pain patients (80%) would receive an immediate physical therapy session. Complicated patients would be scheduled for imaging and other tests as needed.

The shift to same day scheduling took three months to implement. "The hardest part was convincing doctors that no backlog was a good thing." The skill-task alignment of physical therapists to uncomplicated back pain freed doctors to focus their skills on the complicated pain. Because of the no-wait access, VMMC averaged four sessions of physical therapy to solve the back pain problems, far below the national average of 11 days. 94% of patients were returned to work the same or next day. This reduced costs to Starbucks and doubled patient volume and increased patient satisfaction.

Doctors kept scheduling MRIs, so IT implemented a block that prevented doctors from ordering an MRI if there was no evidence of a need for one. MRI usage fell from 43% to 8%.

Most hospitals worry that if they reduce the cost of care, they'll fail to meet their financial goals. VMMC found that by organizing their work around the needs of the patient, insurer and company, they *generated margins three times higher than the previous model*.

Skill-Task Alignment

In the primary care center at the Kirkland Clinic, there are two types of care: direct care (with the patient) and indirect care (everything else). Indirect care of patients takes a lot of time. Doctors

often put off this work until the end of the day causing them to miss time with family. One RPIW redesigned the work flow so that the indirect care could be handled with a medical assistant (MA) in about 2-3 minutes between patient visits at a *flow station*. (This is TPS one-piece flow in action.)

In the earlier system, nurses and MAs were under used. In the new flow system, skills were aligned with tasks so that nurses could initiate lab tests prior to the doctor's exam. MAs assisted in both direct and indirect care.

Three MAs answer phones so that callers could receive the medical information they needed immediately rather than wait for a return call from a clinician. 50% of patients were handled completely by the MAs. This reduced repeat calls by 1,000 per week.

Flow stations also helped the bottom line. One group of five physicians went from losing \$300,000/year to a profit of \$112,000 in just one year.

By giving up their autonomy, "physicians gain the freedom to improve, to focus on the work they do best, and reduce the waste that used to rest so squarely on their shoulders." "Anybody can see 21-22 patients per day and go home on time and have very little work left. After implementing flow stations, many providers were able to see 25-28 patients per day. One-piece flow also improved quality of care.

The Kirkland Clinic built a new facility designed for flow in 2009. **There is no waiting room.** Patients *skip the waiting room* by checking in and getting a *self-rooming card*. The MA joins the patient within seconds and completes the rooming process. If the physician doesn't enter within five minutes of the completion of the rooming process, the physician is paged.

All supplies are delivered on the *backside of the room's cabinets*.

Culture

- **The obstacle of *arrogance* has been "embedded in the DNA of American medicine for generations."** Doctors graduated from medical school with an expectation of autonomy, and VMPS demanded standard work, what clinicians call "cookbook medicine. Doctors, in particular, tend to be skeptics."

But value stream mapping and careful analysis found that 80% of patients had uncomplicated issues that could be handled easily with standard work; the other 20% required more creative solutions.

Kaplan felt that to achieve the desired results, VMHC would need "an explicit new deal with the doctors."

- ***The other obstacle is complacency—a sense that everything is working well enough and attempting any sort of sustained change would be overwhelming and disruptive.***
- In the beginning, many employees focused on criticism of VMPS rather than discovery. More people want it to fail than to succeed.
- Some people left rather than change.

Insights

Many people in health care are in leadership positions because they are able to do amazing things to save the day—people who can manage in a crisis. But we don't want a crisis. We want systems and standard work to prevent a crisis. Success depends not on the actions of a charismatic, heroic individual, but on the system. – Sarah Patterson

- Shifting from physician-centric to patient-centric healthcare delivery is the key to optimizing costs, quality and profits. It's also the hardest thing you'll ever do.
- “The antidote to complacency and arrogance is to understand the work—the current state. When you see [a value stream map of the reality] you cannot be complacent. You cannot be arrogant,” says Gary Kaplan.
- Include the insurers as customers and use their needs to further optimize delivery. Coordinated *kaizen* work between payer and provider is essential to improved efficiency.
- **Relentlessly attack waste.** Walking is waste. Patient movement is waste. Supply movement is waste. Eliminate unnecessary movement and waiting of people and supplies.
- **Flow is achieved through standard work.** The people who do the work have to create the standards for work. “When people feel like they have a say in the change, it's not so difficult.”
- **Task-Skill Alignment is critical to productivity.** Align the clinician's skills to the task at hand. Don't let doctors do clerical, nurse or medical assistant work. Use medical assistants to assist doctors in achieving just-in-time documentation. Don't make nurses do non-nursing work. As VMHC found in the spinal center, physical therapists are the best first responder to back pain.
- Consider a full waiting room as a sign of significant waste caused by a physician-centric culture. Consider nurse call lights as defects. Consider patient wait times as waste. Consider unnecessary clinician walking as waste. Start to question conventional wisdom wherever you find it; it may be a barrier to achieving the results desired.
- **A third of total costs are waste.** Removing those costs, paradoxically, will increase profits, patient satisfaction and clinician satisfaction. When your hospital is better, faster and cheaper than neighboring ones, you'll get more patients, clinicians will be able to spend more time with patients and patients will achieve better outcomes faster.
- Create “a *visual workplace* so that everyone knows what's really going on moment-to-moment.”

Simple Steps to Better, Faster, Cheaper Healthcare

1. Get out of your office and find out how things really work.
2. Ask “Why?” five times to identify and eliminate root causes.
3. Create a sense of urgency.
4. Maintain a cross-functional view of patient flow.
5. Remember: “The enemy is waste.”

The good news is that you can start today; the bad news is that you will never be finished.

Charles Kenney, *Transforming Health Care: Virginia Mason's Pursuit of the Perfect Patient Experience*, Productivity Press, New York, 2011.