Chapter 11

Creating High-Velocity Health-Care Organizations

Chapter 3 related the sobering story of Mrs. Grant, the woman who was recovering from successful surgery but who was killed when a nurse inadvertently injected her with several doses of insulin rather than the anticoagulant he had intended to administer. This chapter looks more closely at the complex systems of work used to deliver medical care, showing how organizations that once were stuck in the pack—working too hard and delivering too little—achieved high velocity. In doing that, they not only improved the care provided to their patients and bettered the lot of those who provided that care, they also set an example of how other great organizations—health-care and otherwise—can catch up and win the race.

The American Health-Care System Is Too Dangerous

The American health-care system is at once exhilarating and exasperating. Because it is staffed by exceptional people who have chosen careers in order to provide care, comfort, and cure to others, who are well educated, well trained, and have the best science and technology at their disposal, one's expectations should be optimistic. But the reality is far from what one would expect. Access to care is often hard to secure; when it is obtained, it can be prohibitively expensive; and even if it can be afforded, there is a good chance that something will go wrong. The Institute of Medicine released a study indicating that up to 98,000 of the 33 million people hospitalized each year die as a result of the mismanagement of care, with an equal number succumbing to infections acquired while being treated. An estimated five to ten times as many are injured through mismanaged care. These figures do not extend beyond acute care, nor do they include the waste of time, money, and other resources. The total damage is surely astronomical. It is also demonstrably avoidable. This chapter will show how.

In Chapter 2, we looked at an example of how the increased sophistication of medical science and the consequent complexity of medical treatments require ever more sophisticated approaches to management. In Chapter 3, with the story of Mrs. Grant, we saw how, even in the controlled setting of a hospital, the management of care can break down catastrophically. Then there is the world outside the walls of a hospital, which is where most of the care for chronic conditions such as asthma, diabetes, heart disease, hypertension, and depression takes place. In those situations, it is even harder to pull the pieces of expertise together into effective holistic systems.

In 2007, I was part of a panel discussion, sponsored by the MacArthur Foundation, on the poor system management endemic to health care. As an opening question, we were asked what our biggest fear was—the situation that would keep us awake at night with worry. For me, as the father of three small children, it was the prospect of taking one of our kids to an emergency room.

This fear had both conceptual and practical origins. I was remembering back some years to a presentation at Harvard Medical School by Dr. Lucien Leape, a pioneer in the patient-safety and quality-of-care movement. On a blackboard, he listed a variety of activities according to the risk of getting hurt or killed. On one end were very safe undertakings such as flying on a commercial airliner and going for a walk. Bike riding was a bit more dangerous. Moving toward the other end, there were parachuting and hang-gliding. At the far end of his list was "base jumping," which includes parachuting off buildings, bridges, and the sides of mountains. With only a few seconds of drop time, no time for a backup parachute to open, and a real chance of slamming into the building or mountain from which you jumped, the odds of injury and fatality are enormous, far greater than with regular parachuting. The odds, it turns out, are about equal to the odds of getting hurt or killed in a hospital, and while most of us wouldn't think of base jumping—or of strapping a family member into a parachute and throwing him or her off the roof for sport—we will all encounter a hospital at some point.

Imagine, then, a great hospital, 20 stories high, staffed with dedicated and expert doctors and nurses and equipped with all the best technology. If you get in, your prognosis is fantastic. But you can't just walk in the front door and get care. No, first you have to climb to the roof and parachute down to the entrance. If you survive that, your first-rate medical care can begin. It's outrageous, but that's what most American health care is like today.

Dr. Leape's statistics became quite real to me several years ago when our son, Jesse, was two months old. He had a lung infection of some kind and his breathing was so labored that my wife, Miriam, took him to the emergency room of a major teaching hospital. No end of interns, residents, and nurses filtered in and out of the exam room, some from the emergency department and some from internal medicine. Each one questioned and prodded, but what each one learned or was thinking didn't seem to be shared and amalgamated with what everyone else was thinking. Sure, they were recording information in the chart, but the chart wasn't going to do the interpretation or explanation.

Shift change was even worse. The basic lack of structure and discipline in the handoff meant that a new group of people were all starting from scratch. If that wasn't bad enough, no one could find the test kit to determine which one of two illnesses our son might have, so they managed his symptoms, but without actually starting a treatment. It all ended well enough, but years later, when the panel moderator asked me to name my health-care nightmare, I didn't have to think twice.

Another participant in the meeting—a nurse—had had a different but equally illuminating and disturbing experience. She had gone to visit her aging parents and decided to check on the care they were getting. Several days later, having talked to her parents' primary-care physician, cardiologist, pulmonologist, diabetologist, and other specialists, she had found only one person in the entire health-care system who had anything approaching a holistic view of her parents' conditions and treatments. That was their local pharmacist.

The American Health-Care System Can Do Better

I know we can do much, much better because it has already been done. A number of health-care organizations have gone out of their way to learn from high-velocity organizations, though not by trying to make medical work—which has to be adapted to individual patients—rigid and repetitive. Instead, they have been learning how to replace their old approach to managing with a more sophisticated approach to designing and operating complex processes, improving them when their flaws are found, and modifying the systems as appropriate when circumstances change. I trust this all sounds pretty familiar by now—and pretty encouraging. Here are some examples:

- Ascension Health is the largest Catholic health-care system in the United States. In 2002, Ascension articulated a Call to Action for health care that works, is safe, and leaves no one behind. The objective was to have fewer patients die in their hospitals from preventable causes such as pressure ulcers (bedsores), falls, surgical errors, birth trauma, hospital-acquired (nosocomial) infections, and medication errors. After six years of effort, Ascension estimated that 2,000 lives a year were being saved. Pressure-ulcer rates are 93 percent lower at Ascension facilities than the national average, patient falls are 86 percent lower, and birth-injury rates are nearly three-quarters lower.

- Virginia Mason Medical Center (VMMC), which is discussed in more detail below, has targeted a range of issues. By teaching migraine patients how to avoid pain in the first place and how to manage it when it first starts up, VMMC has cut emergency-room visits for migraines by half and reduced the use of expensive diagnostic tests. Efforts to speed up patient flow through the gastroenterology department have saved VMMC from having to expand the facility and buy new equipment, yet it has been able to keep up with an increasing number of patients. This is a perfect example of "doing more with less"—one of the hallmarks of high-velocity organizations.
- The Mayo Clinic has reported a reduction of more than half in medical injuries at its hospitals.
- Hospitals that have participated in the Institute for Healthcare Improvement's 100,000 Lives Campaign to prevent avoidable deaths and its more recent 5 Million Lives Campaign to prevent avoidable injury have recorded excellent gains in patient safety by reducing surgical-site infections, medication errors, surgical complications, and bedsores. An estimate at 18 months into the program was that more than 120,000 deaths had been avoided.
- Hospitals in the Pittsburgh Regional Healthcare Initiative reduced the rate of central-line infections (those caused by catheters snaked into patients' veins) by 68 percent overall, with some hospitals reducing it by 90 percent and more.
- The pathology department at the University of Pittsburgh Medical Center cut the error rate in a screening test for cervical cancer by half.

- Endoscopes—tubes inserted into the body to take images or biopsy samples—are easily damaged, not only during use but even more so while being cleaned and maintained. A New York hospital reduced the number of endoscope repairs from three a day to three a week. At $5,000 per repair, this has led to an annual savings of $3 million. Beyond that, it means greater availability because fewer endoscopes are being fixed at any given moment. Furthermore, less effort is needed to keep track of backup endoscopes, since fewer are needed in the system.

All this shows what can be done. If we extrapolate these results, we find that a hospital visit does not have to be as dangerous as parachuting off a cliff, crippling both physically and financially to the individual and the larger society.

Case: Improving Primary Care

Boston's Massachusetts General Hospital (MGH) has been building its capability for process excellence in primary care. For example, the adult-medicine practice at its Revere Health Center was able to increase the productivity of its flu shot clinic 500 percent in three two-hour sessions. They did this by following the approach of the world's best organizations. Before they began their work, the staff "scripted" as well as they could the way they thought check-in, inoculation, documentation, and checkout should proceed. They did this for two reasons. First, they wanted to be sure that they started with their best collective understanding of what would work and what would not. Second, by defining what was normal ahead of time, the staff would find it easier to detect abnormal situations while doing their work. Was this out of the ordinary? Not for the Revere team. Having devoted their professional training and practice to understanding what is normal for complex biological systems (people) so that they could detect abnormalities (symptoms of illness) easily, they found that the same discipline applied to the complex system in which they were embedded—the daily work processes on which they depended to provide care to people.

By specifying ahead of time what they were going to do, seeing problems as they emerged, and treating them in real time, the practice generated terrific results. Whereas in most years the practice was challenged by fitting its flu-shot clinic into an already full schedule, this time lengthy waits for patients were virtually eliminated. The work was easier for the staff. Efficiency, as measured in terms of flu shots per clinical staff hour, increased fivefold, as shown in Table 11-1.

Table 11-1 Flu-shot clinic improvement

	MGH Revere Flu-Shot Clinic		
	Session 1	*Session 2*	*Session 3*
Hours per session	2	2	2
Flu shots administered per session	43	71	151
Clinical support staff FTEs involved	3.5	2.5	2.5
Flu shots administered per hour of staff time	6.1	14.2	30.2

The basic principle was that when a problem was identified, the staff did not "make do," work around the problem, or cope to get by. Having practiced the skills of process design and operation improvement on other "routine" work, they were in good shape to do the same thing at an accelerated pace (just as we saw with Toyota's crisis recovery in Chapter 10). When something went wrong during the clinic, they had a momentary huddle and a rapid redesign of a piece of the process, then continued almost without hesitation with a new specification in place. Changes were from stem to stern, affecting the work methods of individual people, the handoffs between one step and another, and the sequencing of work. For instance, check-in for the clinic collided with check-in for regular appointments; lines formed while nurses waited. A modification was put in place. Flu-shot patients were steered directly to the inoculation area; they filled out a simple paper "encounter form," and the front-desk secretaries entered the information into the computer during slow times and at the end of the day.

Another slowdown involved asking about allergies. Revere's patients speak English, Spanish, Arabic, Khmer, and Portuguese, with a smattering of French and Russian. Trying to get verbal confirmation on allergies created a huge bottleneck. Quickly, the nurses polled the center's interpreters and generated simple "point to" signs in each language. Another problem solved and then another one seen.

Normally, patients coming for an examination or consultation went into an examination room and had a chance to hang up their coats and prepare for the examination or treatment. The flu clinic was not in a typical exam room, and patients were not there as long as they would be for a regular exam. More time was spent fumbling with personal items and trying to find somewhere to place them than giving the shot. Another quick modification was made to the work area so that patients could disencumber themselves, get the shot, and be on their way quickly. In three shifts, totaling six hours, the staff made more than 20 process changes (approximately three times per hour) that allowed a fivefold increase in productivity.

As staff members were celebrating its success, they began speculating about the next year's clinic. They realized that the biggest bottleneck was patients trying to park in the health center's small lot. "How about a drive-through shot clinic?" someone suggested, not entirely facetiously. "We could have the patients queue around the block, where they could pick up the encounter form on a clipboard. At the right time, signs would advise them to take off their coats and turn up the heat in the car. As they got closer, another sign would tell them to roll down the window, and at the last minute they could stick their arms out."

Revere's efforts were not limited to the flu inoculations; these were part of a common approach to getting better across the board. In such a multilingual setting, having interpreters in the right place, at the right time, speaking the right language to support clinicians was essential for quality of care and efficient patient flow. Rejecting the alternatives of "we need more people," "we have to try harder," or "we just have to accept the disconnects," staff worked with the secretaries who scheduled appointments to better level the demand for language services, streamlined flows, better-partitioned time and responsibility for "on-line" work (real-time interpretation) and "off-line" work (follow-up on correspondence, lab results, and phone calls) more effectively, and built a better signaling system to call for language assistance. They discovered and showed that there was no problem of unavailable interpreters. There were myriad problems that made it too hard for interpreters to be available and too easy for them not to be.

The unit's medical director commented:

> We became used to inefficiency to such a degree that we actually accepted it as the norm. It is only when these inefficiencies are removed that we realize just how great a burden they've been. The changes we have made are often subtle, but the cumulative impact of all these little changes has significantly improved efficiency and quality of life within the practice.

At MGH's Back Bay primary-care practice, the clinical staff members took Mrs. Grant's experience to heart and committed themselves to a simple doctrine: no ambiguity in work design and no workarounds of problems when they are seen. The staff members started by shadowing one another, with the practice manager shadowing the medical director and a licensed nurse practitioner tailing a medical assistant (MA). The shadows took minute-by-minute notes about what factors caused a disruption in the flow of work. In four hours, they together found nearly 300 instances in which the doctor and the MA had to work around a problem. Armed with those insights, they made it a weekly ritual to peel items off the list. The results included halving the distance the medical assistant had to walk each day, increasing the time per visit that the physician was in the exam room with patients, and decreasing the number of interruptions.

They then applied the same approach to patient scheduling. Rather than contend with the fact that some patients were allotted too little time and others too much, doctors started tracking how much time was actually needed and what patient characteristics drove that need. Then, secretaries, doctors, and nurses developed an interview script for front-desk employees so that they could better determine the amount of time a patient needed for his or her next appointment. Rather than a one-size-fits-all standard appointment length in which too little time was allocated, forcing the doctor to run late or the patient to leave prematurely, they gave themselves the flexibility to match the time provided with the time needed.

The successes at Back Bay and Revere are significant examples because primary care is a critical link (but often the missing link) in the American health-care system. Good primary preventive care keeps people well so that they do not need other forms of care. For those with illnesses that cannot be cured and have to be managed, such as asthma or diabetes, good chronic care can greatly improve the quality of a patient's life while avoiding expensive and often ineffective acute (hospital) care.

In reality, our health-care system often undermines primary care and is therefore hard on patients and providers alike. Patients have trouble gaining access to practices in many areas, and primary-care doctors work long hours for far less pay than specialists such as dermatologists and plastic surgeons. Part of the cost of poor-quality health care is the toll that working in broken systems takes on doctors, nurses, pharmacists, technicians, aides, administrators, and others. Like the Big Three autoworkers I described in Chapter 3, these health-care workers have to go to work every day knowing that to do what they aspire to do, they will be firefighting, working around problems, and depending on their own and their colleagues' beyond-the-call-of-duty efforts just to keep frustrating situations from becoming tragic ones. And they still know that no amount of heroism will ever be enough.

All the success stories described above turned on an organization's decision to (1) switch from managing functions in isolation to managing the provision of care as a coherent, integrated start-to-finish process and (2) switch from making do when problems are discovered to designing work so problems are immediately visible, swarming those problems when they occur, and involving those who are affected by a problem in solving them and improving their own work processes. Let's watch this approach in action in the realm of acute care.

Case: Putting an End to Hospital-Acquired Infections

The medical staff at Allegheny General Hospital (AGH) focused on the problem of bloodstream infections related to central lines, which are catheters snaked into a vein in order to deliver medication very quickly into the bloodstream. These infections add $3,700 to $29,000 to the cost of care for patients who become ill. Much worse, they kill 14,000 to 28,000 patients a year in the United States. Allegheny General's chief of medicine, Rick Shannon, and his colleagues wondered whether a systems approach similar to that of companies such as Alcoa and Toyota would allow AGH to eliminate central-line infections entirely.

Allegheny General started by reviewing the medical records of every patient who had passed through its intensive-care and cardiac critical-care units in fiscal year 2003. They wanted to determine which factors had caused individual central-line infections and use those discoveries as the basis for process improvement.

Their effort had two surprising results. First, the medical records said little about what caused infections. Although the records documented the treatments that had been ordered and those that had been carried out, they did not capture the subtleties that cause infection, such as inadequate hand hygiene, a catheter accidentally draped across a ventilator tube, or shared equipment that has not been properly sanitized. The second surprise was that AGH's rate of central-line infections was far higher and the consequences for patients far worse than they had realized. AGH had been recording infections related to subclavian placements—catheters snaked past the collarbone and the sternum—but had not been tracking the more infection-prone femoral placements—catheters snaked through the groin. They also had not counted AGH patients who had been readmitted to other institutions for treatment of central-line-related infections. AGH's infection rate was really double what had been thought. More significant were the human costs: Among the 1,753 patients admitted to AGH's intensive care units in 2003, 37 patients had been infected, of whom 19 died.

Realizing the limited utility of retrospective reviews of aggregated data, AGH created a central-line team with the mission of observing every central-line placement and every incident of line maintenance to see the microbreaks in routine that might lead to an infection. They found that doctors, nurses, the materials distribution staff, and others were working hard, but in isolation from one another. Each work "element" was not well-integrated into the system, leading to problem after problem. There were problems rooted in ambiguous assignment of responsibility (pathway problems, as discussed in Chapter 6), unreliable handoffs and exchanges of information (connection problems), and individual work methods that were not dependable. The one point on which all could agree was the desired output of the process for placing and maintaining lines: No one should be harmed.

In terms of the system breakdowns, the team observed a resident who was on call in the intensive-care unit (ICU) placing a femoral line in a patient, a particularly surprising move given all the attention that had been given to the risk and cost of infections. True, it is easier to insert a central line on the inside of the thigh—a femoral line—than near the collarbone—a subclavian line. There is less twisting and turning required. But in the long run, a femoral line is much more dangerous because the inner thigh is a much "dirtier" part of the body than the neck; there are many microbes in that area that are happy to take advantage of a puncture in the skin and invade the body.

This is basic information that any medical resident knows. Why, then, had this resident placed a femoral line rather than a subclavian line? Certainly, he was neither lazy nor stupid. Rather, he was forced into a dilemma. Those responsible for creating training rotations, and those responsible for scheduling residents within a rotation, had done so without taking into account the specific needs in that particular unit. They had done their work, but without a clear understanding of how it fit into the system as a whole. He hadn't had specific training in how to place central lines. He did his best under the circumstances, using the femoral placement because he did not feel confident doing a more difficult subclavian one.

However, the problem went beyond that. If the femoral line had subsequently been replaced with a subclavian line, there would at least have been less time for microbes to take advantage of it. But that was unlikely to happen; there was no one specifically designated to move lines from high-risk to low-risk locations. The more experienced specialists in intensive-care medicine were the obvious choice, but there were poor mechanisms for the night shift to indicate to the day shift that a line should be replaced. In other words, the connection—the handoff of responsibility (in the form of information about high-risk lines) from one shift to the next—was underdesigned.

Idiosyncratic and plentiful as those problems were, once they were seen, they could be solved. AGH developed training for all residents rotating through the ICU and adjusted its schedules to make sure every shift had someone capable of placing subclavian catheters. While those responses were being developed, every day shift had a person responsible for replacing femoral lines with subclavian lines (the specialists mentioned above) and the team worked out a set of simple signals to indicate when such work had to be done.

Once a central line is put in, it needs to be maintained. The line itself needs to be checked for kinks, the puncture needs to be checked for infection, and so on. And here, too, the team observed breakdowns as nurses tried to do their work but couldn't find bandages, gloves, gowns, or hand sanitizer where and when they needed them. Rather than continue the traditional nursing practices of hunting and hoarding or "being careful" (for example, changing a bandage while standing on tiptoe as far from the patient as possible because you can't find the gown you should be wearing when you work close to a patient), the team worked to integrate nursing and materials distribution into a reliable system to help determine what items were needed in what quantity, in what form, and at what location by whom and when, to ensure that catheter-wound sites could be cleaned and rebandaged without running the risk of infection.

No one ever found a silver-bullet solution to the problem of infections. Rather, the line team and the ICU staff made dozens of changes in the way they did their work and the results of their 90-day effort were spectacular. In 2004, the number of patients and the severity of their conditions increased at Allegheny General, but the number of infected patients dropped from 37 to 6 and the number of deaths plummeted from 19 to 1. The record of success continued through 2005 and 2006 (see Table 11-2).

Case: Stress-Testing and Improving Medication Administration

In the previous example, problems occurred often enough that it was possible to see them just by watching the system in action. The University of Pittsburgh Medical Center (UPMC) South Side hospital took this approach a step further by creating a high-speed mock-up of their own pharmacy in order to see problems that would be much harder to spot in

Table 11-2 Eliminating Central-Line Infections at Allegheny General Hospital

	FY 03	*FY 04 Year 1*	*FY 05 Year 2*	*FY 06 Year 3 (10 months)*
Intensive-care-unit admissions	1,753	1,798	1,829	1,832
Central lines employed	1,110	1,321	1,487	1,898
Line days	4,687	5,052	6,705	7,716
Infections	49	6	11	3
Patients infected	37	6	11	3
Rates (infections/1,000 line days)	10.5	1.2	1.6	0.39
Deaths	19 (51%)	1 (16%)	2 (18%)	0 (0%)

real time. South Side had decided to deal with the persistent problem of missing meds: the disruption caused by nurses going to the place where medications were stored in the nursing unit, only to discover that what was needed was not there. The subsequent waste of time and emotional energy to restore the system by chasing down a pharmacist to chase down the pill was extraordinary. I remember watching one nurse finding that a med was out of place. She called the pharmacist who was to have dispensed the medication, but that person was not in the room. Another pharmacist did his best to track down the order, but to no avail. After an hour of churning, the original pharmacist returned to the department. In fact, the medication was not missing; it was stocked out and on order from the distributor. Obviously, there were several problems here. The first, of course, was the problem of stockouts and the second was the difficulty of making visible the fact that the medication, though late, was on the way. Even in the absence of the drug, that information would have saved hours of wasted nursing and pharmacy time.

Fatigued and frustrated by situations of that type occurring too often, the staff members challenged themselves with the following question: Why isn't medication administration *ideal*? That is, why can't the pharmacy deliver one order at a time when it is requested and when it is needed, without defects or delays?

They had some insight into the problem. Medication administration was done in batches. Physicians made their rounds early in the day, with occasional follow-ups if patients' conditions changed. Medication orders would be collected and delivered periodically to the pharmacy and entered by the pharmacists, who would look for potential problems with dosages, interactions, and allergies. Orders would accumulate until the afternoon. The next day the pharmacy staff would begin filling the orders, assembling the proper mix and volume for each patient. This was done by the afternoon, at which point a "delivery tech" would run things to their point of use in the hospital. There was a separate "first orders" process for getting at least one dose to a patient after an order was written, but that did not account for the bulk of the deliveries and, anyway, it was in effect a redundant workaround solution to the problem that the main process was too balky to be relied on for speed. Because so much time passed before medications were delivered, there were double workarounds: getting additional meds to fill the gap between when the first order drop-off was made and when the regular deliveries occurred and returning medications to the pharmacy because patients' conditions had changed in the meantime.

To get to the root of the problem, the staff set up a prototype process. They took a real pharmacist, a real pharmacy tech, and real orders—although from the previous day—and tried to fill those orders one at a time (one every three minutes, as it worked out), delivering them to a cardboard box rather than to the unit. With everything in place, they started the test, stopping every time the pharmacy team could not maintain the pace and investigating why they could not. There were printer jams, stockouts, excessive walking distances, and so forth. Within a few hours, they discovered dozens of factors that made keeping up impossible. Some were easy fixes, such as storing drugs in accordance with how frequently they were used rather than alphabetically. Others were more difficult, such as changing the time that deliveries were made to nursing units so as not to interfere with meals and patient hygiene. Together, these changes had a large cumulative effect.

Delivering one order at a time ultimately was not feasible because the doctors did their rounds within a narrow period in the morning and the evening—before or after their scheduled surgery and clinical hours—and some units were quite far from the pharmacy. Still, there were remarkable gains. Before, a whole day's worth of orders would not be delivered until the next day. Now, every order was being delivered no more than two hours after it was placed. The rate of missing meds fell 88 percent, search time went down 60 percent, stockouts were cut by 85 percent, and the need to dispose of intravenous medications that had been mixed but not used was reduced significantly.

Case: Stopping the Presurgical Madness

It used to be that on a typical day, 40 patients or more came to the West Penn Allegheny Hospital ambulatory surgery unit. The staff made heroic efforts to have the patients ready to go whenever the surgical team was ready to take them. The patients, on the other hand, spent hours waiting for their surgery, wearing their embarrassing hospital gowns. But after some months of high-velocity effort, the situation there was entirely different, as can be seen in Table 11-3.

The difference between the before and after conditions was due to Gloria, the nurse in charge of presurgical nursing. Having heard fellow Pittsburgh resident and Alcoa CEO Paul O'Neill's admonition that the way to get close to zero injuries at Alcoa was to see problems, solve problems, and share what was learned, Gloria had an epiphany: "I always thought I was a problem solver," she confessed. "But then I realized I had been 'solving' the same problem every day for 20 years."

Gloria decided that enough was enough. She declared to her staff that, starting the following Monday, she would not help them work around problems as in the past. Instead, she wanted them to call her immediately when they experienced a problem so that she could help swarm it and solve it and it would not recur, needing to be solved again every day for another 20 years.

Table 11-3 Presurgical Nursing at West Penn Allegheny

Metric	*Before*	*After*
Time between signing in and starting registration	Up to 2 hours	0
Time patients spent registering	12 minutes to 1 hour	3 minutes
Time spent assembling patients' charts	9 hours each day	2.25 hours
Number of charts with unstamped pages	35	Less than 1
Nurses' time wasted as a result each day	70 minutes	Negligible
Number of gowned patients waiting on chairs in hallway	4 to 7 at any given time	0
Time spent waiting in gowns in public	25 minutes on average	0
Number of patients whose lab results are incomplete	7 out of 42	0
Availability of supplies	Some unavailable; others overstocked but past expiration	What is needed is available when, where, to whom, and in the quantity required
Number of unnecessary blood-bank reports issued	10 to 11 per day	0

There was an important qualification. She understood that, at Toyota, a fundamental part of the work of team leaders and group leaders is problem solving and process improvement. Yet she knew that she could not make an abrupt change, flipping 180 degrees from working around problems to solving them. Even half a day would be too much. After some reflection, she decided to start with a 15-minute period in the afternoon (2:00 to 2:15), after most of the surgeries had begun.

At 2:00 p.m. on Monday, Gloria stopped her usual frantic fire-fighting, stationed herself in the center of the unit, and waited. That Monday was like any other Monday, with the normal need to chase down lab results and supplies, yet no one reported a problem. It was normal, after all. On Tuesday, Gloria reexplained the concept, but again there were no problems reported. On Wednesday, a nurse came running to Gloria with a problem. Eager to rush to it while it was still hot, Gloria was disappointed, though not terribly surprised, to find that the problem already had been worked around.

It was not until the next Monday that someone brought a live problem to her. In taking a patient's history, a nurse had found that the chart was missing forms and had other defects. Immediately, Gloria huddled with the secretary who built the charts every day to help establish what it meant for a chart to be defect-free and investigate what it was about the job that made creating a defect-free chart so difficult. Needless to say, they did not resolve that on Monday, and even Tuesday's and Wednesday's 15 minutes were not sufficient. However, by pounding away at the problem day after day, they developed myriad countermeasures: how to organize the workstation, how to access documents, how to create consent forms, from where to gather patient information and previous lab results. Chart building went from taking nine hours a day to taking two, and nurses no longer needed to fix broken charts on the fly.

More to the point, they had freed so much time that it was like having an extra secretary in the unit and a lot of additional nursing time. Now Gloria was free 30 minutes a day to see a problem and solve a problem rather than helping with workarounds. Registration popped up as the next problem to solve and when the dust had settled, the unit ended up with the equivalent of yet one more secretary.

Within a few months, a unit that had been hard on patients and staff alike was functioning like a well-tuned machine. The key was taking that first step of breaking the workaround habit—even if only for 15 minutes a day, during a slow time—solving problems, stabilizing and improving the process, and gaining bundles of time for nursing the patients rather than nursing a broken process.

Case: Total Dedication to High-Velocity Health Care

There are many health care providers testing the waters, experimenting with managing the complex processes needed to deliver care in the same fashion as the world's greatest organizations. A few have taken the plunge. One is Seattle's Virginia Mason Medical Center (VMMC), a 300-bed teaching hospital that employs 5,400 people, has 400 doctors, admits 16,000 patients a year, and has more than 1 million outpatient visits. Struggling with problems of staff retention, quality, safety, and cost, VMMC's leadership got interested in the Toyota Production System in 2001 when they started learning about the great results local businesses were getting by upgrading the way they managed their complex work systems.

VMMC dipped its toes in the water with a few pilot projects. Then, in 2002, the hospital's chairman and president, along with its senior administrative and medical leadership, made a two-week visit to Japan. They toured factories, worked on the line briefly, and participated in an improvement project at a Toyota affiliate. They were blown away by the discipline with which work was done and the flexibility and agility with which it was improved and adapted with fluid grace.

Upon their return, VMMC's leadership made a commitment to provide the same high-quality work environment to their staff and the same quality of service to their patients that they had experienced in Japan. They also made a commitment to retain all employees; they didn't want people to conclude that finding ways to accomplish more work with less effort would be rewarded with a layoff.

VMMC began training *everyone* on the staff, from frontline workers to the most senior executives and even members of the hospital's board. Then it tackled head-on the coupled problems we saw in the Mrs. Grant tragedy: operating complex processes as if managing the functional pieces were sufficient and tolerating (even encouraging) workarounds when the system was crying out about the flaws in its design. To complement the deep clinical expertise in its various departments, Virginia Mason created a "*kaizen* promotion office" as a place to develop expertise in process management; in other words, it had its medical professionals develop their expertise within functional specialties (the vertical perspective to which we referred in earlier chapters) while home-growing expertise in the horizontal perspective of crafting high-performing boundary-spanning care-delivery processes.

These process experts have led hundreds of rapid-improvement projects, attending to sick processes with the urgency that traditionally was reserved for attending to sick people. To ensure that care-related problems did not remain unaddressed, VMMC instituted its Patient Safety Alert System. When an employee notices that a process has an urgent condition—a failure or aberration that might lead to patient harm—that employee has the right *and the responsibility* to report the problem on a 24/7 hotline, invoking a drop-and-run commitment from the department chief and vice president to swarm the situation, stop the process if necessary, and ensure that the situation does not deteriorate further or recur. (In other words, just what happens when a patient has an urgent condition and a doctor or nurse calls a code.) To fulfill its commitment to managing work so that problems are seen when and where they occur, the senior leadership does safety walkarounds, seeing for themselves how processes really operate rather than how they are supposed to operate and creating more opportunities for staff to report the difficulties, impediments, obstacles, and inconveniences that compromise their best efforts to provide perfect care. Virginia Mason has enjoyed the financial benefits of greater efficiency—such as eliminating budgeted construction projects, as mentioned above—and its patients have had better clinical experiences, as with migraine management and a host of other conditions.

Process Management as a Problem of Medical Education

I have already offered several examples of how the frameworks presented in *The High-Velocity Edge* apply to much more than the manufacturing operations from which it originated. We saw in

Chapter 5 that they can be used to understand, diagnose, and improve a product-development process (Pratt & Whitney) and a service process (Avenue A), not to mention the nonprofit and very dangerous work of nuclear propulsion. We saw in Chapter 6 how well the framework for process design can be applied to workplace training. We have been seeing in this chapter how it applies to another very complex service process—health care. Now I would like to show how useful it is for understanding a process about as far from manufacturing as you can get—medical education.

Remember my friend Mark Schmidhofer, mentioned in Chapter 3, whose long medical training did not address the management responsibilities thrust upon him as a specialist in a hospital? Not only does an American medical education fail to include training in managing processes, one could argue that it is not even managed as a process itself. Yet it certainly is a process—a sequence of steps intended to produce certain results. As a process it has been criticized for its cost, its length, and the mismatch between what medical students are taught and what new doctors need to know.

My colleagues Elizabeth Armstrong of Harvard Medical School and Marie Mackey, at the time a researcher at Harvard Business School, and I decided to examine the medical educational process with the same framework/discipline I have been describing throughout this book, starting with Mr. Ohba's questions: What results or outputs is the system meant to achieve? Who is responsible for performing what sequence of steps to achieve those objectives? How are handoffs managed across the connections that link individual steps? What methods are used within a step to achieve success? We also asked: For every level of specification, are there built-in tests to indicate when the system or process is failing?

We discovered that medical education is underdesigned in comparison with the system design and operation criteria of Toyota and other high-velocity organizations. In other words, the preparation for doctoring is not even as well-thought-out to achieve its ostensible aims as the training for an assembly-line worker at a Toyota plant (described in Chapter 6). Of course, a medical student is intensely trained. The question we were left with was whether the training was as effective as possible, done with the least waste and the least risk to patients and students. Let's take a look.

When we surveyed medical-education reform proposals, we found that they focused on expanding the curriculum with courses such as medical ethics (adding steps to the pathway) or changing the teaching approach from lecturing to case studies (a change in the method within a process or pathway step). And despite concerns about cost and duration, some reformers think a medical education should last even longer.

For Armstrong, Mackey, and me, such proposals set off warning bells. This is a classic trade-off that assumes that we are getting as much yield as possible from the current investment and therefore have to give up something good (time and money) for another good (quality of educational experience). It is just the sort of thinking—in order to have perfect safety, we'll have to take a hit in productivity—that Alcoa soundly rejected. Our examinations of exceptionally high-velocity organizations would lead us to wonder: What's to stop us from getting more for less? Why can't a medical education be shorter, cheaper, *and* better?

To answer that question, Armstrong, Mackey, and I looked at the first four years of medical education, leading up to the M.D. degree, and wrote a paper about a representative student, "Emily Wilson." What we see from her experience is that she—along with her peers and instructors—is subject to a system in which individual educational experiences are not managed as pieces of an interdependent system, leaving those responsible for the pieces (teachers and students alike) to cobble together coherent approaches in an ad hoc and very suboptimal fashion. This process seemed less analogous to the training at Toyota, Indiana, than to the process-chaos Avenue A experienced in its early days.

Like other students during her first and second years at medical school, Emily Wilson took basic science courses such as anatomy, physiology, biochemistry, epidemiology, microbiology, pathology, and genetics—and also received some teaching about the doctor-patient relationship—as preparation for her clinical training. Her third and fourth years were quite different. Training was done in teaching hospitals, where students were to leave behind the conceptual frame of the classroom and instead learn by seeing the practical reality of patient care. In her third year, Wilson had clerkships in internal medicine, obstetrics, pediatrics, psychiatry, and surgery, delaying family medicine until her fourth year. In contrast, the sequence for one of her classmates was psychiatry and family medicine followed by surgery, pediatrics, and obstetrics, with internal medicine at the end. A third had a completely different sequence. The fact that the clerkships were at several different hospitals added variation, as did the fact that, regardless of the rotation, Wilson was never teamed with fellow students with whom she had trained previously. Much of the training depended on a downward flow of direction and critique—students reporting to residents, residents reporting to attending physicians—but there was little continuity. Students' rotations were not synched with those of the residents or those of the attending physicians, so the students frequently changed instructors in midstream.

Thus, as Wilson cycled through the system, the people responsible for her training and evaluation came and went, not only between rotations but during them. The fourth year repeated this pattern, only more so. For their fourth year, medical students plan clinical rotations on the basis of the specialty they want to pursue and the experiences, grades, and evaluations they will need in order to be accepted by a desirable residency program. It was hard to have confidence in the process. For instance, in an anesthesiology rotation, Wilson had to shadow a different physician each day (there were 45 in the department, plus 24 residents). In a lecture-based radiology clerkship, there were different lecturers each session and attendance was never taken, let alone practice provided.

Emily Wilson's experience (and therefore the experience of her instructors) was echoed in the stories of 10 other current and former students from seven medical schools whom we interviewed. Interviewing medical educators revealed similar patterns and themes. When we shared Wilson's case with 68 participants in a program for medical educators at Harvard Medical School—participants who came from 31 institutions and 16 of whom came from outside North America—64 of the 68 agreed that Wilson's experience could have been that of one of their own students.

When we reviewed Wilson's case, we could not help noticing the role that chance played in what she learned, how well she learned it, and how she was evaluated. Because clerkships in the third year were assigned on the basis of room in a department, without regard to sequence, there were 720 different ways to complete the six requirements. In a class of 150, it was unlikely that any two students would encounter the same material in the same sequence. The fact that clerkships were at different hospitals, with residents and attending physicians changing according to their own schedules, increased the randomness of the process. The unsynchronized staffing schedule meant that responsibility for training within a rotation was somewhat arbitrary as well.

As tough as this might have been on the students, imagine what it must have been like for the educators. Say, for example, that you are in charge of an obstetrics rotation. Will the students have had any exposure to internal medicine or surgery, key foundations for your discipline, so that you can teach more specialized material and skills, or will you be responsible for teaching your students the basics? As for preparing students for the next rotation—forget it. Each one will be heading off to a different subject. What, then, are your options? You could treat all the students as if they knew nothing. Some instructors are known to do that. You could try to build on what each student has learned already, different in each case, which would require extensive customization. You could simply teach what you considered important in your field, assuming that those students who get it are the smart one and those who don't are the dumb ones. But do any of these sound like a good way to train a doctor?

In short, when we looked at medical education from a process perspective, we saw no clarity of output, an unpredictable learning sequence, unreliable handoffs with no predictability in regard to what students know coming into a process step or what they will have to master before they move on, and lack of consistency in how training will occur within a rotation. We quickly realized that a disjointed approach virtually guarantees the problems so commonly attributed to medical education, such as excessive time and cost and lack of consistency and quality (the problems plaguing those Toyota competitors who haven't invested as much in process excellence as they might). The solution, though, is not more investment but a more holistic investment. If that existed, it would be possible to define acceptable and unacceptable progress along the way rather than evaluating students on effort, personality, and other impressions not directly related to professional performance. It would also be far easier to recognize sooner rather than later when students were struggling, so that a remedy might take minutes, hours, or days rather than weeks, months, or semesters.

MEDICAL EDUCATION AS A PROCESS WITH AN OUTPUT

I hope I have convinced you that there is much to be gained by looking at a wide range of activities—from seat assembly to medical school—through the process framework I have been using. Here is one more observation on the "process" of medical education.

Much of education, medical or otherwise, consists of training that is based on a schedule: A certain number of hours, days, weeks, or months is devoted to a topic, and then an evaluation is done to determine a grade. This is a "fixed input" and "variable output" approach. What is invested (time) is set; what is generated (skill) varies unpredictably and therefore requires subsequent inspection, sorting, and possible rejection and waste (see Figure 11-1). And, to borrow a phrase, a medical education is a mighty expensive thing to have to reject and waste.

For Toyota, training is a matter of "variable input" (time and coaching may vary) but "fixed output." (See Figure 11-2.) As with every other process, the output of any training—and of each stage of the training—is specified. Someone advances from one stage to the next only when he or she has passed the threshold. A well-specified training process with built-in tests will not deliver a half-trained person any more than a well-run assembly line will deliver a car with two wheels and half an engine. (Even if the line produced such a monster, it would not deliver it to anyone.)

Figure 11-1 Fixed inputs, variable outputs

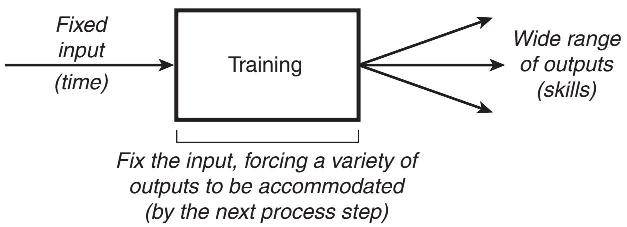
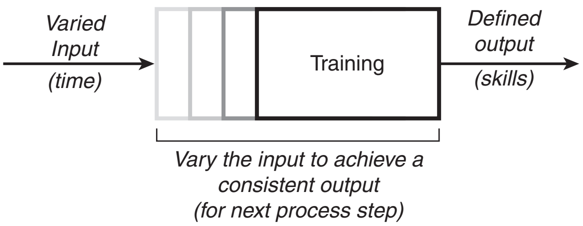


Figure 11-2 Variable inputs, defined outputs



Looked at in this light, a problem with our medical education system is that its output is not very clearly specified—one can assume that an M.D. will know certain things, but there is much else that he or she may or may not know—and is certainly not specified in such a way as to fulfill many of the responsibilities of a practicing physician, inside or outside a hospital. And yet, there's no reason that the output of a medical education could not be much better specified and no reason why young doctors could not emerge ready, not only to apply their particular skills, but to take part in the much larger and more complex process of delivering medical care that is not only very good but absolutely safe. Probably cheaper, too.

CHAPTER 12

CONCLUSION

Why do some organizations outdistance the field while their peers and competitors struggle to keep up? The difference lies in the different approaches the leaders and the strugglers take to managing complex systems in which many people work collaboratively toward a common goal.

Most organizations are hindered by a structural problem: They manage their functions individually, not as steps in a well-integrated process. Each function does its job and somehow the whole thing comes together—except when it doesn't. At the same time, most organizations are also hindered by a dynamic problem: When problems crop up, many of them are treated—that is, ignored—as unavoidable noise. ("Ah, that darn thing never works." "Don't worry, we never get those on time.") This is a dynamic problem in that the organization is *not* dynamic; problems do not provoke change.

The leaders, which I have been characterizing as high-velocity organizations, have a different structural and dynamic approach. Though they invest heavily in the functional expertise they need in order to be world class, those functional specialties are always managed with an eye to their role in an overall process—delivering pills to a patient safely or delivering defect-free beds to customers or delivering well-trained new hires to an assembly line.

But what separates the leaders from the followers even more is a dynamic difference. For the leaders, the daily chatter of imperfect systems is not unavoidable noise to be griped about or ignored; it is a stream of messages telling them where they can and must improve. These organizations know that they cannot conceptually design or plan their way to perfection, but they know that they can discover near-perfection by continually applying the four capabilities I have described all through this book.

What can great companies do to catch up to the market leaders and win the race? The experience of Bob Dallis, the automotive leader who restarted his career at Toyota, provides some clues.

Some months after Dallis had returned to the United States from Japan and begun his regular work, he had a chance to talk with a senior Japanese Toyota executive, who asked how his work was proceeding. Dallis explained that things were both good and bad. On the good side, he had greater facility in managing operations than he had ever had before. The bad news? When Dallis had been at a Big Three auto company, he had spent a lot of time learning the nuances of shop-floor process-management tools such as how to calculate the pitch of a *heijunka* box and how to determine the number of cards in a *kanban*-based pull system. Now things seemed a little too simple—just a systematic approach to designing and operating systems, a simple set of rules for problem solving and improvement, a clear way to share learning, and a well-defined role as a manager. Was he missing something?

"Bob," said the executive, "you have to understand that the Toyota Production System is much like golf." Not seeing the connection, Dallis protested, "But golf is very difficult." "No, it isn't," he was corrected. "It is a remarkably simple game." This debate about simple versus difficult continued until the executive asked Dallis to describe the last time he had played golf: what day, what time, what he wore, the route he took to get to the course, and so forth. Finally, he had walked and talked Dallis up to the first tee.

"And what did you do then?"

"Well, I played the hole."

"No, what did you *do*?" Dallis was asked again.

"Well, I took a ball from my bag, picked a driver, and hit the ball toward the hole."

"Did you get it in?"

"Of course not; it was par five."

"What did you do then, go home?"

"No! I found the ball and used a driver."

"Did you get it in?"

"No!"

"What next?"

"I found the ball and used a different club . . . and then a wedge . . . and then a putter."

You can see the pattern developing. This executive walked and talked Dallis through several holes shot by shot. Finally, he said, "See, it is a simple game. Take a ball, put it on the ground, hit it with a stick toward a hole, and keep repeating that until you are done." Dallis protested, "But it is really hard. There are traps and hazards, roughs and fast greens, in and out of bounds, obstacles, wind, and all sorts of other things." "But Bob, aside from the ball, the club, and the hole, what is there?" Dallis tried to protest again until the executive gently interrupted and corrected him: "Bob, I said it was a simple game with simple rules. I never claimed it did not require a lot of practice."

On the topic of adhering to a simple rule, here is one more reflection:

Chapter 6 described the *jidoka* concept pioneered by the late Sakichi Toyoda. When a thread broke on a loom, the machine ought to stop and identify where the break had occurred so the operator wouldn't waste her time unwittingly doing pointless work. And in general, work should be designed with a built-in test that immediately tells the worker when and where a problem occurs (part of Capability 1), so as to unleash the creative dynamic of problem solving (Capability 2) and knowledge sharing (Capability 3).

The Toyoda family has a museum which, needless to say, contains many textile and automotive pieces. But of all the milestone products the company has created, the one chosen as the museum's centerpiece is a large loom designed and built by Sakichi Toyoda himself. It is right in the entrance atrium, and no matter what route you take through the museum, you cannot help but see it.

I remember being impressed at first by the loom's technical complexity. On most looms, the shuttle weaves back and forth, side to side, creating a sheet of fabric, but on this loom, the shuttle weaves in a circle, creating a cylinder of fabric. Still operating and in good repair, with fabric rising out of it like a serene plume of steam from a hot spring, it is aesthetically appealing as well as technologically fascinating.

Then I got around to reading the sign. This loom is one of a kind. Sakichi Toyoda never made a duplicate. Why not? Because he never figured out how to get the first one to stop when a thread broke.

In light of all the successes that Toyoda and his family had achieved, I was perplexed that the family would choose a failure—the founder's failure, no less—as the centerpiece of its museum. Finally, I came to recognize that the loom doesn't symbolize a failure; it represents a remarkable success. True, the machine itself is imperfect. But the very fact that there is only one of it perfectly embodies Sakichi Toyoda's commitment to *jidoka* and the commitment to *jidoka* he instilled in his company, a commitment that has lasted over generations. In his eyes, a machine, no matter how elegant, that would not warn its operator of an error could not be put to use. It was not reliable, and to pretend otherwise would be wrong. The many examples of self-correcting systems that we examined in this book, and the myriad others within Toyota and other high-velocity organizations, are fuller testimony to the value and continuity of that commitment.

Before we part, let's consider how to create an organization with a similar commitment. We've had many examples with Bob Dallis's mentors, Pratt & Whitney, Avenue A, Alcoa, the naval reactor program, and the medical practices in Chapter 11. High-velocity management is a skill and, like any other skill, it requires practice. Here is how to begin:

- Start small. Find a process or system that is reasonably tightly bounded so that the number of people learning together is relatively small. That way the chance for shared reflection will be relatively high. Think in terms of the local *jishuken*, discussed in Chapter 8, which were the necessary precursors for company and intercompany collaboration.

- Solve a problem that really matters. Don't pick an ancillary process about which no one cares, yourself included. When you start to score gains, you want people to sit up and take notice. Allegheny General Hospital went after central-line infections, West Penn Allegheny focused on operating-room delays, and Alcoa started with workplace risk.
- Don't think too much, but do a lot. That's where the real learning takes place. Despite all the golf videos and manuals available, no one ever mastered golf without hitting bucket after bucket of practice balls on the putting green and the driving range.
- Start with a small footprint but a long leg. Although you should start with a fairly small group and a fairly well-defined problem, as I said above, make sure that every layer of management between the shop floor (or its equivalent) and you is involved. After all, what you are trying to master is a fundamentally different set of roles and relationships, as made vivid in Chapter 10.
- Stay safe. Since you will certainly make errors as you learn, be sure that your experiment is safe and that it will not imperil your standing or put your organization at risk.
- Don't wait until you have enough free time. You never will. Budget time every day for designing a work process to see its problems, solving those problems, and sharing what you learn with others to whom the new insights may be useful, just like Gloria did at West Penn Allegheny.

Here is one last thought:

The title of Philip Crosby's seminal book says it all: *Quality Is Free*. Crosby, along with W. Edwards Deming and Joseph Juran, prophets of the quality movement, confronted conventional wisdom directly, uncompromisingly, and unapologetically. It was thought then that quality always has a cost. What you could get out of a system was limited by the money you had put into it. To get something more out of a system, you had to either spend more or give up something else. Crosby and the others showed that this belief was rooted in a perverse combination of arrogance and pessimism. It is arrogant to believe that anything we have created cannot be improved. It is pessimistic to believe that we are incapable of ever improving something that is flawed.

Deming, Juran, Crosby, Rickover, O'Neill, Toyoda, and all the others we have encountered in this book rejected that arrogant pessimism for a humble optimism. They were humble in recognizing that no matter what the investment of time, effort, and resources, what we create is riddled with imperfections. Their optimism was that no matter how flawed, with an energetic, open-minded commitment to discovery, we can always do better.

We ignore the truth of their message at our own peril. When individuals, groups, organizations, and societies fall back on that conventional wisdom, the dominant question is no longer *how*—how can something be done better?—but *what*—what must we sacrifice to get what we need? The language of trade-offs is found everywhere in political debates. In an otherwise affluent society, we have 40 million people who lack medical coverage, those who do have it must pay a crippling cost, and even for those who are not set back by the cost, the care may turn out to cause harm. In the language of trade-offs, we are faced with a decision: Do we provide more care to more people at great expense, or do we deny care because the additional burden is not affordable? The doctors, nurses, pharmacists, and hospital administrators we've met in this book have already shown that the language of trade-offs is a cop-out.

This is also true in the world of manufacturing. The idea that cars can be safe, reliable, high-performing, and tailored to a multitude of customer needs once seemed fantastic. Now it is the norm, the least one would expect of a car. Does it seem fantastic to think that we could live comfortably while still leaving a lighter footprint on the natural world? Of course we can. We just haven't quite figured out how. Yet.

The same thing is true wherever else we look. We do not need conceptual, hypothetical prognostication to say that we can do better. The empirical evidence is already available and irrefutable. Certain organizations already do much more with much less than their peers and competitors can conceive. It's not magic. What they have done, you can do.

It just takes practice.