

WHAT THE  
MAKING OF  
WORLD-CLASS  
CARS HAS TAUGHT  
US ABOUT DELIVERING  
WORLD-CLASS MEDICINE



## EMPOWERED TO IMPROVE

THIS MUCH IS OBVIOUS: PEOPLE ARE not cars. Operating on a cancer patient — an individual, someone’s spouse, someone’s parent — is not the same as the assembly-line manufacture of identical coupes.

And yet, the same “lean thinking” techniques that fueled Toyota’s global success in quality and market share are having a dramatic impact on the delivery of health care, and helping the University of Michigan to map a future of medicine that relies on new efficiencies and smart innovations to improve patient care and lower health care costs.

BY IAN DEMSKY



IN CASE OF PROBLEM  
PULL

Lean efforts — which reassess work to maximize value and learning while minimizing waste — have been under way at the U-M for several years, including initiatives that cut door-to-balloon times for heart attack patients, reduced the lengths of stay for critical care patients on ventilators, and improved access for new patients to the Urology Clinic.

One recent project exemplifies the big impact that can come from looking at medicine through lean-colored lenses. For a year-and-a-half, Department of Otolaryngology Chair Carol Bradford (M.D. 1986, Residency 1992) turned her operating room into a laboratory — the first anywhere to apply the lean model to head and neck surgery. Not only were she and her colleagues able to identify about 75 hours of wasted time per year within her weekly block of two operating days, they showed that focusing on efficiency and profitability does not have to come at the expense of staff morale, surgical resident education, or care provided to patients.

If the approach were extended to all 35 adult operating rooms over a five-day work week, it could add as many as 6,500 additional hours of OR capacity each year and potentially millions in new revenue, according to the team's study, which was published in the June issue of the *Journal of the American College of Surgeons*. "Most of the changes we made

were actually pretty simple — like doing certain tasks simultaneously rather than in series," says Bradford. "But simple things can pay big dividends."

The findings come at a time when hospital budgets — including U-M's — have been strained by financial downturn, high rates of uninsurance and underinsurance, and potential impacts from changes to federal health care laws. "We're entering an era where we have to be more and more mindful about how to deliver care safely, efficiently and effectively," Bradford adds. "Efficiency is without question part of health care reform."

## GOING TO THE GEMBA

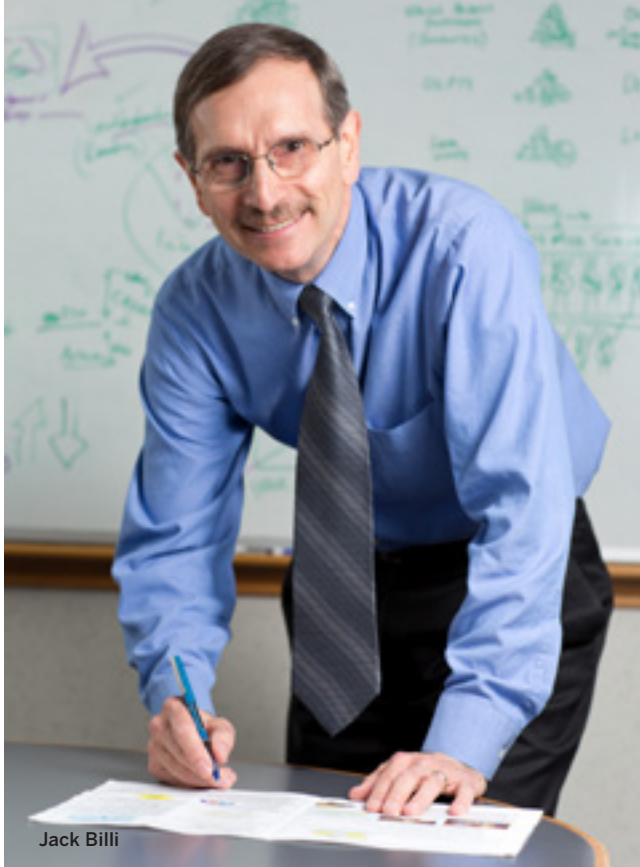
The 1990 bestseller *The Machine That Changed the World* describes the difference between mass production and lean production as a "difference in goals." Mass production settles for being cost effective and "good enough," while lean producers "set their sights explicitly on perfection" and continual improvement. At its core, lean thinking is about ensuring that each step of a particular process — in Bradford's case, all aspects of an operation from the induction of anesthesia to the surgical dressing — adds value for the customer, no matter whether that customer is in a car dealership or a hospital bed.

"Doctors and nurses already do this process in their clinical practice every day," explains U-M's lean guru John E. "Jack" Billi, M.D. (Residency 1981), professor of internal medicine and of medical education. They gather information about a

**NOT ONLY WERE BRADFORD AND HER COLLEAGUES ABLE TO IDENTIFY ABOUT 75 HOURS OF WASTED TIME PER YEAR WITHIN HER WEEKLY BLOCK OF TWO OPERATING DAYS, THEY SHOWED THAT FOCUSING ON EFFICIENCY AND PROFITABILITY DOES NOT HAVE TO COME AT THE EXPENSE OF STAFF MORALE, SURGICAL RESIDENT EDUCATION, OR CARE PROVIDED TO PATIENTS.**



Carol Bradford



Jack Billi

patient's problem, analyze it, and propose an intervention that treats the root cause of the issue, not just the symptoms. Then they monitor the outcome and adjust the strategy if necessary.

"The only difference is that with lean the patient is the Health System," says Billi, who heads the Michigan Quality System, the unit tasked with implementing lean across UMHS. MQS efforts are coordinated by an operations team and supported by seven full-time lean coaches and more than 20 additional part-time coaches embedded across various departments.

Besides valuing the insights of front-line workers over top-down directives, leaders of lean-thinking organizations also spend time in the trenches observing firsthand the real capabilities and difficulties within an organization — a step known in the lean idiom as "going to the gemba," going to where the work is done.

Adopting the lingo is one way of helping an institution become conversant with lean principles and to start to think in new ways. "Just yesterday I said to a colleague, 'This isn't working very well, better pull the andon cord,'" says Bradford, referring to the stop cord that every worker on the Toyota assembly line is empowered to pull when they see a problem.

Above all, lean principles are stubbornly practical. "At first the idea that one would go and look at a problem, talk to workers about it, write down problems and dissect them to their root causes, and then address them one by one almost seemed too simple, too common sense," says Michael W. Mulholland, M.D., Ph.D., the Frederick A. Coller Distinguished Professor of Surgery and chair of the Department of Surgery.

But Mulholland's initial skepticism of the lean approach was eclipsed after witnessing the success of projects like Bradford's — which was a finalist for the 2011 National Lean Best Practice Award presented by the Institute of Industrial Engineers, where it faced competition from innovators at places like IBM, Xerox and Vought Aircraft Industries.

"Every discrete improvement is cumulative," notes Mulholland, who has been thinking a lot these days about the entire surgical "value stream," where 10 major areas of improvement opportunity have been identified. "Not to diminish its importance, but Dr. Bradford's project is one piece of one of those big areas."

Moreover, the surgical stream has two siblings — acute medical care and ambulatory care — that are receiving similar attention.

## BREAKING OPEN THE BLACK BOXES

The analysis in Bradford's OR, spearheaded by the study's first author, Ryan M. Collar, M.D. (Residency 2011), and lean trainer Mary Duck, began by mapping the actions and responsibilities for each of seven roles — from surgical faculty to scrub nurses, anesthesiologists to OR technicians — for every stage of an operation.

"I think many of us assumed the delays and problems we were experiencing were someone else's fault," says David Healy, M.D., assistant professor of anesthesiology and director of head and neck anesthesia. "Sometimes anesthesia is blamed for delays, but it's like a black box — not many people know what it takes to get people ready and keep them safe before a surgical intervention. My view of the preparation happening inside the OR was the same way.

"But by doing the timelines and working out who is doing what, when and why, we could actually see as a group where the issues really were." The exercise helped each role to better understand the responsibilities of others, along with the challenges they routinely face. "It gives you renewed respect for the people you work with," Healy says.

The "swim lane" mapping process also helped Sandra Feiner, R.N., communicate to her coworkers the importance for nurses of interviewing patients before they're sedated, even though the work may at first appear redundant. "We're doing one last double check of important documentation and making sure the patient is 100 percent ready for surgery," says Feiner, who oversees care in the otolaryngology ORs. "Those few minutes while the patient is still awake is also our chance to get to know





Michael Mulholland

them a bit, meet their families, and reassure them they're in good hands."

Bradford echoes her colleagues' sentiments. "It was freeing, actually, to all be pulling in the same direction," she says. "Creating a team of people who trust each other and who can ask questions and work together as a team is probably the most important take-away from this process."

The anecdotal evidence is backed up by data. The study measured staff morale, feelings of support, and thoughts about problem-solving on a five-point scale before and after the lean implementation. Progress was made in every category, with the composite score rising from 2.93 to 3.61 — an improvement of more than 20 percent. The research also surveyed surgical residents and found that the increased emphasis on efficiency did not have a detrimental effect on their education. More importantly, perhaps, they'll carry their experience with lean philosophy into their future careers, says Bradford.

In their search for valueless work, or *muda*, Bradford and her colleagues identified several places where time was being wasted. Each was relatively small and simple, but collectively made a significant impact. For example, time could be lost when anesthesiology faculty who were responsible for multiple rooms were not immediately available to induce a

patient. Though not appropriate for every case, one under-utilized option was to use the overhead paging system to call for another faculty member to assist.

"Interestingly enough," confides Healy, "that system already existed. The surgeons in the OR weren't always aware it could be done and we anesthesiologists just assumed they knew about it. That's one of the key things we learned — that we all probably assume too much."

Meanwhile, ORs were sitting empty between the completion of cleaning and the arrival of the next patient. "One of the easiest changes was to say 'room ready' about 10 or 15 minutes earlier so that the transportation could be done in parallel with the last part of the room preparation," says Bradford. As a result, OR turnaround time — the time from the end of dressing one patient to the first incision on the next patient — fell from 89 minutes to 69 minutes. "When you're doing several cases a day, that can make a huge difference," she says.

The time savings also led to financial gains from reducing by half the number of cases that finished after 5 p.m. and required overtime for hourly workers.

## THE RIGHT SYSTEM, THE RIGHT CULTURE

Although he wasn't a doctor, what naturalist John Muir said of the entire universe is equally true of health care systems: When you try to pick out anything by itself, you find it's hitched to everything else.

Creating 6,500 hours of new operating room capacity would also require having enough inpatient beds for all those new patients. As problems are addressed, bottlenecks shift downstream: Work hard to fix delays and make sure all your morning cases start on time, and you may discover they're now backing up in the recovery room.

"The U-M has been so successful that we don't have enough beds and operating rooms to easily accommodate all the patients who want to come here," Mulholland says. "So the top-priority projects within the surgical value stream deal with capacity, which can be improved by more efficient and coordinated use of our physical assets."

Going lean also means changing some of the traditional ways of thinking about medical practice. "Hierarchies are being flattened, and for good reason," Mulholland says. "It's a reflection of the world we live in. In the operating room there will always be differentiation. The anesthesiologist will put the patients to sleep, the surgeon will wield the scalpel, but they all share knowledge. One group is not smarter than any other group."

“We always go around and introduce ourselves by our first names,” explains Bradford. “In the OR, I’m Carol, not Dr. Bradford — even through some of my residents have a hard time getting used to that.”

Recently Billi, also associate vice president for medical affairs, got to see hospital operations from a new perspective. “It was really enlightening and humbling to actually be a family member of a patient,” he says.

Billi observed nurses running back and forth because there wasn’t enough laundry, being diverted by call lights going off because meals weren’t delivered on time, and sorting things out after a patient’s X-ray was scheduled at the same time as a blood transfusion. “You have these nurses who are incredibly talented and capable, who are spending time doing these workarounds, and they probably don’t see them as workarounds because it’s been the standard way of getting the job done,” he says.

“We have a fantastic health system,” Billi continues. “My family gets all of their medical care here. I moved my parents here so my father could have a hip replacement. And yet, like every health system in the country, we have challenges. We need to be honest about them and try to understand their causes — and then not bring in experts to fix them, but help

**“MOST OF THE CHANGES WE MADE WERE ACTUALLY PRETTY SIMPLE — LIKE DOING CERTAIN TASKS SIMULTANEOUSLY RATHER THAN IN SERIES. BUT SIMPLE THINGS CAN PAY BIG DIVIDENDS.”**

the front-line workers find and fix the root cause of the most important problems because they know the work the best.”

Billi points to the long-term savings that came from something as simple as adding drawer dividers and reorganizing a single supply cart used for peripherally inserted central catheter lines. “The estimate is that it saves a nurse an hour a day — every PICC team nurse, every day, for the rest of time,” he says. Since 2009, more than 200 “everyday lean” ideas have been put into practice.

The U-M received coaching on its first few lean initiatives from General Motors, which itself had come to realize the value of lean principles, but coaching will never get the U-M where it needs to go, says Billi. “That might work if we had three problems, but if you have 22,000 workers and each one touches a dozen processes and each process has a dozen problems, you can never hire enough coaches to help. Who has to fix these problems? The workers themselves.”

But the lean approach doesn’t attempt to tackle the existing culture head-on, according to Billi. “Within lean thinking, the concept of culture is really important. But culture is a result of the right processes. If you want a culture that empowers workers to solve problems, you don’t get a culture transplant — the right system will build the right culture.

“Toyota’s leaders have said they combined average workers with brilliant processes to produce superb work,” Billi says. “We have brilliant people at the U-M. Imagine what we can do when we make our processes equally brilliant.” [M]



David Healy and Sandra Feiner