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The philosophy of lean manufacturing has transformed

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health care in Denver.

**Denver Health patients can pick up prescriptions at one of the network's eight community health centers, the same location where they receive treatment.**

MCCORY JAMES PHOTOGRAPHY

## By Dylan Scott

FedEx. Microsoft. Toyota. Those were the companies that Patricia Gabow planned to use as a template for overhauling Denver Health, a health-care network in Colorado's largest city. Gabow has served as the head of the health group since the early 1990s, and about eight years ago, she began envisioning a new model based on private-sector practices. When Gabow pitched the idea, her staff balked at using automobile manufacturing or package delivery to teach doctors how to better serve a low-income, mostly minority population. One co-worker, Gabow recalls, took her aside and told her it was "the craziest idea I've ever heard."

"We were still doing things pretty much as we had when I was an intern 40 years ago," says Gabow, who first came to Denver Health in 1973. Back then, the organization was a city-owned hospital called Denver General. Gabow, who had trained as a nephrologist, had to convince administrators of the need for such kidney care. She worked for half a salary for more than a year before the city decided she was right, ultimately creating a full nephrology department with Gabow as the head. She became director of medical services in 1981 and took over as CEO in 1992.

When Gabow took control of Denver Health, the organization had a $39 million cash deficit and was already performing $100 million in annual care for uninsured patients. Given its patient population and battered finances, she realized that only fundamental reform would keep the operation sustainable.

Gabow decided that the best way to meet the community's needs was by rebuilding Denver General from the ground up. Her first step? Decouple the hospital from the city, which had overseen the facility for nearly 150 years. In 1997, Gabow convinced Mayor Wellington Webb that the organization could better operate away from the city's bureaucracy, and Denver Health was established as a public, academic and independent health system. "At the time, I said to the mayor: 'This isn't a divorce,'" says Gabow. "We were still going to be the city's health-care system. We just needed a different house." Oversight of the system, which included a major hospital, emergency response teams and a smattering of community clinics, was now solely in the hands of Gabow, her staff and a board of directors that was appointed to five-year terms by the mayor. The newly independent Denver Health then invested $388 million to upgrade its facilities and infrastructure for delivering care.

That's when things got interesting. After the initial investments were completed, Gabow and her team began to focus more intently on the patients in their system. She says they stepped back and asked themselves, "How do we perfect the patient experience?" That's when she turned to private-sector firms for advice. In 2004, Gabow organized a group of advisers from some

**Denver Health CEO Patricia Gabow**

DAVID KIDD

of the largest companies in the world—including FedEx, Microsoft, Ritz-Carlton and Toyota—to look at how they examined and solved problems in their own businesses. Gabow and her team soon settled on the idea of "lean manufacturing," the management philosophy of efficiency and waste reduction that transformed the Toyota automobile company in the 1980s and '90s.

The methods that Gabow learned—and the new model of care her hospital implemented—have revolutionized patient care in Denver. Today, Denver Health has become a national model for public-sector health care. The system has managed to improve outcomes while driving down costs. Last year, the organization received a Shingo Prize for Operational Excellence, an international award that recognizes efficient and effective business models. According to the University HealthSystem Consortium, Denver Health has the lowest mortality rate of any of the nation's 113 academic health centers.

At the same time, costs have been kept in check. While the system's expenses for treating uninsured patients have ballooned from $100 million in 1991 to nearly $400 million in 2010, Denver Health has consistently operated in the black. An inpatient stay at Denver Health costs about 35 percent less than a stay at one of the Metro Denver hospitals, the private, nonprofit network that serves much of the rest of the city's population. Gabow estimates that utilizing lean has yielded up to $127 million in financial benefit without the organization having to lay off any of its 5,400 employees.

The Denver Health approach is one that public hospitals everywhere should emulate, says Mark McClellan, director of the Engelberg Center for Health Care Reform at the Brookings Institution and former administrator at the Centers for Medicare & Medicaid Services (CMS) during the George W. Bush administration. While at CMS, McClellan consulted with Denver Health on how its newly adopted operations model could be translated to the federal government. Denver Health, McClellan says, "didn't start with some savings target. They started with identifying ways to really reform care. They have the right vision, which is: What is the way that health care for the people we're serving should look? And then asking: How do we get there?"

The lean manufacturing model is based on five principles, according to the Lean Enterprise Institute: 1) Identify the value of the product for the customer; 2) Map the process for creating the product and eliminate elements without value; 3) Create a flow for the value-creating steps; 4) Let customers pull value from that flow; and 5) Begin the process again and seek perfection.

Put more simply, it's about eliminating wasteful actions. Anything that doesn't add value for the ultimate customer is considered wasteful. "The philosophy is that waste is disrespectful to humanity because it squanders scarce resources, and waste is disrespectful to individuals because it asks them to do work with no value," Gabow says. "We've added that waste is disrespectful to our patients because it asks them to endure processes with no value."

For Denver Health, the key to eliminating waste turned out to be integration, or restructuring operations at its different facilities to create one mega-system of patient care. The organization treats 170,000 patients annually, more than one-third of the city's population. Forty percent of the city's children seek treatment there. Roughly 70 percent of the patients are ethnic minorities, and many of them don't speak English. Most are poor, and 42 percent of them are uninsured. In addition to a large primary hospital and emergency room, Denver Health comprises eight community health centers, each equipped with its own pharmacy, and another 13 school-based health centers. Denver Health also runs the city's 911 emergency medical services system, a non-emergency medical hotline, the Rocky Mountain Poison and Drug Center, and the Rocky Mountain Regional Trauma Center.

But as far as Denver Health is concerned, all those disparate elements are the same. Every one of those institutions shares the same information system, and every patient who enters the system is assigned a number. So whether someone checks into the emergency room or an outpatient specialty clinic, physicians can access all the relevant data that Denver Health has ever accumulated. It's been a major shift in the way the system operates, says Thomas Mackenzie, who, as chief quality officer of Denver Health, is charged with implementing and maintaining the lean principles. "It's not thinking about things in different silos for different components," Mackenzie says, "but thinking about how you can provide the best care for patients across the whole continuum of care."

Mackenzie points to one specific example of how lean has transformed the system's approach: treatment of patients for blood coagulation. Every year, Denver Health treats about 1,000 patients with anticoagulation medicine to prevent blood clots. As the medi-

cal staff looked to apply the lean model to that care, they encountered a startling degree of variation between the eight primary-care clinics, several specialty clinics and the dozens of physicians who staffed them. The approaches differed in how often blood tests were done, where patients were seen, how often patients were advised over the phone and so on. So Mackenzie and his staff developed clear protocols for treating patients for that specific condition. They held weeklong events to train staff on the new approach.

Lean also inspired a restructuring of the Denver Health Medical Center's rapid response system for patients who go into cardiac arrest. At most hospitals, a dedicated team is on call 24 hours a day, seven days a week for rapid response, and temporarily assume care of those patients from their primary nurses and doctors. But in applying the lean principles, the medical center's staff recognized an opportunity to cut costs while ensuring continuity of care. A regular assessment schedule was established for nurses to monitor their patients, and criteria were developed for nurses to determine if a patient was at risk. Then a specific protocol was outlined for staff to follow if a nurse made that determination, providing guidelines for moving up the chain of command if the immediate attending physician is not available or the patient's condition did not improve. An analysis by Denver Health staff found that the number of non-ICU cardiac arrest incidents decreased significantly following the implementation of the new procedures. And it bestowed rapid response responsibilities on staff members who were already working, rather than requiring an entirely separate team.

That process for improving care has pervaded every aspect of Denver Health, and it has attracted national attention. According to former CMS Administrator McClellan, Denver Health served as the inspiration for revamping payments for physicians who treat patients with federally subsidized insurance, such as Medicare and Medicaid, transitioning from a fee-for-service model to one that rewards outcomes. Denver Health has also set the standard in its relationships with its patients and the resulting compliance of those patients, says Len Nichols, director of the Center for Health Policy Research and Ethics at George Mason University. That achievement is amplified, Nichols says, because the organization serves a population "that some would consider problematic." The ongoing connectedness between Denver Health and its patients leads to measurably better outcomes: Nearly 90 percent of its infant patients receive annual immunizations, compared to a 75 percent national average, according to the Kaiser Family Foundation. Sixty-eight percent of those with high blood pressure take measures to control it, which correlates with a 70 percent national average, according to the Centers for Disease Control and Prevention.

MCCORY JAMES PHOTOGRAPHY

**The system treats 40 percent of the city's children and operates 13 school-based health centers.**

Gabow doesn't shrink from her role as the architect of a national model for public-sector hospitals. She knows the eyes of the national health-care community are on Denver. "We are really serious about wanting to be a model for the nation because our country is facing some tough choices," she says. "And we need to demonstrate models that are cost-efficient and high quality."

Despite Denver Health's past successes, this year could prove to be the organization's most pivotal yet. Gabow announced in November that she will retire at the end of 2012. The seemingly universal opinion among health-care professionals—both within Denver Health and at the national level—seems to be that the organization's transformation could never have occurred without her leadership. Finding a replacement who can match Gabow's ambition and tenacity is paramount to Denver Health's continued success, says George Mason's Nichols. "They have to keep the momentum going," he says. "The person they pick to succeed her, that's probably as important a search as any in the country right now, with the possible exception of the president of the United States."

Part of her success, says Nichols, stems from her history as a practicing physician. "If we want to achieve our goals, improving care while cutting costs, what we need is physician leadership. Only doctors can convince other doctors that these changes are worth doing. Denver Health is a model for reform, but it'd be easier if we could just clone Patty Gabow."

Mackenzie, for his part, says the philosophy of efficiency and quality that Gabow has instilled at the institution has become so ingrained that it will sustain itself even after she leaves. "She's been critical in keeping up the momentum for this transformation. She's been the driver." But now, he says, the rest of the staff is carrying Gabow's vision. "At this point, we think our work is exactly the recipe that America needs." **G**

*Email dscott@governing.com*