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Restaurant chains have managed to combine quality control, cost control, and innovation. Can health care?

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It was Saturday night, and I was at the local Cheesecake Factory with my two teen-age daughters and three of their friends. You may know the chain: a hundred and sixty restaurants with a catalogue-like menu that, when I did a count, listed three hundred and eight dinner items (including the forty-nine on the "Skinnylicious" menu), plus a hundred and twenty-four choices of beverage. It's a linen-napkin-and-tablecloth sort of place, but with something for everyone. There's wine and wasabi-crusted ahi tuna, but there's also buffalo wings and Bud Light. The kids ordered mostly comfort food—pot stickers, mini crab cakes, teriyaki chicken, Hawaiian pizza, pasta carbonara. I got a beet salad with goat cheese, white-bean hummus and warm flatbread, and the miso salmon.

Medicine has long resisted the productivity revolutions that transformed other industries. But the new chains aim to change this.

The place is huge, but it's invariably packed, and you can see why. The typical entrée is under fifteen dollars. The décor is fancy, in an

accessible, Disney-cruise-ship sort of way: faux Egyptian columns, earth-tone murals, vaulted ceilings. The waiters are efficient and friendly. They wear all white (crisp white oxford shirt, pants, apron, sneakers) and try to make you feel as if it were a special night out. As for the food—can I say this without losing forever my chance of getting a reservation at Per Se?—it was delicious.

The chain serves more than eighty million people per year. I pictured semi-frozen bags of beet salad shipped from Mexico, buckets of precooked pasta and production-line hummus, fish from a box. And yet nothing smacked of mass production. My beets were crisp and fresh, the hummus creamy, the salmon like butter in my mouth. No doubt everything we ordered was sweeter, fattier, and bigger than it had to be. But the Cheesecake Factory knows its customers. The whole table was happy (with the possible exception of Ethan, aged sixteen, who picked the onions out of his Hawaiian pizza).

I wondered how they pulled it off. I asked one of the Cheesecake Factory line cooks how much of the food was premade. He told me that everything's pretty much made from scratch—except the cheesecake, which actually is from a cheesecake factory, in Calabasas, California.

I'd come from the hospital that day. In medicine, too, we are trying to deliver a range of services to millions of people at a reasonable cost and with a consistent level of quality. Unlike the Cheesecake Factory, we haven't figured out how. Our costs are soaring, the service is typically mediocre, and the quality is unreliable. Every clinician has his or her own way of doing things, and the rates of failure and complication (not to mention the costs) for a given service routinely vary by a factor of two or three, even within the same hospital.

It's easy to mock places like the Cheesecake Factory—restaurants that have brought chain production to complicated sit-down meals. But the "casual dining sector," as it is known, plays a central role in the ecosystem of eating, providing three-course, fork-and-knife restaurant meals that most people across the country couldn't previously find or afford. The ideas start out in élite, upscale restaurants in major cities. You could think of them as research restaurants, akin to research hospitals. Some of their enthusiasms—miso salmon, Chianti-braised short ribs, flourless chocolate espresso cake—spread to other high-end restaurants. Then the casual-dining chains reëngineer them for affordable delivery to millions. Does health care need something like this?

Big chains thrive because they provide goods and services of greater variety, better quality, and lower cost than would otherwise be available. Size is the key. It gives them buying power, lets them centralize common functions, and allows them to adopt and diffuse innovations faster than they could if they were a bunch of small, independent operations. Such advantages have made Walmart the most successful retailer on earth. Pizza Hut alone runs one

in eight pizza restaurants in the country. The Cheesecake Factory's major competitor, Darden, owns Olive Garden, LongHorn Steakhouse, Red Lobster, and the Capital Grille; it has more than two thousand restaurants across the country and employs more than a hundred and eighty thousand people. We can bristle at the idea of chains and mass production, with their homogeneity, predictability, and constant genuflection to the value-for-money god. Then you spend a bad night in a "quaint" "one of a kind" bed-and-breakfast that turns out to have a manic, halitoxic innkeeper who can't keep the hot water running, and it's right back to the Hyatt.

Medicine, though, had held out against the trend. Physicians were always predominantly self-employed, working alone or in small private-practice groups. American hospitals tended to be community-based. But that's changing. Hospitals and clinics have been forming into large conglomerates. And physicians—facing escalating demands to lower costs, adopt expensive information technology, and account for performance—have been flocking to join them. According to the Bureau of Labor Statistics, only a quarter of doctors are self-employed—an extraordinary turnabout from a decade ago, when a majority were independent. They've decided to become employees, and health systems have become chains.

I'm no exception. I am an employee of an academic, nonprofit health system called Partners HealthCare, which owns the Brigham and Women's Hospital and the Massachusetts General Hospital, along with seven other hospitals, and is affiliated with dozens of clinics around eastern Massachusetts. Partners has sixty thousand employees, including six thousand doctors. Our competitors include CareGroup, a system of five regional hospitals, and a new for-profit chain called the Steward Health Care System.

Steward was launched in late 2010, when Cerberus—the multibillion-dollar private-investment firm—bought a group of six failing Catholic hospitals in the Boston area for nine hundred million dollars. Many people were shocked that the Catholic Church would allow a corporate takeover of its charity hospitals. But the hospitals, some of which were more than a century old, had been losing money and patients, and Cerberus is one of those firms which specialize in turning around distressed businesses.

Cerberus has owned controlling stakes in Chrysler and GMAC Financing and currently has stakes in Albertsons grocery stories, one of Austria's largest retail bank chains, and the Freedom Group, which it built into one of the biggest gun-and-ammunition manufacturers in the world. When it looked at the Catholic hospitals, it saw another opportunity to create profit through size and efficiency. In the past year, Steward bought four more Massachusetts hospitals and made an offer to buy six financially troubled hospitals in south Florida. It's trying to create what some have called the Southwest Airlines of health care—a network of high-quality hospitals that would appeal to a more cost-conscious public.

Steward's aggressive growth has made local doctors like me nervous. But many health systems, for-profit and not-for-profit, share its goal: large-scale, production-line medicine. The way medical care is organized is changing—because the way we pay for it is changing.

Historically, doctors have been paid for services, not results. In the eighteenth century B.C., Hammurabi's code instructed that a surgeon be paid ten shekels of silver every time he performed a procedure for a patrician—opening an abscess or treating a cataract with his bronze lancet. It also instructed that if the patient should die or lose an eye, the surgeon's hands be cut off. Apparently, the Mesopotamian surgeons' lobby got this results clause dropped. Since then, we've generally been paid for what we do, whatever happens. The consequence is the system we have, with plenty of individual transactions—procedures, tests, specialist consultations—and uncertain attention to how the patient ultimately fares.

Health-care reforms—public and private—have sought to reshape that system. This year, my employer's new contracts with Medicare, BlueCross BlueShield, and others link financial reward to clinical performance. The more the hospital exceeds its cost-reduction and quality-improvement targets, the more money it can keep. If it misses the targets, it will lose tens of millions of dollars. This is a radical shift. Until now, hospitals and medical groups have mainly had a landlord-tenant relationship with doctors. They offered us space and facilities, but what we tenants did behind closed doors was our business. Now it's their business, too.

The theory the country is about to test is that chains will make us better and more efficient. The question is how. To most of us who work in health care, throwing a bunch of administrators and accountants into the mix seems unlikely to help. Good medicine can't be reduced to a recipe.

Then again neither can good food: every dish involves attention to detail and individual adjustments that require human judgment. Yet, some chains manage to achieve good, consistent results thousands of times a day across the entire country. I decided to get inside one and find out how they did it.

Dave Luz is the regional manager for the eight Cheesecake Factories in the Boston area. He oversees operations that bring in eighty million dollars in yearly revenue, about as much as a medium-sized hospital. Luz (rhymes with "fuzz") is forty-seven, and had started out in his twenties waiting tables at a Cheesecake Factory restaurant in Los Angeles. He was writing screenplays, but couldn't make a living at it. When he and his wife hit thirty and had their second child, they came back east to Boston to be closer to family. He decided to stick with the Cheesecake Factory. Luz rose steadily, and made a nice living. "I wanted to have some business skills," he said—he started a film-production company on the side—"and there was no other place I knew where you could go in, know nothing, and learn top to bottom how to run a business."

To show me how a Cheesecake Factory works, he took me into the kitchen of his busiest restaurant, at Prudential Center, a shopping and convention hub. The kitchen design is the same in every restaurant, he explained. It's laid out like a manufacturing facility, in which raw materials in the back of the plant come together as a finished product that rolls out the front. Along the back wall are the walk-in refrigerators and prep stations, where half a dozen people stood chopping and stirring and mixing. The next zone is where the cooking gets done—two parallel lines of countertop, forty-some feet long and just three shoe-lengths apart, with fifteen people pivoting in place between the stovetops and grills on the hot side and the neatly laid-out bins of fixings (sauces, garnishes, seasonings, and the like) on the cold side. The prep staff stock the pullout drawers beneath the counters with slabs of marinated meat and fish, serving-size baggies of pasta and crabmeat, steaming bowls of brown rice and mashed potatoes. Basically, the prep crew handles the parts, and the cooks do the assembly.

Computer monitors positioned head-high every few feet flashed the orders for a given station. Luz showed me the touch-screen tabs for the recipe for each order and a photo showing the proper presentation. The recipe has the ingredients on the left part of the screen and the steps on the right. A timer counts down to a target time for completion. The background turns from green to yellow as the order nears the target time and to red when it has exceeded it.

I watched Mauricio Gaviria at the broiler station as the lunch crowd began coming in. Mauricio was twenty-nine years old and had worked there eight years. He'd got his start doing simple prep—chopping vegetables—and worked his way up to fry cook, the pasta station, and now the sauté and broiler stations. He bounced in place waiting for the pace to pick up. An order for a "hibachi" steak popped up. He tapped the screen to open the order: medium-rare, no special requests. A ten-minute timer began. He tonged a fat hanger steak soaking in teriyaki sauce onto the broiler and started a nest of sliced onions cooking beside it. While the meat was grilling, other orders arrived: a Kobe burger, a blue-cheese B.L.T. burger, three "old-fashioned" burgers, five veggie burgers, a "farmhouse" burger, and two Thai chicken wraps. *Tap, tap, tap*. He got each of them grilling.

I brought up the hibachi-steak recipe on the screen. There were instructions to season the steak, sauté the onions, grill some mushrooms, slice the meat, place it on the bed of onions, pile the mushrooms on top, garnish with parsley and sesame seeds, heap a stack of asparagus tempura next to it, shape a tower of mashed potatoes alongside, drop a pat of wasabi butter on top, and serve.

Two things struck me. First, the instructions were precise about the ingredients and the objectives (the steak slices were to be a quarter of an inch thick, the presentation just so), but not about how to get there. The cook has to decide how much to salt and baste, how to sequence the onions and mushrooms and meat so they're done at the same time, how to swivel from grill

to countertop and back, sprinkling a pinch of salt here, flipping a burger there, sending word to the fry cook for the asparagus tempura, all the while keeping an eye on the steak. In producing complicated food, there might be recipes, but there was also a substantial amount of what's called "tacit knowledge"—knowledge that has not been reduced to instructions.

Second, Mauricio never looked at the instructions anyway. By the time I'd finished reading the steak recipe, he was done with the dish and had plated half a dozen others. "Do you use this recipe screen?" I asked.

"No. I have the recipes right here," he said, pointing to his baseball-capped head.

He put the steak dish under warming lights, and tapped the screen to signal the servers for pickup. But before the dish was taken away, the kitchen manager stopped to look, and the system started to become clearer. He pulled a clean fork out and poked at the steak. Then he called to Mauricio and the two other cooks manning the grill station.

"Gentlemen," he said, "this steak is perfect." It was juicy and pink in the center, he said. "The grill marks are excellent." The sesame seeds and garnish were ample without being excessive. "But the tower is too tight." I could see what he meant. The mashed potatoes looked a bit like something a kid at the beach might have molded with a bucket. You don't want the food to look manufactured, he explained. Mauricio fluffed up the potatoes with a fork.

I watched the kitchen manager for a while. At every Cheesecake Factory restaurant, a kitchen manager is stationed at the counter where the food comes off the line, and he rates the food on a scale of one to ten. A nine is near-perfect. An eight requires one or two corrections before going out to a guest. A seven needs three. A six is unacceptable and has to be redone. This inspection process seemed a tricky task. No one likes to be second-guessed. The kitchen manager prodded gently, being careful to praise as often as he corrected. ("Beautiful. Beautiful!" "The pattern of this pesto glaze is just right.") But he didn't hesitate to correct.

"We're getting sloppy with the plating," he told the pasta station. He was unhappy with how the fry cooks were slicing the avocado spring rolls. "Gentlemen, a half-inch border on this next time." He tried to be a coach more than a policeman. "Is this three-quarters of an ounce of Parm-Romano?"

And that seemed to be the spirit in which the line cooks took him and the other managers. The managers had all risen through the ranks. This earned them a certain amount of respect. They in turn seemed respectful of the cooks' skills and experience. Still, the oversight is tight, and this seemed crucial to the success of the enterprise.

The managers monitored the pace, too—scanning the screens for a station stacking up red flags, indicating orders past the target time, and deciding whether to give the cooks at the station a nudge or an extra pair of hands. They watched for waste—wasted food, wasted time,

wasted effort. The formula was Business 101: Use the right amount of goods and labor to deliver what customers want and no more. Anything more is waste, and waste is lost profit.

I spoke to David Gordon, the company's chief operating officer. He told me that the Cheesecake Factory has worked out a staff-to-customer ratio that keeps everyone busy but not so busy that there's no slack in the system in the event of a sudden surge of customers. More difficult is the problem of wasted food. Although the company buys in bulk from regional suppliers, groceries are the biggest expense after labor, and the most unpredictable. Everything—the chicken, the beef, the lettuce, the eggs, and all the rest—has a shelf life. If a restaurant were to stock too much, it could end up throwing away hundreds of thousands of dollars' worth of food. If a restaurant stocks too little, it will have to tell customers that their favorite dish is not available, and they may never come back. Groceries, Gordon said, can kill a restaurant.

The company's target last year was at least 97.5-per-cent efficiency: the managers aimed at throwing away no more than 2.5 per cent of the groceries they bought, without running out. This seemed to me an absurd target. Achieving it would require knowing in advance almost exactly how many customers would be coming in and what they were going to want, then insuring that the cooks didn't spill or toss or waste anything. Yet this is precisely what the organization has learned to do. The chain-restaurant industry has produced a field of computer analytics known as "guest forecasting."

"We have forecasting models based on historical data—the trend of the past six weeks and also the trend of the previous year," Gordon told me. "The predictability of the business has become astounding." The company has even learned how to make adjustments for the weather or for scheduled events like playoff games that keep people at home.

A computer program known as Net Chef showed Luz that for this one restaurant food costs accounted for 28.73 per cent of expenses the previous week. It also showed exactly how many chicken breasts were ordered that week ($1,614 worth), the volume sold, the volume on hand, and how much of last week's order had been wasted (three dollars' worth). Chain production requires control, and they'd figured out how to achieve it on a mass scale.

As a doctor, I found such control alien—possibly from a hostile planet. We don't have patient forecasting in my office, push-button waste monitoring, or such stringent, hour-by-hour oversight of the work we do, and we don't want to. I asked Luz if he had ever thought about the contrast when he went to see a doctor. We were standing amid the bustle of the kitchen, and the look on his face shifted before he answered.

"I have," he said. His mother was seventy-eight. She had early Alzheimer's disease, and required a caretaker at home. Getting her adequate medical care was, he said, a constant battle.

Recently, she'd had a fall, apparently after fainting, and was taken to a local emergency room. The doctors ordered a series of tests and scans, and kept her overnight. They never figured out what the problem was. Luz understood that sometimes explanations prove elusive. But the clinicians didn't seem to be following any coördinated plan of action. The emergency doctor told the family one plan, the admitting internist described another, and the consulting specialist a third. Thousands of dollars had been spent on tests, but nobody ever told Luz the results.

A nurse came at ten the next morning and said that his mother was being discharged. But his mother's nurse was on break, and the discharge paperwork with her instructions and prescriptions hadn't been done. So they waited. Then the next person they needed was at lunch. It was as if the clinicians were the customers, and the patients' job was to serve *them*. "We didn't get to go until 6 P.M., with a tired, disabled lady and a long drive home." Even then she still had to be changed out of her hospital gown and dressed. Luz pressed the call button to ask for help. No answer. He went out to the ward desk.

The aide was on break, the secretary said. "Don't you dress her yourself at home?" He explained that he didn't, and made a fuss.

An aide was sent. She was short with him and rough in changing his mother's clothes. "She was manhandling her," Luz said. "I felt like, 'Stop. I'm not one to complain. I respect what you do enormously. But if there were a video camera in here, you'd be on the evening news.' I sent her out. I had to do everything myself. I'm stuffing my mom's boob in her bra. It was unbelievable."

His mother was given instructions to check with her doctor for the results of cultures taken during her stay, for a possible urinary-tract infection. But when Luz tried to follow up, he couldn't get through to her doctor for days. "Doctors are busy," he said. "I get it. But come on." An office assistant finally told him that the results wouldn't be ready for another week and that she was to see a neurologist. No explanations. No chance to ask questions.

The neurologist, after giving her a two-minute exam, suggested tests that had already been done and wrote a prescription that he admitted was of doubtful benefit. Luz's family seemed to encounter this kind of disorganization, imprecision, and waste wherever his mother went for help.

"It is unbelievable to me that they would not manage this better," Luz said. I asked him what he would do if he were the manager of a neurology unit or a cardiology clinic. "I don't know anything about medicine," he said. But when I pressed he thought for a moment, and said, "This is pretty obvious. I'm sure you already do it. But I'd study what the best people are doing, figure out how to standardize it, and then bring it to everyone to execute."

This is not at all the normal way of doing things in medicine. ("You're scaring me," he said, when I told him.) But it's exactly what the new health-care chains are now hoping to do on a mass scale. They want to create Cheesecake Factories for health care. The question is whether the medical counterparts to Mauricio at the broiler station—the clinicians in the operating rooms, in the medical offices, in the intensive-care units—will go along with the plan. Fixing a nice piece of steak is hardly of the same complexity as diagnosing the cause of an elderly patient's loss of consciousness. Doctors and patients have not had a positive experience with outsiders second-guessing decisions. How will they feel about managers trying to tell them what the "best practices" are?

In March, my mother underwent a total knee replacement, like at least six hundred thousand Americans each year. She'd had a partial knee replacement a decade ago, when arthritis had worn away part of the cartilage, and for a while this served her beautifully. The surgeon warned, however, that the results would be temporary, and about five years ago the pain returned.

She's originally from Ahmadabad, India, and has spent three decades as a pediatrician, attending to the children of my small Ohio home town. She's chatty. She can't go through a grocery checkout line or get pulled over for speeding without learning people's names and a little bit about them. But she didn't talk about her mounting pain. I noticed, however, that she had developed a pronounced limp and had become unable to walk even moderate distances. When I asked her about it, she admitted that just getting out of bed in the morning was an ordeal. Her doctor showed me her X-rays. Her partial prosthesis had worn through the bone on the lower surface of her knee. It was time for a total knee replacement.

This past winter, she finally stopped putting it off, and asked me to find her a surgeon. I wanted her to be treated well, in both the technical and the human sense. I wanted a place where everyone and everything—from the clinic secretary to the physical therapists—worked together seamlessly.

My mother planned to come to Boston, where I live, for the surgery so she could stay with me during her recovery. (My father died last year.) Boston has three hospitals in the top rank of orthopedic surgery. But even a doctor doesn't have much to go on when it comes to making a choice. A place may have a great reputation, but it's hard to know about actual quality of care. Unlike some countries, the United States doesn't have a monitoring system that tracks joint-replacement statistics. Even within an institution, I found, surgeons take strikingly different approaches. They use different makes of artificial joints, different kinds of anesthesia, different regimens for post-surgical pain control and physical therapy.

In the absence of information, I went with my own hospital, the Brigham and Women's Hospital. Our big-name orthopedic surgeons treat Olympians and professional athletes. Nine of them do knee replacements. Of most interest to me, however, was a surgeon who was not one of

the famous names. He has no national recognition. But he has led what is now a decade-long experiment in standardizing joint-replacement surgery.

John Wright is a New Zealander in his late fifties. He's a tower crane of a man, six feet four inches tall, and so bald he barely seems to have eyebrows. He's informal in attire—I don't think I've ever seen him in a tie, and he is as apt to do rounds in his zip-up anorak as in his white coat—but he exudes competence.

"Customization should be five per cent, not ninety-five per cent, of what we do," he told me. A few years ago, he gathered a group of people from every specialty involved—surgery, anesthesia, nursing, physical therapy—to formulate a single default way of doing knee replacements. They examined every detail, arguing their way through their past experiences and whatever evidence they could find. Essentially, they did what Luz considered the obvious thing to do: they studied what the best people were doing, figured out how to standardize it, and then tried to get everyone to follow suit.

They came up with a plan for anesthesia based on research studies—including giving certain pain medications before the patient entered the operating room and using spinal anesthesia plus an injection of local anesthetic to block the main nerve to the knee. They settled on a postoperative regimen, too. The day after a knee replacement, most orthopedic surgeons have their patients use a continuous passive-motion machine, which flexes and extends the knee as they lie in bed. Large-scale studies, though, have suggested that the machines don't do much good. Sure enough, when the members of Wright's group examined their own patients, they found that the ones without the machine got out of bed sooner after surgery, used less pain medication, and had more range of motion at discharge. So Wright instructed the hospital to get rid of the machines, and to use the money this saved (ninety thousand dollars a year) to pay for more physical therapy, something that is proven to help patient mobility. Therapy, starting the day after surgery, would increase from once to twice a day, including weekends.

Even more startling, Wright had persuaded the surgeons to accept changes in the operation itself; there was now, for instance, a limit as to which prostheses they could use. Each of our nine knee-replacement surgeons had his preferred type and brand. Knee surgeons are as particular about their implants as professional tennis players are about their racquets. But the hardware is easily the biggest cost of the operation—the average retail price is around eight thousand dollars, and some cost twice that, with no solid evidence of real differences in results.

Knee implants were largely perfected a quarter century ago. By the nineteen-nineties, studies showed that, for some ninety-five per cent of patients, the implants worked magnificently a decade after surgery. Evidence from the Australian registry has shown that not a single new knee or hip prosthesis had a lower failure rate than that of the established prostheses. Indeed, thirty per cent of the new models were likelier to fail. Like others on staff,

Wright has advised companies on implant design. He believes that innovation will lead to better implants. In the meantime, however, he has sought to limit the staff to the three lowest-cost knee implants.

These have been hard changes for many people to accept. Wright has tried to figure out how to persuade clinicians to follow the standardized plan. To prevent revolt, he learned, he had to let them deviate at times from the default option. Surgeons could still order a passive-motion machine or a preferred prosthesis. “But I didn’t make it easy,” Wright said. The surgeons had to enter the treatment orders in the computer themselves. To change or add an implant, a surgeon had to show that the performance was superior or the price at least as low.

I asked one of his orthopedic colleagues, a surgeon named John Ready, what he thought about Wright’s efforts. Ready was philosophical. He recognized that the changes were improvements, and liked most of them. But he wasn’t happy when Wright told him that his knee-implant manufacturer wasn’t matching the others’ prices and would have to be dropped.

“It’s not ideal to lose my prosthesis,” Ready said. “I could make the switch. The differences between manufacturers are minor. But there’d be a learning curve.” Each implant has its quirks—how you seat it, what tools you use. “It’s probably a ten-case learning curve for me.” Wright suggested that he explain the situation to the manufacturer’s sales rep. “I’m my rep’s livelihood,” Ready said. “He probably makes five hundred dollars a case from me.” Ready spoke to his rep. The price was dropped.

Wright has become the hospital’s kitchen manager—not always a pleasant role. He told me that about half of the surgeons appreciate what he’s doing. The other half tolerate it at best. One or two have been outright hostile. But he has persevered, because he’s gratified by the results. The surgeons now use a single manufacturer for seventy-five per cent of their implants, giving the hospital bargaining power that has helped slash its knee-implant costs by half. And the start-to-finish standardization has led to vastly better outcomes. The distance patients can walk two days after surgery has increased from fifty-three to eighty-five feet. Nine out of ten could stand, walk, and climb at least a few stairs independently by the time of discharge. The amount of narcotic pain medications they required fell by a third. They could also leave the hospital nearly a full day earlier on average (which saved some two thousand dollars per patient).

My mother was one of the beneficiaries. She had insisted to Dr. Wright that she would need a week in the hospital after the operation and three weeks in a rehabilitation center. That was what she’d required for her previous knee operation, and this one was more extensive.

“We’ll see,” he told her.

The morning after her operation, he came in and told her that he wanted her getting out of bed, standing up, and doing a specific set of exercises he showed her. “He’s pushy, if you want to say it that way,” she told me. The physical therapists and nurses were, too. They were a team,

and that was no small matter. I counted sixty-three different people involved in her care. Nineteen were doctors, including the surgeon and chief resident who assisted him, the anesthesiologists, the radiologists who reviewed her imaging scans, and the junior residents who examined her twice a day and adjusted her fluids and medications. Twenty-three were nurses, including her operating-room nurses, her recovery-room nurse, and the many ward nurses on their eight-to-twelve-hour shifts. There were also at least five physical therapists; sixteen patient-care assistants, helping check her vital signs, bathe her, and get her to the bathroom; plus X-ray and EKG technologists, transport workers, nurse practitioners, and physician assistants. I didn't even count the bioengineers who serviced the equipment used, the pharmacists who dispensed her medications, or the kitchen staff preparing her food while taking into account her dietary limitations. They all had to coördinate their contributions, and they did.

Three days after her operation, she was getting in and out of bed on her own. She was on virtually no narcotic medication. She was starting to climb stairs. Her knee pain was actually less than before her operation. She left the hospital for the rehabilitation center that afternoon.

The biggest complaint that people have about health care is that no one ever takes responsibility for the total experience of care, for the costs, and for the results. My mother experienced what happens in medicine when someone takes charge. Of course, John Wright isn't alone in trying to design and implement this kind of systematic care, in joint surgery and beyond. The Virginia Mason Medical Center, in Seattle, has done it for knee surgery and cancer care; the Geisinger Health Center, in Pennsylvania, has done it for cardiac surgery and primary care; the University of Michigan Health System standardized how its doctors give blood transfusions to patients, reducing the need for transfusions by thirty-one per cent and expenses by two hundred thousand dollars a month. Yet, unless such programs are ramped up on a nationwide scale, they aren't going to do much to improve health care for most people or reduce the explosive growth of health-care costs.

In medicine, good ideas still take an appallingly long time to trickle down. Recently, the American Academy of Neurology and the American Headache Society released new guidelines for migraine-headache-treatment. They recommended treating severe migraine sufferers—who have more than six attacks a month—with preventive medications and listed several drugs that markedly reduce the occurrence of attacks. The authors noted, however, that previous guidelines going back more than a decade had recommended such remedies, and doctors were still not providing them to more than two-thirds of patients. One study examined how long it took several major discoveries, such as the finding that the use of beta-blockers after a heart attack improves survival, to reach even half of Americans. The answer was, on average, more than fifteen years.

Scaling good ideas has been one of our deepest problems in medicine. Regulation has had its place, but it has proved no more likely to produce great medicine than food inspectors are to produce great food. During the era of managed care, insurance-company reviewers did hardly any better. We've been stuck. But do we have to be?

Every six months, the Cheesecake Factory puts out a new menu. This means that everyone who works in its restaurants expects to learn something new twice a year. The March, 2012, Cheesecake Factory menu included thirteen new items. The teaching process is now finely honed: from start to finish, rollout takes just seven weeks.

The ideas for a new dish, or for tweaking an old one, can come from anywhere. One of the Boston prep cooks told me about an idea he once had that ended up in a recipe. David Overton, the founder and C.E.O. of the Cheesecake Factory, spends much of his time sampling a range of cuisines and comes up with many dishes himself. All the ideas, however, go through half a dozen chefs in the company's test kitchen, in Calabasas. They figure out how to make each recipe reproducible, appealing, and affordable. Then they teach the new recipe to the company's regional managers and kitchen managers.

Dave Luz, the Boston regional manager, went to California for training this past January with his chief kitchen manager, Tom Schmidt, a chef with fifteen years' experience. They attended lectures, watched videos, participated in workshops. It sounded like a surgical conference. Where I might be taught a new surgical technique, they were taught the steps involved in preparing a "Santorini farro salad." But there was a crucial difference. The Cheesecake instructors also trained the attendees how to teach what they were learning. In medicine, we hardly ever think about how to implement what we've learned. We learn what we want to, when we want to.

On the first training day, the kitchen managers worked their way through thirteen stations, preparing each new dish, and their performances were evaluated. The following day, they had to teach their regional managers how to prepare each dish—Schmidt taught Luz—and this time the instructors assessed how well the kitchen managers had taught.

The managers returned home to replicate the training session for the general manager and the chief kitchen manager of every restaurant in their region. The training at the Boston Prudential Center restaurant took place on two mornings, before the lunch rush. The first day, the managers taught the kitchen staff the new menu items. There was a lot of poring over the recipes and videos and fussing over the details. The second day, the cooks made the new dishes for the servers. This gave the cooks some practice preparing the food at speed, while allowing the servers to learn the new menu items. The dishes would go live in two weeks. I asked a couple of the line cooks how long it took them to learn to make the new food.

"I know it already," one said.

"I make it two times, and that's all I need," the other said.

Come on, I said. How long before they had it down pat?

"One day," they insisted. "It's easy."

I asked Schmidt how much time he thought the cooks required to master the recipes. They thought a day, I told him. He grinned. "More like a month," he said.

Even a month would be enviable in medicine, where innovations commonly spread at a glacial pace. The new health-care chains, though, are betting that they can change that, in much the same way that other chains have.

Armin Ernst is responsible for intensive-care-unit operations in Steward's ten hospitals. The I.C.U.s he oversees serve some eight thousand patients a year. In another era, an I.C.U. manager would have been a facilities expert. He would have spent his time making sure that the equipment, electronics, pharmacy resources, and nurse staffing were up to snuff. He would have regarded the I.C.U. as the doctors' workshop, and he would have wanted to give them the best possible conditions to do their work as they saw fit.

Ernst, though, is a doctor—a new kind of doctor, whose goal is to help disseminate good ideas. He doesn't see the I.C.U. as a doctors' workshop. He sees it as the temporary home of the sickest, most fragile people in the country. Nowhere in health care do we expend more resources. Although fewer than one in four thousand Americans are in intensive care at any given time, they account for four per cent of national health-care costs. Ernst believes that his job is to make sure that everyone is collaborating to provide the most effective and least wasteful care possible.

He looked like a regular doctor to me. Ernst is fifty years old, a native German who received his medical degree at the University of Heidelberg before training in pulmonary and critical-care medicine in the United States. He wears a white hospital coat and talks about drips and ventilator settings, like any other critical-care specialist. But he doesn't deal with patients: he deals with the people who deal with patients.

Ernst says he's not telling clinicians what to do. Instead, he's trying to get clinicians to agree on precise standards of care, and then make sure that they follow through on them. (The word "consensus" comes up a lot.) What I didn't understand was how he could enforce such standards in ten hospitals across three thousand square miles.

Late one Friday evening, I joined an intensive-care-unit team on night duty. But this team was nowhere near a hospital. We were in a drab one-story building behind a meat-trucking facility outside of Boston, in a back section that Ernst called his I.C.U. command center. It was outfitted with millions of dollars' worth of technology. Banks of computer screens carried a live feed of cardiac-monitor readings, radiology-imaging scans, and laboratory results from I.C.U. patients throughout Steward's hospitals. Software monitored the stream and produced yellow

and red alerts when it detected patterns that raised concerns. Doctors and nurses manned consoles where they could toggle on high-definition video cameras that allowed them to zoom into any I.C.U. room and talk directly to the staff on the scene or to the patients themselves.

The command center was just a few months old. The team had gone live in only four of the ten hospitals. But in the next several months Ernst's "tele-I.C.U." team will have the ability to monitor the care for every patient in every I.C.U. bed in the Steward health-care system.

A doctor, two nurses, and an administrative assistant were on duty in the command center each night I visited. Christina Monti was one of the nurses. A pixie-like thirty-year-old with nine years' experience as a cardiac intensive-care nurse, she was covering Holy Family Hospital, on the New Hampshire border, and St. Elizabeth's Medical Center, in Boston's Brighton neighborhood. When I sat down with her, she was making her rounds, virtually.

First, she checked on the patients she had marked as most critical. She reviewed their most recent laboratory results, clinical notes, and medication changes in the electronic record. Then she made a "visit," flicking on the two-way camera and audio system. If the patients were able to interact, she would say hello to them in their beds. She asked the staff members whether she could do anything for them. The tele-I.C.U. team provided the staff with extra eyes and ears when needed. If a crashing patient diverts the staff's attention, the members of the remote team can keep an eye on the other patients. They can handle computer paperwork if a nurse falls behind; they can look up needed clinical information. The hospital staff have an OnStar-like button in every room that they can push to summon the tele-I.C.U. team.

Monti also ran through a series of checks for each patient. She had a reference list of the standards that Ernst had negotiated with the people running the I.C.U.s, and she looked to see if they were being followed. The standards covered basics, from hand hygiene to measures for stomach-ulcer prevention. In every room with a patient on a respirator, for instance, Monti made sure the nurse had propped the head of the bed up at least thirty degrees, which makes pneumonia less likely. She made sure the breathing tube in the patient's mouth was secure, to reduce the risk of the tube's falling out or becoming disconnected. She zoomed in on the medication pumps to check that the drips were dosed properly. She was not looking for bad nurses or bad doctors. She was looking for the kinds of misses that even excellent nurses and doctors can make under pressure.

The concept of the remote I.C.U. started with an effort to let specialists in critical-care medicine, who are in short supply, cover not just one but several community hospitals. Two hundred and fifty hospitals from Alaska to Virginia have installed a version of the tele-I.C.U. It produced significant improvements in outcomes and costs—and, some discovered, a means of driving better practices even in hospitals that had specialists on hand.

After five minutes of observation, however, I realized that the remote I.C.U. team wasn't exactly in command; it was in negotiation. I observed Monti perform a video check on a middle-aged man who had just come out of heart surgery. A soft chime let the people in the room know she was dropping in. The man was unconscious, supported by a respirator and intravenous drips. At his bedside was a nurse hanging a bag of fluid. She seemed to stiffen at the chime's sound.

"Hi," Monti said to her. "I'm Chris. Just making my evening rounds. How are you?" The bedside nurse gave the screen only a sidelong glance.

Ernst wasn't oblivious of the issue. He had taken pains to introduce the command center's team, spending weeks visiting the units and bringing doctors and nurses out to tour the tele-I.C.U. before a camera was ever turned on. But there was no escaping the fact that these were strangers peering over the staff's shoulders. The bedside nurse's chilliness wasn't hard to understand.

In a single hour, however, Monti had caught a number of problems. She noticed, for example, that a patient's breathing tube had come loose. Another patient wasn't getting recommended medication to prevent potentially fatal blood clots. Red alerts flashed on the screen—a patient with an abnormal potassium level that could cause heart-rhythm problems, another with a sudden leap in heart rate.

Monti made sure that the team wasn't already on the case and that the alerts weren't false alarms. Checking the computer, she figured out that a doctor had already ordered a potassium infusion for the woman with the low level. Flipping on a camera, she saw that the patient with the high heart rate was just experiencing the stress of being helped out of bed for the first time after surgery. But the unsecured breathing tube and the forgotten blood-clot medication proved to be oversights. Monti raised the concerns with the bedside staff.

Sometimes they resist. "You have got to be careful from patient to patient," Gerard Hayes, the tele-I.C.U. doctor on duty, explained. "Pushing hard on one has ramifications for how it goes with a lot of patients. You don't want to sour whole teams on the tele-I.C.U." Across the country, several hospitals have decommissioned their systems. Clinicians have been known to place a gown over the camera, or even rip the camera out of the wall. Remote monitoring will never be the same as being at the bedside. One nurse called the command center to ask the team not to turn on the video system in her patient's room: he was delirious and confused, and the sudden appearance of someone talking to him from the television would freak him out.

Still, you could see signs of change. I watched Hayes make his virtual rounds through the I.C.U. at St. Anne's Hospital, in Fall River, near the Rhode Island border. He didn't yet know all the members of the hospital staff—this was only his second night in the command center,

and when he sees patients in person it's at a hospital sixty miles north. So, in his dealings with the on-site clinicians, he was feeling his way.

Checking on one patient, he found a few problems. Mr. Karlage, as I'll call him, was in his mid-fifties, an alcoholic smoker with cirrhosis of the liver, severe emphysema, terrible nutrition, and now a pneumonia that had put him into respiratory failure. The I.C.U. team injected him with antibiotics and sedatives, put a breathing tube down his throat, and forced pure oxygen into his lungs. Over a few hours, he stabilized, and the I.C.U. doctor was able to turn his attention to other patients.

But stabilizing a sick patient is like putting out a house fire. There can be smoldering embers just waiting to reignite. Hayes spotted a few. The ventilator remained set to push breaths at near-maximum pressure, and, given the patient's severe emphysema, this risked causing a blowout. The oxygen concentration was still cranked up to a hundred per cent, which, over time, can damage the lungs. The team had also started several broad-spectrum antibiotics all at once, and this regimen had to be dialled back if they were to avoid breeding resistant bacteria.

Hayes had to notify the unit doctor. An earlier interaction, however, had not been promising. During a video check on a patient, Hayes had introduced himself and mentioned an issue he'd noticed. The unit doctor stared at him with folded arms, mouth shut tight. Hayes was a former Navy flight surgeon with twenty years' experience as an I.C.U. doctor and looked to have at least a decade on the St. Anne's doctor. But the doctor was no greenhorn, either, and gave him the brushoff: "The morning team can deal with that." Now Hayes needed to call him about Mr. Karlage. He decided to do it by phone.

"Sounds like you're having a busy night," Hayes began when he reached the doctor. "Mr. Karlage is really turning around, huh?" Hayes praised the doctor's work. Then he brought up his three issues, explaining what he thought could be done and why. He spoke like a consultant brought in to help. This went over better. The doctor seemed to accept Hayes's suggestions.

Unlike a mere consultant, however, Hayes took a few extra steps to make sure his suggestions were carried out. He spoke to the nurse and the respiratory therapist by video and explained the changes needed. To carry out the plan, they needed written orders from the unit doctor. Hayes told them to call him back if they didn't get the orders soon.

Half an hour later, Hayes called Mr. Karlage's nurse again. She hadn't received the orders. For all the millions of dollars of technology spent on the I.C.U. command center, this is where the plug meets the socket. The fundamental question in medicine is: Who is in charge? With the opening of the command center, Steward was trying to change the answer—it gave the remote doctors the authority to issue orders as well. The idea was that they could help when a unit doctor got too busy and fell behind, and that's what Hayes chose to believe had happened. He entered the orders into the computer. In a conflict, however, the on-site physician has the final

say. So Hayes texted the St. Anne's doctor, informing him of the changes and asking if he'd let him know if he disagreed.

Hayes received no reply. No "thanks" or "got it" or "O.K." After midnight, though, the unit doctor pressed the video call button and his face flashed onto Hayes's screen. Hayes braced for a confrontation. Instead, the doctor said, "So I've got this other patient and I wanted to get your opinion."

Hayes suppressed a smile. "Sure," he said.

When he signed off, he seemed ready to high-five someone. "He called *us*," he marvelled. The command center was gaining credibility.

Armin Ernst has big plans for the command center—a rollout of full-scale treatment protocols for patients with severe sepsis, acute respiratory-distress syndrome, and other conditions; strategies to reduce unnecessary costs; perhaps even computer forecasting of patient volume someday. Steward is already extending the command-center concept to in-patient psychiatry. Emergency rooms and surgery may be next. Other health systems are pursuing similar models. The command-center concept provides the possibility of, well, command.

Today, some ninety "super-regional" health-care systems have formed across the country—large, growing chains of clinics, hospitals, and home-care agencies. Most are not-for-profit. Financial analysts expect the successful ones to drive independent medical centers out of existence in much of the country—either by buying them up or by drawing away their patients with better quality and cost control. Some small clinics and stand-alone hospitals will undoubtedly remain successful, perhaps catering to the luxury end of health care the way gourmet restaurants do for food. But analysts expect that most of us will gravitate to the big systems, just as we have moved away from small pharmacies to CVS and Walmart.

Already, there have been startling changes. Cleveland Clinic, for example, opened nine regional hospitals in northeast Ohio, as well as health centers in southern Florida, Toronto, and Las Vegas, and is now going international, with a three-hundred-and-sixty-four-bed hospital in Abu Dhabi scheduled to open next year. It reached an agreement with Lowe's, the home-improvement chain, guaranteeing a fixed price for cardiac surgery for the company's employees and dependents. The prospect of getting better care for a lower price persuaded Lowe's to cover all out-of-pocket costs for its insured workers to go to Cleveland, including co-payments, airfare, transportation, and lodging. Three other companies, including Kohl's department stores, have made similar deals, and a dozen more, including Boeing, are in negotiations. Big Medicine is on the way.

Reinventing medical care could produce hundreds of innovations. Some may be as simple as giving patients greater e-mail and online support from their clinicians, which would enable timelier advice and reduce the need for emergency-room visits. Others might involve

smartphone apps for coaching the chronically ill in the management of their disease, new methods for getting advice from specialists, sophisticated systems for tracking outcomes and costs, and instant delivery to medical teams of up-to-date care protocols. Innovations could take a system that requires sixty-three clinicians for a knee replacement and knock the number down by half or more. But most significant will be the changes that finally put people like John Wright and Armin Ernst in charge of making care coherent, coördinated, and affordable. Essentially, we're moving from a Jeffersonian ideal of small guilds and independent craftsmen to a Hamiltonian recognition of the advantages that size and centralized control can bring.

Yet it seems strange to pin our hopes on chains. We have no guarantee that Big Medicine will serve the social good. Whatever the industry, an increase in size and control creates the conditions for monopoly, which could do the opposite of what we want: suppress innovation and drive up costs over time. In the past, certainly, health-care systems that pursued size and market power were better at raising prices than at lowering them.

A new generation of medical leaders and institutions professes to have a different aim. But a lesson of the past century is that government can influence the behavior of big corporations, by requiring transparency about their performance and costs, and by enacting rules and limitations to protect the ordinary citizen. The federal government has broken up monopolies like Standard Oil and A.T. & T.; in some parts of the country, similar concerns could develop in health care.

Mixed feelings about the transformation are unavoidable. There's not just the worry about what Big Medicine will do; there's also the worry about how society and government will respond. For the changes to live up to our hopes—lower costs and better care for everyone—liberals will have to accept the growth of Big Medicine, and conservatives will have to accept the growth of strong public oversight.

The vast savings of Big Medicine could be widely shared—or reserved for a few. The clinicians who are trying to reinvent medicine aren't doing it to make hedge-fund managers and bondholders richer; they want to see that everyone benefits from the savings their work generates—and that won't be automatic.

Our new models come from industries that have learned to increase the capabilities and efficiency of the human beings who work for them. Yet the same industries have also tended to devalue those employees. The frontline worker, whether he is making cars, solar panels, or wasabi-crusted ahi tuna, now generates unprecedented value but receives little of the wealth he is creating. Can we avoid this as we revolutionize health care?

Those of us who work in the health-care chains will have to contend with new protocols and technology rollouts every six months, supervisors and project managers, and detailed metrics on our performance. Patients won't just look for the best specialist anymore; they'll look for the best system. Nurses and doctors will have to get used to delivering care in which our own

convenience counts for less and the patients' experience counts for more. We'll also have to figure out how to reward people for taking the time and expense to teach the next generations of clinicians. All this will be an enormous upheaval, but it's long overdue, and many people recognize that. When I asked Christina Monti, the Steward tele-I.C.U. nurse, why she wanted to work in a remote facility tangling with staffers who mostly regarded her with indifference or hostility, she told me, "Because I wanted to be part of the change."

And we are seeing glimpses of this change. In my mother's rehabilitation center, miles away from where her surgery was done, the physical therapists adhered to the exercise protocols that Dr. Wright's knee factory had developed. He didn't have a video command center, so he came out every other day to check on all the patients and make sure that the staff was following the program. My mother was sure she'd need a month in rehab, but she left in just a week, incurring a fraction of the costs she would have otherwise. She walked out the door using a cane. On her first day at home with me, she climbed two flights of stairs and walked around the block for exercise.

The critical question is how soon that sort of quality and cost control will be available to patients everywhere across the country. We've let health-care systems provide us with the equivalent of greasy-spoon fare at four-star prices, and the results have been ruinous. The Cheesecake Factory model represents our best prospect for change. Some will see danger in this. Many will see hope. And that's probably the way it should be. ♦

ILLUSTRATION: HARRY CAMPBELL