

Cowboys and Pit Crews  
2011 Harvard Medical School Commencement Address  
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In his book, The Youngest Science, the great physician-writer Lewis Thomas described his internship at Boston City Hospital in pre-penicillin 1937. Hospital work, he observed, was mainly custodial. “If being in a hospital bed made a difference,” he said, “it was mostly the difference produced by warmth, shelter, and food, and attentive, friendly care, and the matchless skill of the nurses in providing these things. Whether you survived or not depended on the natural history of the disease itself. Medicine made little or no difference.”

That didn’t stop the interns from being, as he put it, “frantically busy.” He learned to focus on diagnosis—insuring nothing was missed, especially an illness with an actual, effective treatment. There were only a few. Lobar pneumonia could be treated with antiserum, an injection of rabbit antibodies against the *pneumococcus*, if the intern identified the subtype correctly. Patients in diabetic coma responded dramatically to animal-extracted insulin and intravenous fluid. Acute heart failure patients could be saved by bleeding away a pint of blood from an arm vein, administering a leaf-preparation of digitalis, and delivering oxygen by tent. Early syphilitic paresis sometimes responded to a mix of mercury, bismuth, and arsenic. Surgery could treat certain tumors and infections. Beyond that, medical capabilities didn’t extend much further.

The distance medicine has traveled in the couple of generations since is almost unfathomable for us today. We now have treatments for nearly all of the tens of thousand of diagnoses and conditions that afflict human beings. We have more than 6,000 drugs and 4,000 medical and surgical procedures, and you, the clinicians graduating today, will

be legally permitted to provide them. Such capabilities cannot guarantee everyone a long and healthy life, but they can make it possible for most.

People worldwide want and deserve the benefits of your capabilities. Many fear they will be denied them, however, whether because of cost, availability, or incompetence of caregivers. We are now witnessing a global societal struggle to assure universal delivery of our know-how. We in medicine, however, have been slow to grasp why this is such a struggle, or how the volume of discovery has changed our work and responsibilities.

The rapid growth in medicine's capacities is not just a difference in degree but a difference in kind. We have experienced the sort of vast, quantum alteration that my father describes experiencing during a life that brought him from childhood in rural India to retirement from a surgical practice in Ohio. The greatest leap for him, he tells me, wasn't in taking that first step off the plane in New York City, extraordinary as that was. It was in going from his rural farming village of 5,000 people to Nagpur, a city of millions where he was admitted to medical school, 300 kilometers away. Both communities were impoverished. But the structure of life, the values, and the ideas were so different as to be unrecognizable. Visiting back home, he found that one generation couldn't even grasp the other's challenges. Here is where we seem to find ourselves, as well.

We are at a cusp point in medical generations. The doctors of former generations lament what medicine has become. If they could start over, the surveys tell us, they wouldn't choose the profession today. They recall a simpler past without insurance company hassles, government regulations, malpractice litigation, not to mention nurses

and doctors bearing tattoos and talking of wanting “balance” in their lives. These are not the cause of their unease, however. They are symptoms of a deeper condition—which is the reality that medicine’s complexity has exceeded our individual capabilities as doctors.

The core structure of medicine—how health care is organized and practiced—emerged in an era when doctors could hold all the key information patients needed in their heads and manage everything required themselves. One needed only an ethic of hard work, a prescription pad, a secretary, and a hospital willing to serve as one’s workshop, loaning a bed and nurses for a patient’s convalescence, maybe an operating room with a few basic tools. We were craftsmen. We could set the fracture, spin the blood, plate the cultures, administer the antiserum. The nature of the knowledge lent itself to prizing autonomy, independence, and self-sufficiency among our highest values, and to designing medicine accordingly. But you can’t hold all the information in your head any longer, and you can’t master all the skills. No one person can work up a patient’s back pain, run the immunoassay, do the physical therapy, protocol the MRI, and direct the treatment of the unexpected cancer found growing in the spine. I don’t even know what it means to “protocol” the MRI.

Before Elias Zerhouni became director of the National Institutes of Health, he was a senior hospital leader at Johns Hopkins, and he calculated how many clinical staff were involved in the care of their typical hospital patient—how many doctors, nurses, and so on. In 1970, he found, it was 2.5 full time equivalents. By the end of the 1990s, it was more than fifteen. The number must be even larger today. Everyone has just a piece of patient care. We’re all specialists now—even primary care doctors. A structure that

prioritizes the independence of all those specialists will have enormous difficulty achieving great care.

We don't have to look far for evidence. Two million patients pick up infections in American hospitals, most because someone didn't follow basic antiseptic precautions. Forty percent of coronary disease patients and sixty percent of asthma patients receive incomplete or inappropriate care. And half of major surgical complications are avoidable with existing knowledge. It's like no one's in charge—because no one is. The public's experience is that we have amazing clinicians and technologies but little consistent sense that they come together to provide an actual system of care, from start to finish for people. We train, hire, and pay doctors to be cowboys. But it's pit crews people need.

Another sign this is the case is the unsustainable growth in the cost of health care. Medical performance tends to follow a bell curve, with a wide gap between the best and the worst results for a given condition, depending on where people go for care. The costs follow a bell curve, as well, varying for similar patients by thirty to fifty percent. But the interesting thing is: the curves do not match. The places that get the best results are not the most expensive places. Indeed, many are among the least expensive. This means there is hope—for if the best results required the highest costs, then rationing care would be the only choice. Instead, however, we can look to the top performers—the positive deviants—to understand how to provide what society most needs: better care at lower cost. And the pattern seems to be that the places that function most like a system are most successful.

By a system I mean that the diverse people actually work together to direct their specialized capabilities toward common goals for patients. They are coordinated by

design. They are pit crews. To function this way, however, you must cultivate certain skills which are uncommon in practice and not often taught.

For one, you must acquire an ability to recognize when you've succeeded and when you've failed for patients. People in effective systems become interested in data. They put effort and resources into collecting them, refining them, understanding what they say about their performance.

Second, you must grow an ability to devise solutions for the system problems that data and experience uncover. When I was in medical school, for instance, one of the last ways I'd have imagined spending time in my future surgical career would have been working on things like checklists. Robots and surgical techniques, sure. Information technology, maybe. But checklists?

They turn out, however, to be among the basic tools of the quality and productivity revolution in aviation, engineering, construction—in virtually every field combining high risk and complexity. Checklists seem lowly and simplistic, but they help fill in for the gaps in our brains and between our brains. They emphasize group precision in execution. And making them in medicine has forced us to define our key aims for our patients and to say exactly what we will do to achieve them. Making teams successful is more difficult than we knew. Even the simplest checklist forces us to grapple with vulnerabilities like handoffs and checklist overload. But designed well, the results can be extraordinary, allowing us to nearly eliminate many hospital infections, to cut deaths in surgery by as much as half globally, and to slash costs, as well.

Which brings us to the third skill that you must have but haven't been taught—the ability to implement at scale, the ability to get colleagues along the entire chain of care

functioning like pit crews for patients. There is resistance, sometimes vehement resistance, to the efforts that make it possible. Partly, it is because the work is rooted in different values than the ones we've had. They include humility, an understanding that no matter who you are, how experienced or smart, you will fail. They include discipline, the belief that standardization, doing certain things the same way every time, can reduce your failures. And they include teamwork, the recognition that others can save you from failure, no matter who they are in the hierarchy.

These values are the opposite of autonomy, independency, self-sufficiency. Many doctors fear the future will end daring, creativity, and the joys of thinking that medicine has had. But nothing says teams cannot be daring or creative or that your work with others will not require hard thinking and wise judgment. Success under conditions of complexity still demands these qualities.

Resistance also surfaces because medicine is not structured for group work. Even just asking clinicians to make time to sit together and agree on plans for complex patients feels like an imposition. "I'm not paid for this!" people object, and it's true right up to the highest levels.

I spoke to a hospital executive the day after he'd presented to his board a plan to reorient his system around teams that focus on improving care outcomes, improving the health of the community, and lowering its costs of care. The meeting was contentious. The aims made sense, but hospital finances are not based on achieving them, and the board wasn't sure about asking payers to change that. The meeting ended unresolved. These aims are not yet our aims in medicine, though we need them to be.

Not long ago, I had an experience at our local school that brought home the stakes. I'd gone for a meeting with my children's teachers, and I ran into the superintendent of schools. I told him how worried I was to see my kids' art classes cut and their class sizes rise to almost 30 children in some cases. What was he working on to improve matters, I asked?

You know what I spend my time working on, he said? Health care costs. Teachers' health benefit expenses were up nine percent, city tax revenues were flat, and school enrollment was up. A small percentage of teachers with serious illnesses accounted for the majority of the costs, and the only option he'd found was to cut their benefits.

"Oh," I said.

I went to the teacher meetings. On the way, I ran into a teacher that I had operated on. She'd had a lymphoma. She was one of that small percentage who accounted for most of the costs. That's when it struck me. *I* was part of the reason my children didn't have enough teachers. We all are in medicine. Reports show that every dollar added to school budgets over the last decade for smaller class sizes and better teacher pay was diverted to covering rising health care costs.

This is not inevitable. I do not believe society should be forced to choose between whether our children get a great education or their teachers get great medical care. But only we can create the local medical systems that make both possible. You who graduate today will join these systems as they are born, propel them, work on the policies that accelerate them, and create the innovations they need. Making systems work in health

care—shifting from corralling cowboys to producing pit crews—is the great task of your and my generation of clinicians and scientists.

You are the generation on the precipice of a transformation medicine has no choice but to undergo, the riders in the front car of the rollercoaster clack-clack-clacking its way up to the drop. The revolution that remade how other fields handle complexity is coming to health care, and I think you sense it. I see this in the burst of students obtaining extra degrees in fields like public health, business administration, public policy, information technology, education, economics, engineering. Of some 200 students graduating today, more than 35 are getting such degrees, intuiting that ordinary medical training wouldn't prepare you for the world to come. Two years ago, the Institute for Healthcare Improvement started its Open School, offering free online courses in systems skills such as outcome measurement, quality improvement, implementation, and leadership. They hoped a few hundred medical students would enroll. Forty-five thousand did. You've recognized faster than any of us that the way we train, practice, and innovate has to change. Even the laboratory science must change—toward generating treatments and diagnostics that do not stand in isolation but fit in as reliable components of an integrated, economical, and effective package of care for the needs patients have.

The problems of making health care work are large. The complexities are overwhelming governments, economies, and societies around the world. We have every indication, however, that where people in medicine combine their talents and efforts to design organized service to patients and local communities, extraordinary change can result.

Recently, you might be interested to know, I met an actual cowboy. He described to me how cowboys do their job today, herding thousands of cattle. They have tightly organized teams, with everyone assigned specific positions and communicating with each other constantly. They have protocols and checklists for bad weather, emergencies, the inoculations they must dispense. Even the cowboys, it turns out, function like pit crews now. It may be time for us to join them.