

LAST WORD

## The checklist manifesto

Human error might plummet, says surgeon Atul Gawande, if we all embraced a profoundly simple tool.

POSTED ON JANUARY 7, 2010, AT 11:38 AM

I WAS CHATTING with a medical school friend of mine who is now a general surgeon in San Francisco. We were trading war stories, as surgeons are apt to do. One of John's was about a guy who came in on Halloween night with a stab wound. He had been at a costume party. He got into an altercation. And now here he was.

He was stable, breathing normally, not in pain, just drunk and babbling to the trauma team. They cut off his clothes with shears and looked him over from head to toe. He was of moderate size, about 200 pounds, most of the excess around the middle. That was where they found the stab wound, a neat 2-inch red slit in his belly, pouting open like a fish mouth. They'd need to take him to the operating room, check to make sure the bowel wasn't injured, and sew up the little gap. "No big deal," John said. They had time, they determined.

Then a nurse noticed that the patient had stopped babbling. His heart rate had skyrocketed. His eyes were rolling back in his head. The nurse called for help and the members of the trauma team swarmed back into the room. They stuck a tube down his airway and pushed air into his lungs, poured fluid and blood into him. They still couldn't get his pressure up.

So now they were crashing into the operating room—stretcher flying, nurses racing to get the surgical equipment set up, John grabbing a No. 10 blade and slicing through the skin of the man's abdomen in one determined swipe. When John pierced the abdominal cavity itself, an ocean of blood suddenly burst out of the patient. "Crap." Blood was everywhere. The assailant's blade had gone more than a foot through the man's skin, through the fat, through the muscle, along the left of his spinal column, and right into the aorta, the main artery from the heart. "Which was crazy," John said.

Another surgeon joined to help and got a fist down on the aorta above the puncture point, stopping the bleeding. He said he hadn't seen an injury like it since Vietnam. That description was pretty close, it turned out. The other guy at the costume party, John later learned, was dressed as a soldier—with a bayonet.

John still shakes his head ruefully when he talks about the case. The patient was touch-and-go for a couple days. But he did pull through. There are a thousand ways that things can go wrong when you've got a patient with a stab wound. But everyone involved got almost every step right—from the head-to-toe examination to the placement of a catheter to make sure his urine was running clear. Except no one remembered to ask the patient or the emergency medical technicians what the weapon was. "Your mind doesn't think of a bayonet in San Francisco," John says.

DURING MY SURGICAL training, I read a short essay on the nature of human fallibility that I haven't stopped pondering since. The philosophers Samuel Gorovitz and Alasdair MacIntyre wished to describe why we fail at what we set out to do in the world. They arrived at some useful insights. One reason, they observed, is "necessary fallibility." Much of the world and the universe is—and will remain—outside of our understanding and control.

There are substantial realms, however, in which control is within our reach. We can build skyscrapers, predict snowstorms, save people from heart attacks and stab wounds. In such realms, Gorovitz and

MacIntyre point out, we have just two reasons that we may nonetheless fail.

The first is ignorance—we may err because science has given us only a partial understanding of the world and how it works. There are heart attacks we still haven't learned how to stop, skyscrapers we do not yet know how to build. The second type of failure the philosophers called ineptitude—because in these instances the knowledge exists, yet we might fail to apply it correctly.

Thinking about the bayonet story in the context of the challenges that today's doctors face, I was struck by how greatly the balance of ignorance and ineptitude has shifted in medicine. Sometime over the past several decades, science has filled in enough knowledge to make ineptitude as much our struggle as ignorance. In medicine, it is not money or the threat of malpractice lawsuits that are the source of our greatest difficulties and stresses. It is the complexity that science has dropped upon us. Consider heart attacks. Even as recently as the 1950s, we had little idea of how to prevent or treat them. Today, by contrast, if you should have a heart attack, we have a whole panel of effective therapies that can not only save your life but also limit the damage to your heart. But decisions have to be made quickly, and getting the steps right is proving brutally hard, even for those who know them.

The problem is not unique to medicine. You see it in the 36 percent increase over the past four years in lawsuits against attorneys for legal mistakes—the most common being simple administrative errors, like missed court dates. You see it in flawed software design, in foreign intelligence failures, in our tottering banks—in fact, in almost any endeavor requiring mastery of complexity and of large amounts of knowledge.

The capability of individuals in these fields does not appear to be our primary difficulty. Training in most fields is longer and more intense than ever. People spend years of 60-, 70-, 80-hour weeks building their base of knowledge and experience before going out into practice on their own—whether they are doctors or professors or lawyers or engineers.

The reason that our failures remain frequent is increasingly evident: The volume and complexity of what we know has exceeded our individual ability to deliver its benefits correctly, safely, or reliably.

That means we need a different strategy for overcoming failure, one that takes advantage of the knowledge people have, but somehow also makes up for our inevitable human inadequacies. And there is such a strategy—though it will seem almost ridiculous in its simplicity, maybe even crazy to those of us who have spent years carefully developing ever more advanced skills and technologies.

It is a checklist.

PEOPLE IN THE skyscraper-building business have long appreciated the value of checklists. Going back to medieval times, the dominant way people put up major buildings was by hiring Master Builders who designed them, engineered them, and oversaw construction from start to finish, portico to plumbing. But by the middle of the 20th century, the Master Builders were dead and gone. The variety and sophistication of advancements in the construction process had overwhelmed the abilities of any individual to master them.

At a construction site in downtown Boston, Finn O'Sullivan, a project executive, tried to explain to me one day how he and his colleagues made sure that the 250 people who were working at the site performed their tasks correctly every day, and how the 32-story office and apartment complex they were building would come together properly. But I didn't completely get his explanation until he brought me to the field office's

conference room, where several butcher-block-size checklists were hung on the walls. Looking closely, I saw that they were a day-by-day listing of every building task that needed to be accomplished, in what order, and when.

Even more impressive to me was what I learned during a tour of the unfinished skyscraper—after I noticed something that didn't look right even to my untrained eyes. The building had reached a height of only 14 stories, and on each of the upper floors large amounts of rainwater had pooled in the same place, up against the walls of the building's inner concrete core. It was as if the floors were tilted inward, like a bowl.

"Yeah, the owners saw that and they weren't too happy," Bernie Rouillard, the project's lead structural engineer, told me. He explained what he thought happened. The immense weight of the building's concrete core, combined with the particular makeup of the soil beneath it, had probably caused the core to settle, he said. Meanwhile, the outer steel frame had not yet been loaded with weight—there were still 18 stories to be built up it. Rouillard fully expected the floors to level out once the steel frame was loaded.

The fascinating thing to me wasn't Rouillard's explanation. I had no idea what to make of his answer. What struck me was learning that these kinds of complications arise regularly in construction: Large complex structures are routinely allowed to go up in the midst of our major cities even though no one person, no Master Builder, can say with absolute certainty that the structure will behave as planned. Back in the conference room, O'Sullivan showed me a different checklist—called the submittal schedule—designed to address that problem. The submittal schedule didn't specify construction tasks; it specified communication tasks. For the way project managers deal with the unexpected is by making sure experts speak to one another—on X date regarding Y process. The experts could make individual judgments, but they had to do so as part of a team that took one another's concerns into account and agreed on a way forward.

I came away from my skyscraper tour with a kind of theory: Under conditions of complexity, not only are checklists a help, they are required for success.

HAVING HIT ON this theory, I began to recognize checklists in odd corners everywhere—in airline cockpits, of course, but also in the hands of professional football coordinators, and in the kitchens of high-end restaurants. At Rialto in Boston, chef and owner Jody Adams used checklists everywhere to ensure that her staff achieved an extraordinary level of excellence every night while serving 150 people in five hours. The most basic checklists of all were the recipes—typed out, put in plastic sleeves, and placed at every station. Adams was religious about her staff's using them: Even when she is doing the cooking, she says, "following the recipe is essential to making food of consistent quality over time."

Checklists even pop up in the world of arena rock. Listening to the radio one day, I heard the story behind rocker David Lee Roth's notorious insistence that Van Halen's contracts with concert promoters contain a clause specifying that a bowl of M&M's has to be provided backstage, but with every single brown candy removed, upon pain of forfeiture of the show, with full compensation to the band. At least once, Van Halen actually followed through, peremptorily canceling a show in Colorado when Roth found some brown M&M's in his dressing room. This turned out to be, however, not another example of the insane demands of power-mad celebrities but of an ingenious ruse.

As Roth explained in his memoir, *Crazy From the Heat*, "Van Halen was the first band to take huge productions into tertiary, third-level markets. We'd pull up with nine 18-wheeler trucks, full of gear, where the standard was three trucks, max. And there were many, many technical errors—

whether it was the girders couldn't support the weight, or the flooring would sink in, or the doors weren't big enough to move the gear through. The contract rider read like a version of the Chinese Yellow Pages because there was so much equipment, and so many human beings to make it function." So just as a little test, buried somewhere in the middle of the rider, would be Article 126, the no-brown-M&M's clause. "When I would walk backstage, if I saw a brown M&M in that bowl," he wrote, "well, we'd line-check the entire production. Guaranteed you'd run into a problem." The mistakes could be life-threatening, the radio story pointed out. In Colorado, the band found that the local promoters had failed to read the weight requirements and that the staging would have fallen through the arena floor.

"David Lee Roth had a checklist!" I yelled at the radio. Everywhere I looked, in fact, the evidence seemed to point to the same conclusion. There may be no field or profession where checklists wouldn't be tremendously beneficial.

From the book *The Checklist Manifesto* ©2010 by Atul Gawande. Used with permission of Metropolitan Books, a division of Henry Holt and Co.

---