LEFT BEHIND ; THE STORIES ARE SCARY: A PATIENT FINDS THAT HIS SURGEON LEFT A SPONGE OR MAYBE A CLAMP IN HIS BODY. BUT ATUL GAWANDE IS TRYING TO WRITE HAPPIER ENDINGS.

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THE MEDICAL ISSUE Douglas Starr is codirector of The Knight Center for Science and Medical Journalism at Boston University.

DR. ATUL GAWANDE IS conducting a simulated thyroid removal at Brigham and Women's Hospital. The operation is a bloody procedure. It involves about 100 instruments and dozens of surgical sponges, small gauzelike pads used for sopping up blood. Each time Gawande asks for more sponges, the nurses count them aloud before handing them over - the standard way of keeping track of equipment to make sure nothing gets left inside the patient. Later, as he's getting ready to close, an exchange takes place that no surgeon wants to hear.

"Do you have all the sponges?" says one of the nurses. "I count 27, so three must still be in there."

"I don't see any," says the other.

"Um, keep checking."

Gawande knows what usually comes next - a frustrating process of counting and recounting to make sure nothing gets left inside the patient. Or they might have to use an X-ray to detect one of the reflective strips on each sponge. Or do a scavenger hunt inside the open cavity, pushing the organs this way and that.

Or on rare occasions - once in every 15,000 operations in the United States, according to Gawande - the patient actually goes home without anyone realizing there's a foreign object still inside him. The patient may suffer health problems for years, desperately worrying until an alert physician discovers the object. (In one case a couple of years ago, a woman set off an airport metal detector, only to find that a retractor had been left in her abdomen months before. Last month, a Boston doctor was disciplined for leaving a sponge in a patient in 2002.)

"These cases are really the worst of the worst," says Gawande, who specializes in the removal of endocrine tumors. He has also written a bestselling book, Complications: A Surgeon's Notes on an Imperfect Science, and is a staff writer at The New Yorker. "Anytime you hear that someone has left a 12-inch retractor in a patient, you think, `What kind of idiot did that?'"

But what if the surgeon wasn't an idiot - in the same way that not every pilot in a plane crash is an incompetent? That's the question that has medical experts beginning to take an engineer's view of hospitals. Rather than see them as warrens of individual doctors and nurses, the new view posits them as complicated human and mechanical systems with small, undetected flaws that can make mistakes inevitable. To borrow the airline industry's language, it isn't pilot error

that causes most mistakes, but subtle system problems instead. Gawande's simulation conforms to a growing interest in finding new ways to reduce medical errors - not by punishing doctors after the fact, but by building more safeguards into the system.

"The important question isn't how to keep bad physicians from harming patients," Gawande wrote in an essay, "When Doctors Make Mistakes," "it's how to keep good physicians from harming patients."

GAWANDE, 39, IS A TALL, loose-limbed man with dark skin, glasses, and tousled black hair. His casual good looks and genial manner put a visitor at ease, even as he chats about discomfiting topics such as colorectal cancer and ruptured appendixes. Gawande, who lives in Newton, grew up in a medical household. His parents, both from India, met during their residency in New York and then set up their practices in Athens, Ohio. He spent a good chunk of his childhood hanging around hospitals or answering emergency phone calls when his folks weren't home. Yet he never perceived medicine as a struggle - not, at least, until he began to practice it on his own. It was then, during his residency at Brigham and Women's, that he realized what a "human endeavor" medicine really is and started writing about the theme of doctor fallibility. No one who has read about the tracheotomy he once botched can help but flinch on behalf of both the patient and her doctor. It's impossible not to squirm at his self-description as a surgeon in training, fumbling to insert a central line into a patient and jabbing his collarbone with the needle instead.

"When he first approached me about writing for The New Yorker, I thought, `What a terrible idea,' " says Dr. Michael Zinner, surgeon in chief at Brigham and Women's Hospital. "Here he was going to tell everybody about the problems we have on a daily basis. But the reality is, if you don't take a look at yourself, you won't understand your problems very well."

"Physicians view this quite positively," Dr. Jeffrey Drazen, editor of The New England Journal of Medicine, says of Gawande's work. "We've gone from a culture of blame to a culture of `Let's find out what's wrong and fix it.'"

Confronting error scientifically has become a theme of Gawande's medical life as well as his writing. During his residency in the 1990s, he joined a growing number of doctors applying the tools of scientific observation to medical mistakes. Doctors have always discussed errors in their weekly hospital staff meetings - the morbidity and mortality conference, or "M&M's," in hospital parlance. Their contents have the same legal protection as the confessional. The only glimpses we get of medical error occur during the occasional well-publicized malpractice trial. And those cite only the most egregious mistakes, not the most typical.

The issue became more public, however, when in 1999 the Institute of Medicine, a branch of the National Academies of Sciences, released a report estimating that between 44,000 and 98,000 Americans died from mistakes in hospitals each year. Even at the lower rate, hospitals ranked as the eighth leading cause of death in the United States, ahead of breast cancer, auto accidents, and AIDS. The initial report indicated the scope of the problem but only broadly examined the underlying causes. Meanwhile, Gawande and other physicians kept working to expose the anatomy of mistakes. In a recent study, for example, he and colleagues interviewed 38 surgeons who knew of or had been involved in a medical error. Most errors, they found, involved a chain of events - say, a surgeon who was new to a particular procedure, combined with overworked staff and a miscommunication between surgical shifts. Analysts call that the "Swiss cheese effect," in which a lot of little things can eventually line up to cause a mistake.

To really dig down to the root of medical error, Gawande began to take a hard look at the grandfather of all mistakes - that rare but dreaded occasion when a surgeon leaves something inside a patient who's been sewn up and sent on his way. There's nothing ambiguous about such mistakes; no way you can explain around it. "It's just sloppiness," says Boston malpractice attorney Andrew Meyer. "Brain freeze."

Courts classify those mistakes as res ipsa loquitur, meaning "the thing speaks for itself."

Hospitals are defenseless against such claims and pay big and embarrassing liability settlements. More than almost any other error, that of "retained foreign bodies" prompts Gawande's question: "What kind of idiot did that?"

But he and his colleagues didn't find idiots when they analyzed 54 cases from Massachusetts teaching hospitals over the past 15 years. They found circumstances and places that contribute to mistakes. For example, patients in emergency surgery were nine times more likely to leave with retained foreign bodies than non- emergency patients undergoing the same operation. (Sponges accounted for about two-thirds of those objects.) When there was an unexpected change in procedure during surgery, patients were four times as likely to have retained foreign objects. Obese patients were twice as likely.

All of this makes sense, explains Gawande. You can see how emergency room doctors might be so busy that they'd lose track of an instrument or a sponge, or how the same might occur when an unexpected hemorrhage interrupts a routine operation. Obese people, he notes, have more flesh to obscure an instrument or surgical sponge.

Still, the system is supposed to take care of those problems. That's why nurses count all the instruments and sponges. Yet in almost 90 percent of the cases Gawande examined, the end count had, in fact, matched the one at the beginning. Something had gone wrong with the system. But what?

THE SYSTEMS APPROACH isn't new to medicine. In the 1970s, anesthesiologists, facing a malpractice insurance crisis, took a hint from the aviation and nuclear power industries and hired systems engineers to watch how they worked. The suggested changes were striking for their simplicity. Some involved designing oxygen tanks so someone couldn't accidentally shut off a patient's oxygen; others had all dials turning in the same on-off direction. Others prescribed using certain speech patterns - an element in what the airline industry calls "crew resource management" - to eliminate miscommunication. Those system tweaks caused the death rate in the United States from anesthesia to drop over the past 30 years to one- 50th of the former number.

Gradually more changes have begun to permeate hospitals. Today, if you go for shoulder surgery, for example, the surgeon will initial which shoulder to work on while you're still awake - a simple precaution that should eliminate the slightest chance of a calamity. Some hospitals have patient and doctor together go over a checklist before the operation - "like a pilot's final checklist before taking off," says Dr. John Chessare, senior vice president for medical affairs at Boston Medical Center.

Still, the operation itself remained a kind of black box to systems engineers until a group of researchers at Brigham and Women's Hospital began to open it over the past three years. Two human-factors experts - one who worked with the airline industry and another who worked with nuclear power - were recruited to team up with surgeons and observe surgeries. Collated by computer, their thousands of notations revealed patterns. Communication stood out as a problem: The team recorded "88 instances where critical information was either lost or degraded," even though no accidents occurred.

According to Dr. Caprice Christian, one of the study's authors, what surprised the group most was what it learned about the count. Nurses had to count hundreds of instruments and dozens of sponges while answering phones and handing surgeons other instruments to close up the patient. In one case, a nurse trainee became so distracted counting sponges that she handed contaminated fluid to the surgeon. (He caught it just in time.) The count, specifically designed to ensure patient safety, had become part of the problem.

GAWANDE HAD BEEN wondering if technology could help with the count and had been consulting with engineers from MIT. "For God's sake," he says, "you can't walk out of a bookstore without an alarm going off. How can a patient leave an OR with an instrument inside him?" Then a colleague pointed him to a young entrepreneur's business plan posted online. Brian Stewart of Santa Monica, California, was investing in companies making medical devices when he got into

a discussion with his surgeon father. His father had been late for a meeting with him because of a missed-sponge count following an operation. Father and son were at a grocery store when Brian Stewart, who knew nothing of the complexities of the operating theater, ridiculed the nurses who had made his father late. "I said, `What can be so hard to count to 20? You just count to 20 and then do it again.' " Just then they reached the cashier, who slid their items past a bar-code scanner. "At that point, we just looked at each other and said, `Aah.'"

The younger Stewart arranged for a company to stamp bar codes onto surgical sponges, using waterproof polymers and a complex pattern that identifies each sponge individually. He had a fabricator produce a hand-held scanner that chirps every time it registers a sponge. The scanner has a nice big display that reads: "Total IN," "Total OUT," and "Total REMAINING."

Gawande began testing the system last spring, challenging nurses to see if they could trip up the scanner. They dipped the sponges in mustard and ketchup. Finally in October, Gawande and his colleagues suited up for surgery and draped a volunteer patient for the simulated operation. Each time the nurses handed Gawande a sponge, he'd plunk it in the bowl of cough syrup and chocolate sauce to simulate blood, stool, and pus.

It seemed to go well - nurses passing sponges in front of the scanner, a reassuring bleep sounding each time. Then Gawande palmed a sponge, and a couple stuck together in a single goopy mass. That's when the nurses came up three short. But instead of counting, recounting, and searching the patient, they could see from the scanner exactly which sponges were missing and when they were scanned in. With those clues, the nurses found the missing sponges within minutes, two of which were in the garbage.

The device still needs work. Nurses had to struggle with especially goopy sponges, stretching them this way and that under the scanner - a distracting and mildly frustrating task. "The point is not to prove that this is the greatest thing that's ever been made," Gawande told them, "but to get a sense that we've got a way to take some of the dog and pony show out of the counting."

It all needs adjusting. But Gawande hopes that thousands of such tweaks - in all sorts of settings in hospitals across the country - provide engineering solutions to "idiotic" mistakes.

[Illustration]
Caption: PHOTOGRAPH BY KENT DAYTON

Abstract (Document Summary)

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