



THE VALUE OF MEDICAL TECHNOLOGY: IMPROVING PATIENT HEALTH & DELIVERING VALUE

Noel Zuniga's life was saved by innovative medical technology.

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NOEL ZUNIGA, AN AVID RUNNER AND father of three, had just gotten back from a weekend of snorkeling with his family when the heart attack hit. It was March in Panama City, where he was stationed as an NCIS agent at the U.S. embassy. Sunday night at the gym, he suddenly felt his chest light up as if on fire. A clot was choking his heart.

The cardiologists in Panama were well versed in the latest techniques. Through an artery in his leg, they snaked a tube all the way to his heart to release a dye that helped show on x-rays where the blockage was. Once the doctors found the clogged artery, they widened it with a balloon so blood could flow around the clot. A metal tube—a stent—then held the artery open. Zuniga's heart was still straining though, so up through his leg the doctors also delivered a balloon pump: a device parked just outside his heart that would beat in sync and help move blood.

Zuniga seemed stable after this, and the doctors told his wife to go and get some rest. She had barely gotten home when they called her again with crushing news. His

heart had gone into shock, and the lack of oxygen was causing his organs to fail. This was the worst-case scenario.

"They told me he had about a 20 percent chance of living," she said.

Zuniga's colleagues at the embassy made frantic calls to other cardiac experts. Professors at the University of Miami Hospital recommended a stronger pump. There was one that the FDA had approved a couple of years ago. It used a pen-cap-sized propeller that fit inside an artery and could move more than twice the amount of blood per minute that the balloon pump could. And crucially, it was tiny enough that it could snake through the same route up Zuniga's leg. No open-heart surgery was necessary. By then, Zuniga was so weak that he wasn't likely to survive a medivac flight to Miami. So the Miami team flew to Panama.

The new pump brought Zuniga back from the brink. It took over a major part of his heart's duties, giving that shaky organ a chance to rest. Stable again, Zuniga was whisked to Miami, where his heart was

deemed strong enough that the pump was taken out days later. He's now in cardiac rehab, where he's slowly returning to jogging, one of his favorite activities.

The devices that saved Noel Zuniga's life can be seen in two ways. To the doctors who worked on his case, technology saved his life. The angiograms gave them a map of where the clot was; the balloon angioplasty and stent unclogged it; and the small but powerful pump kept his blood flowing when his heart started to fail. But these same technologies have also gotten caught in the crossfire of a larger debate over how to contain health care spending.

In policy circles, medical innovation is often regarded with a certain wariness. "Technology is the primary cause of our skyrocketing health-care costs," proclaimed a September headline in MIT's Technology Review. A report from the Congressional Budget Office in 2008 advised that "future increases in spending could be moderated if costly new medical services were adopted more selectively ... and if diffusion

of existing costly services was slowed."

But innovation is a broad notion, and ill-defined on purpose. Since the costs of technology are hard to measure directly, macroeconomic studies of trends in health care spending use the "residual" method. Estimates are arrived at by subtraction. Anything that can't be accounted for by medical inflation, demographic shifts, income growth, or changes in the insurance market is said to be caused by changing technology. About half of the growth in recent health care spending is unexplained in this way. To underscore how blunt these models are, recent studies that factor in rates of obesity, diabetes, and heart disease argue that these chronic diseases account for a big chunk of the growth in health care costs—up to 30 percent.

The term "medical technology" is itself an extremely vague way to talk about the diversity of devices and diagnostics used in the health care system. The term encompasses new and existing procedures, devices, diagnostics, drugs, or even new ways to use previous-generation technologies. A closer look at specific cases and illnesses shows that while some innovations in health care—devices or other treatments—can increase health care costs, others may decrease them.

The medical device field, for instance, has seen success at lowering costs while improving effectiveness. Companies in this industry produce diagnostic machines, surgical tools, and implantables like artificial knees and hips. Since 1989, this sector has accounted for about 6 percent of health spending, with costs growing at half the rate of inflation—1.2 percent versus 2.8 percent. In other words, the price of medical devices has actually been falling in real terms.

Newer devices and the new procedures that employ them can sometimes be more expensive, but they can also save money by reducing the risk of complications and shortening the hospital stay. Endoscopic surgery is a classic example. Surgeons operate using a fiber-optic camera and tools threaded through small incisions made in the skin. The cuts are smaller, there is less scarring, and patients can go home faster, often on the same day.

The spinning pump that Zuniga had in his heart had been compared against the traditional balloon pump in a randomized trial of two hundred patients. The money saved when patients got healthier faster more than made up for the additional cost of the new device. They spent two fewer days in the hospital, and were less likely to have to go back for additional surgery.

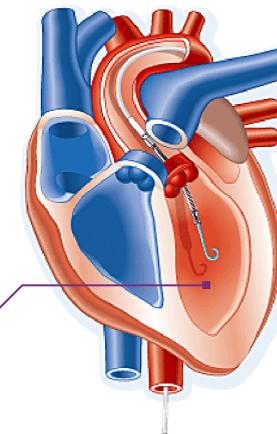
Furthermore, looking solely at the medical

costs can understate—sometimes wildly—the benefit of some of these treatments. Insulin pumps are a wearable convenience for diabetes patients that allow them to program how much insulin they get over the course of a day. Instead of having to inject themselves with three or four shots a day, patients get a smooth dose that ramps up and down. Newer devices can communicate wirelessly with implantable blood sugar meters so patients prick less and worry less about managing their disease. Studies have suggested that such technologies reduce the rate of infections and hospitalizations, but the biggest benefit is the freedom not to have to think about diabetes all the time.

Joint replacements offer a more dramatic illustration of the huge but hard-to-calculate lifestyle improvements that medical devices can provide. The costs of these procedures, which alleviate painful and often debilitating bone-on-bone grinding, can quickly add up into a statistic about how much Americans spend on healthcare. But the benefits—more working years, fewer disability payments collected, and improved quality of life—go unrecorded.

Researchers find those who receive knee replacements are healthier overall, probably because they can lead more active lives. Research indicates that, seven years after surgery, Medicare patients who receive total joint replacement run a lower risk of heart failure and mortality, as compared to osteoarthritis sufferers who do not receive total joint replacement. A recent study estimated that even when costs are counted, total knee replacements net society about \$19,000 per patient, mostly because patients can go back to work. The authors calculated that the U.S. saves \$12 billion dollars from the procedures performed in a single year. Another report from the U.K. found that in a

The pump that saved Noel Zuniga's life was snaked in through an artery in his leg. Approved by the FDA in 2008, it's among the first generation of devices that can shoulder half or more of a heart's work without requiring open-chest surgery.



A tiny motor powers this device—it's less than an inch long and thinner than a pen.

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year, hip replacement surgery allowed 11,000 people to continue working, saving the nation's welfare system \$56.5 million each year they are employed.

Diane Lancaster, a cancer survivor and grandmother of eight, understands the value of joint replacement. Lancaster had part of her knee replaced three years ago. She had always suffered from a bit of knee pain, but it had gotten progressively worse as she passed through her fifties. First she stopped running. Then she stopped going to yoga. Then she stopped doing any kind of exercise at all because of the pain. She started gaining weight. "I'm an accountant so I was lucky," she said. "I could sit at a desk for eight hours and not have to stand."

The turning point came when she found herself completely unable to walk during a family vacation to Disney World. Her grandsons had to push her around in a wheelchair so she could get to her favorite ride, Space Mountain. "They actually liked doing that," she said, but Lancaster was frustrated that she couldn't take care of herself. "When I got back I knew it was time to get the surgery because I didn't want to go through that again."

These days, Lancaster is back in the yoga studio. She no longer pops Aleve to get through the day. She is astonished to have full, pain-free range of motion in her knee again, something she had not enjoyed for decades. Lancaster said she was thinking about returning to the track soon, though perhaps not the 2-3 miles a day that was her old routine. Not yet, at least. ■