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Weighing the Costs of a CT Scan's Look Inside the Heart

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A group of cardiologists recently had a proposition for Dr. Andrew Rosenblatt, who runs a busy heart clinic in San Francisco: Would he join them in buying a CT scanner, a \$1 million machine that produces detailed images of the heart?

The scanner would give Dr. Rosenblatt a new way to look inside patients' arteries, enable his clinic to market itself as having the latest medical technology and provide extra revenue.

Although tempted, Dr. Rosenblatt was reluctant. CT scans, which are typically billed at \$500 to \$1,500, have never been proved in large medical studies to be better than older or cheaper tests. And they expose patients to large doses of radiation, equivalent to at least several hundred X-rays, creating a small but real [cancer](#) risk.

Dr. Rosenblatt worried that he and other doctors in his clinic would feel pressure to give scans to people who might not need them in order to pay for the equipment, which uses a series of X-rays to produce a composite picture of a beating heart.

"If you have ownership of the machine," he later recalled, "you're going to want to utilize the machine." He said no to the offer.

And yet, more than 1,000 other cardiologists and [hospitals](#) have installed CT scanners like the one Dr. Rosenblatt turned down. Many are promoting heart scans to patients with radio, Internet and newspaper ads. Time magazine and [Oprah Winfrey](#) have also extolled the scans, which were given to more than 150,000 people in this country last year at a cost exceeding \$100 million. Their use is expected to soar through the next decade. But there is scant evidence that the scans benefit most patients.

Increasing use of the scans, formally known as CT angiograms, is part of a much larger trend in American medicine. A faith in innovation, often driven by financial incentives, encourages American doctors and hospitals to adopt new technologies even without proof that they work better than older techniques. Patient advocacy groups and some doctors are clamoring for such evidence. But the story of the CT [angiogram](#) is a sobering reminder of the forces that overwhelm such efforts, making it very difficult to rein in a new technology long enough to determine whether its benefits are worth its costs.

Some medical experts say the American devotion to the newest, most expensive technology is an important reason that the United States spends much more on health care than other industrialized nations — more than \$2.2 trillion in 2007, an estimated \$7,500 a person, about twice the average in other countries — without providing better care.

No one knows exactly how much money is spent on unnecessary care. But a Rand Corporation study

estimated that one-third or more of the care that patients in this country receive could be of little value. If that is so, hundreds of billions of dollars each year are being wasted on superfluous treatments.

At a time when Americans are being forced to pay a growing share of their medical bills and when access to medical care has become a major political issue for states, Congress and the presidential candidates, health care experts say it will be far harder to hold down premiums and expand insurance coverage unless money is spent more wisely.

The problem is not that newer treatments never work. It is that once they become available, they are often used indiscriminately, in the absence of studies to determine which patients they will benefit.

Some new treatments, like the cancer drug Gleevec and implantable heart [defibrillators](#), undoubtedly save lives, contributing to the United States' reputation for medical breakthroughs. But others — like artificial spinal disks, which can cost tens of thousands of dollars to implant but have not been shown to reduce back pain in many patients, and Vytorin, a new [cholesterol](#) drug that costs 20 times as much as older medicines but has not been proved superior — have been criticized for not justifying their costs.

And sometimes, the new technologies prove harmful. Physicians were stunned, for example, when clinical trials showed last year that expensive [anemia](#) medicines might actually hasten death in kidney and cancer patients. Such drugs are used more widely in the United States than elsewhere.

“We have too many situations where we thought we knew what the answer was and it didn't turn out like everyone thought,” said Dr. Mark Hlatky, a cardiologist and professor of health research and policy at [Stanford University](#).

A Tool of Dubious Value

The problem of inadequate study is especially serious for medical devices and imaging equipment like scanners, which typically are not as strictly regulated as prescription drugs. Under [Food and Drug Administration](#) regulations, the makers of CT scanners — CT is short for computed tomography — do not have to conduct studies to prove that their products benefit patients, as drug makers do. The manufacturers must certify only that the scanners are safe and provide accurate images.

Once the F.D.A. approves a test or device, [Medicare](#) rarely demands evidence that it benefits patients before agreeing to pay for it. But last year, Medicare officials raised questions about the benefits of CT heart scans and said it would demand more studies before paying for them. But after heavy lobbying by cardiologists, Medicare backed down. Private insurers, while initially reluctant to pay for the tests, are also covering them.

Physicians in this country have a free hand in deciding when to use new technology like CT angiography. Some are conservative. But others, especially doctors in private practice who own their scanners, use the tests aggressively.

Douglas Ring, a 63-year-old Los Angeles real estate developer, said he received a CT heart scan in October 2005, on the advice of Dr. Ronald P. Karlsberg, a Beverly Hills cardiologist. “Ron has been my physician for 15 or 20 years, and he got this new toy in his office, and he said I should try it,” Mr. Ring said. He took the test despite having no symptoms of heart disease, like [shortness of breath](#) and [chest pain](#). He was already

taking cholesterol medicine, and a different test had shown no problems with his heart.

The CT heart scan by Dr. Karlsberg found a moderate buildup of plaque in one of Mr. Ring's coronary arteries. The doctor increased Mr. Ring's cholesterol medicines and encouraged him to [diet](#) and exercise.

Dr. Karlsberg said he considered the information from Mr. Ring's [CT scan](#) extremely valuable. "Here's a case of near-serious coronary disease that required medical management," said Dr. Karlsberg, a partner at the Cardiovascular Medical Group of Southern California, which conducted about 1,400 CT heart scans last year.

Many other cardiologists, though, say patients like Mr. Ring do not benefit from CT scans. And by the time they are 50, most people will have plaque visible on a CT scan, so the findings of Mr. Ring's scan were not surprising.

Arteries narrowed by plaque are not necessarily a threat, said Dr. Eric Topol, a practicing cardiologist and director of the Scripps Translational Science Institute in La Jolla, Calif. The danger arises when bits of plaque break and produce a clot that blocks blood to the heart. But CT angiograms cannot tell whether a particular blockage is likely to rupture or, except in extreme cases, is keeping the heart from receiving enough blood.

If doctors do choose to treat blockages, they can insert [stents](#) — small metal scaffolds that prop open arteries. But while stents have been proved to reduce chest pain, they have not been shown to prolong patients' lives or help them avoid heart attacks. Patients with the most severe blockages can receive bypass surgery, which when necessary can be a lifesaving procedure.

And so patients who do not have chest pain, like Mr. Ring, should not receive CT heart scans, said Dr. Rita Redberg, a cardiologist and researcher at the University of California, San Francisco, who is a leading critic of the scans.

"No data suggests that there's any reason for anyone asymptomatic to have a test," she said. "There certainly is this idea that having a test can help you prevent a [heart attack](#), and I don't know where it came from."

Further, each scan creates an additional lifetime risk of cancer that is somewhere between 1 in 200 and 1 in 5,000, said Dr. David J. Brenner, director of the Center for Radiological Research at [Columbia University](#). Younger patients and women are at higher risk.

Dr. Karlsberg and other cardiologists who support widespread use of CT heart scans argue that they can reduce the need for other tests — like conventional angiograms, which can find plaque but require a catheter to be threaded through the arteries. Conventional angiograms are more expensive than CT scans and carry their own risks.

If a CT heart scan finds plaque that a doctor intends to treat with a [stent](#), a conventional angiogram will still be necessary to determine where and how to implant the stent. So a CT scan does not always eliminate the need for a conventional angiogram.

The most valuable use of a CT angiogram may be when a patient comes to an emergency room complaining of chest pains but has few other symptoms of a heart attack. The test can quickly rule out heart trouble. But

such patients represent a minority of those receiving CT heart scans.

Dr. Karlsberg also pointed to the case of a seemingly healthy 68-year-old patient whom he scanned in his office in 2006. To the shock of both doctor and patient, the scan revealed a 95 percent blockage of the patient's main coronary artery. The patient had immediate bypass surgery to relieve the blockage, an operation that may have saved his life, Dr. Karlsberg said. The man, who cited privacy concerns in asking that his name not be used, confirmed the doctor's account.

Cardiologists who oppose wide use of the scans agree that they can sometimes find dangerous blockages that require immediate surgery in asymptomatic patients. But they said such cases are extremely rare — not common enough to justify using the scans routinely, given their cost and radiation risks.

For too many people, the scans are simply inappropriate, said Dr. Howard C. Herrmann, director of interventional cardiology at the [University of Pennsylvania](#). "I find many patients have CT angiograms who shouldn't be getting CT angiograms."

As more than 13,000 heart doctors gathered in Chicago in late March for the annual American College of Cardiology conference, the biggest and best-located booths belonged to [General Electric](#), [Philips Electronics](#), Siemens and Toshiba, the leading makers of the machines used for CT angiograms.

Cardiologists hired by the companies offered short briefings on ways to reduce radiation doses, while sales representatives in business suits quietly talked up the benefits of the scans and the clarity of the images. The sales atmosphere was low key, more art gallery than "Glengarry Glen Ross."

A hard sell is unnecessary because the manufacturers are finding a receptive audience. Many cardiologists have been eager for a new tool that lets them see inside the heart with unprecedented clarity — while also providing a new source of revenue.

Use of CT scans accelerated after 2004, when manufacturers introduced a new generation called 64-slice scanners, which are fast enough to capture images of a beating heart. The scanners fire X-rays in a series of rotations around the torso, generating thousands of narrow vertical images. Sophisticated software then combines data from the X-rays into a single image.

The Financial Incentives

Already, more than 1,000 hospitals and an estimated 100 private cardiology practices own or lease the \$1 million CT scanners, which can be used for the angiograms and for other imaging procedures. Once they have made that investment, doctors and hospitals have every incentive to use the machines as often as feasible. To pay off a scanner, doctors need to conduct about 3,000 tests, industry consultants say.

Fees from imaging have become a significant part of cardiologists' income — accounting for half or more of the \$400,000 or so that cardiologists typically make in this country, said Jean M. Mitchell, an economist at [Georgetown University](#) who studies the way financial incentives influence doctors.

Besides generating profits themselves, the scans enable cardiologists to find blockages in patients who have no symptoms of heart problems. Doctors can then place stents in patients who would not otherwise have received them, generating additional revenue of \$7,500 to \$20,000 per patient.

While clinical trials have not shown that stents benefit patients with no symptoms of heart disease, they are still routinely inserted in such patients when tests find significant blockages. Cardiologists joke that the phenomenon is “ocular stenosis” — blockages that can be seen are stented.

“You find a lot of asymptomatic disease,” said John O. Goodman, a business consultant to cardiologists. “It will put more patients in the cath lab” — medical shorthand for a [cardiac catheterization](#) laboratory, where conventional angiograms and stenting procedures take place.

Ms. Mitchell said cardiologists simply practice medicine the way the health system rewards them to. Given the opportunity to recommend a test for which they will make money, the doctors will.

“This is not greed,” she said. “This is normal economic behavior.”

Doctors who perform a lot of CT heart scans tend to be evangelists for the technology. Dr. John A. Osborne, a cardiologist in solo practice in Grapevine, Tex., just outside Dallas, argues that CT angiograms catch heart disease at its earliest stages. His Web site, [sothcardiology.com](#), states the proposition in stark terms: “Half of Americans have died of heart attacks and strokes. Which one are you?”

Supported by a staff of about 20 people, Dr. Osborne estimates that he does 15 CT angiograms a day. Arterial plaque is “cancer of the coronaries,” he tells patients. “Do you have it or not?”

Before their plaque creates symptoms, Dr. Osborne asserts, patients should be aggressively treated, urged to diet and exercise and given cholesterol-lowering and other drugs.

Scans ‘Sell Themselves’

Like many cardiologists who perform CT scans, Dr. Osborne relies on primary-care doctors to send him candidates. He frequently gives lectures to primary-care doctors on the technology’s benefits. When doctors see the images, he said, “they become true believers.”

Two years ago, Dr. Osborne persuaded a family practice doctor, Dr. Michael Dotti, to have his own CT angiogram at no cost. Dr. Dotti was amazed at the scan’s ability to spot early signs of disease. “It’s nice to know I have clear arteries at 51,” he said. “The scans sort of sell themselves.”

The technology has been covered in the news media, including a September 2005 Time magazine cover on CT angiograms, “How New Heart-Scanning Technology Could Save Your Life.” The following month, Oprah Winfrey devoted a segment of her television program to women’s heart disease and recommended that her viewers consider taking the test. Representatives for Time and Ms. Winfrey declined to comment on their coverage of the technology.

Even cardiologists who think the CT scans are overused say they may one day prove valuable. If manufacturers can produce scanners that can determine which plaques are stable and which are likely to rupture, the machines could revolutionize the treatment of heart disease. Patients found to be at low risk might be able to avoid taking medicine entirely, while others would be given intensive treatment.

But for now, doctors cannot use the images that way. Finding out whether the heart is actually short of blood and at high risk for an attack requires tests other than a CT scan — most likely, a nuclear [stress](#) test, which

uses radioactive dye to track blood flow through the coronary arteries.

The CT angiogram is “a great technology searching for a great application,” said Dr. Charanjit S. Rihal, the director of the cardiac catheterization laboratory at the [Mayo Clinic](#) in Rochester, Minn., who sees little diagnostic value in the current generation of heart scanners.

CareCore National, a Bluffton, S.C., company that reviews treatment and test requests for health insurers, has found that when doctors request a CT angiogram for a patient, they also frequently ask for a nuclear stress test.

“We’re seeing layering of tests on top of each other,” said Dr. Russell Amico, a CareCore executive. His company denies as many as 70 percent of the CT scans requested, a much higher rate of rejection than for other kinds of tests his company reviews.

Impatient Patients

Sometimes, it is not the doctor but the patient who is eager for the scan. On a recent Wednesday morning on the Upper East Side of Manhattan, Dr. Harvey Hecht at Lenox Hill Hospital watched from a lead-shielded control room as a 59-year-old patient, Robert Franks, underwent a CT angiogram.

Mr. Franks has a family history of cardiac disease, and his father and two uncles died of heart attacks. But Mr. Franks, director of corporate security for Time Inc., is in excellent shape. He works out daily and takes two cholesterol-lowering medicines. The drugs have reduced his LDL, or bad, cholesterol to 60, a remarkably low level.

Nonetheless, in February, Mr. Franks took a test called a [calcium](#) score, which measures the amount of calcified plaque in the arteries. The test, a less extensive form of scanning, revealed a moderate buildup of calcium in his arteries, a potential sign of heart disease.

So he decided to have a nuclear stress test. When that test showed no problem, the cardiologist who conducted it said he did not need more testing.

But Mr. Franks was still not satisfied. “I’m someone who wants to know,” he said.

After doing research on the Internet, he found Dr. Hecht, who recommended a CT angiogram. Dr. Hecht acknowledged that Mr. Franks probably did not have severe heart disease. But he said the scan would be valuable anyway because it might reassure him. And his insurance would cover the cost.

A CT scanner is 8 feet high by 8 feet wide and 2 feet deep, with a doughnut-shaped hole at its center. Wearing a hospital gown, Mr. Franks lay on a table attached to the machine and was injected with a drug to lower his [heart rate](#), along with a contrast dye to improve the quality of the images from the test. (Mr. Franks later compared the warmth he felt after the injection of the dye to “the first sip of a well-blended martini.”)

In the control room, Salvatore Fevola, the manager of the CT scanning equipment at Lenox Hill, instructed Mr. Franks, who was raising his hands over his head, to hold his breath as the table moved through the machine.

Twelve seconds later, the test was complete, and the machine's software began to assemble information from thousands of images into a single coherent picture of Mr. Franks's heart.

A few minutes later, Dr. Hecht studied the results. As he had expected, the angiogram revealed that Mr. Franks's arteries were healthy. In some places, plaque had blocked 25 percent of their blood flow, but in general, cardiologists do not consider blockages clinically relevant until they reduce blood flow at least 70 percent.

After Mr. Franks finished dressing, he joined Dr. Hecht, who went over the results, explaining that his heart appeared healthy and that he would not need a stent. Still, Dr. Hecht recommended that Mr. Franks have another CT angiogram next year to check that the plaque was not thickening. Mr. Franks agreed, pronounced himself satisfied and left.

For Mr. Franks, the test was quick and painless. But it subjected him to a significant dose of radiation.

Based on a reporter's notes about the duration of the scan and the power output reported by the scanner, Dr. Brenner of the Center for Radiological Research estimated that Mr. Franks had received 21 millisieverts of radiation — even more than a typical test, equal to about 1,050 conventional chest X-rays.

Given the radiation risks, Dr. Ralph Brindis, another cardiologist, said Dr. Hecht had erred. Because Mr. Franks had already taken a nuclear stress test with normal results, he did not need a CT angiogram, said Dr. Brindis, vice president of the American College of Cardiology. And particularly because the scan's results were benign, he said, Dr. Hecht should not have recommended a follow-up test.

"The biggest problem we have with radiation is that the doses are cumulative and additive," Dr. Brindis said. "So the concept of doing serial CT testing on asymptomatic patients, I think, is abhorrent. I cannot justify that."

Dr. Hecht said he sharply disagreed with Dr. Brindis. The scan was appropriate for Mr. Franks, despite his normal results from the nuclear stress test, because of Mr. Franks's other risk factors for heart disease, including his higher-than-average calcium score, Dr. Hecht said. And he said he recommended a follow-up scan next year so he could see how quickly the plaque in Mr. Franks's arteries was thickening.

Otherwise, "how do we know that our therapy is effective?" Dr. Hecht said. He acknowledged that many cardiologists do not favor repeat scans but said long-term radiation risks were a relatively minor issue for patients 60 and older.

Cardiologists like Dr. Brindis hurt their patients by being overly conservative and setting unrealistic standards for the use of new technology, Dr. Hecht said.

"It's incumbent on the community to dispense with the need for evidence-based medicine," he said. "Thousands of people are dying unnecessarily."

Medicare's Scrutiny

The Centers for Medicare and [Medicaid](#) Services had decided to push back.

The agency, which this year will spend more than \$800 billion on health care, rarely questions the need to pay for new treatments. But last June, Medicare said it was considering paying for CT heart scans only on the condition that studies be done to show they had value for patients.

Concerned about the overall proliferation of imaging tests, Medicare said it might require a large-scale study to determine the scans' value.

The plan met with fierce resistance, particularly from a relatively new organization of specialists, the Society of Cardiovascular Computed Tomography. The society has 4,700 physician members and one purpose — to promote CT angiograms.

“For the CT society, this was life or death,” said Dr. Daniel S. Berman, the group’s president-elect. “This decision could essentially put them out of business.”

Galvanized, at a meeting in November in Chicago, the CT specialists vowed to overturn any possible Medicare proposal.

“We didn’t need to be talking about registries and the research,” Dr. Berman said. “We needed to be questioning the wisdom of the Medicare decision itself.”

The next month, Medicare issued the draft of its proposal, saying that it would pay for the scans only if a large-scale study were conducted. The CT society, along with other prominent medical groups whose members performed scans, set to work lobbying the agency and members of Congress.

One group marshaled the evidence the doctors would take to Medicare, arguing that the agency had ignored some studies, including those of the new 64-slice CT scans. Another group visited Congressional offices. Defenders of the technology argued that Medicare had agreed to pay for other tests, like [mammograms](#), without requiring proof that they improved patient care. Breakthrough technologies, they said, need time to prove themselves.

Medicare “set the bar so high, no new technology would be able to survive,” said Dr. Michael Poon, a New York cardiologist who is the CT society’s current president.

Cardiologists met with Representative [Carolyn McCarthy](#), a New York Democrat. In March, she and other members of Congress wrote to Medicare, urging it to reconsider its plan. Eventually, a dozen or so senators and 79 representatives lined up to support the society’s efforts.

And Medicare gave way.

“There are a lot of technologies, services and treatments that have not been unequivocally shown to improve health outcomes in a definitive manner,” Dr. Barry Straube, Medicare’s chief medical officer, explained when announcing that the agency would keep covering the tests.

In other words, the lack of evidence that the CT scans provide measurable medical benefit would not stop Medicare from paying for them.

Heavy lobbying makes it virtually impossible for the agency to insist on more evidence before agreeing to

pay for a new technology, said Dr. James Adamson, chief medical officer for Arkansas Blue Cross and Blue Shield. "Medicare," he said, "does not make a lot of really hard decisions."

In a subsequent interview, Marcel Salive, a Medicare official, said the agency still hoped for large-scale studies to demonstrate the value of CT scans.

The technology's proponents say they understand the need to prove its value. "It's incumbent on us to do more work," said Gene Saragnese, vice president for molecular imaging and CT at General Electric.

Doctors are also discussing the creation of registries to track patients who have had CT angiograms. But now that Medicare has backed down, skeptics say it is unlikely that anyone will conduct a major clinical trial to determine if patients who receive CT heart scans have better medical outcomes than those who do not.

"It's clearly going to be much more difficult, given the Medicare decision," said Dr. Sean Tunis, a former Medicare official who directs the Center for Medical Technology Policy, a nonprofit group.

Industry consultants say that now that Medicare has agreed to pay for the tests, resistance among commercial insurers is likely to disappear. "I believe the holdouts will be paying within 12 months," said Michelle Boston, the chief executive of Partners Imaging, a Dallas company that works with doctors to offer CT scans.

And so CT angiograms seem destined to continue, in ever greater numbers. "Once the train leaves the station, once the technology gets on the marketplace, we don't get the evidence," said Dr. Redberg, the University of California, San Francisco, cardiologist. "We're spending a lot of money on technology of unclear benefit and risk."

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