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Hospitals Look to Nuclear Tool to Fight Cancer



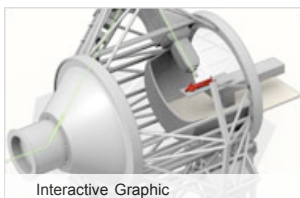
Marissa Roth for The New York Times

Harold Phillips undergoing treatment for prostate cancer in one of the treatment rooms at Loma Linda Medical Center in Loma Linda, Calif.

By ANDREW POLLACK Published: December 26, 2007

There is a new nuclear arms race under way — in hospitals.

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Pummeling Cancer With Protons

Medical centers are rushing to turn nuclear particle accelerators, formerly used only for exotic physics research, into the latest weapons against cancer.

Some experts say the push reflects the best and worst of the nation's market-based health care system, which tends to pursue the latest, most expensive treatments — without much evidence of improved health — even as soaring costs add to the nation's economic burden.

The machines accelerate protons to nearly the speed of light and shoot them into tumors. Scientists say proton beams are more precise than the X-rays now typically used for radiation therapy, meaning fewer side effects from stray radiation and, possibly, a higher cure rate.

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In Loma Linda Medical Center's fixed beam treatment room, where brain and eye tumors are treated, a machine is readied for a patient. The patient's head will be immobilized by the mask at left.

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Marissa Roth for The New York Times

Pete Freeman prepares for treatment for prostate cancer in a fixed beam room at Loma Linda Medical Center in Loma Linda, Calif.

But a 222-ton accelerator — and a building the size of a football field with walls up to 18-feet thick in which to house it — can cost more than \$100 million. That makes a proton center, in the words of one equipment vendor, “the world’s most expensive and complex medical device.”

Until 2000, the United States had only one hospital-based proton therapy center. Now there are five, with more than a dozen others announced. Still more are under consideration.

Some experts say there is a vast need for more proton centers. But others contend that an arms race mentality has taken hold, as medical centers try to be first to take advantage of the prestige — and the profits — a proton site could provide.

“I’m fascinated and horrified by the way it’s developing,” said Dr. Anthony L. Zietman, a radiation oncologist at Harvard and [Massachusetts General Hospital](#), which operates a proton center. “This is the dark side of American medicine.”

Once hospitals have made such a huge investment, experts like Dr. Zietman say, doctors will be under pressure to guide patients toward proton therapy when a less costly alternative might suffice.

Similar cost concerns were expressed in the past about other new technology like [M.R.I.](#) scanners. While those have become accepted staples of medical practice, there is still concern about their overuse and the impact on medical spending.

Dr. Zietman said that while protons were vital in treating certain rare tumors, they were little better than the latest [X-ray](#) technology in dealing with [prostate cancer](#), the common disease that many proton centers are counting on for business.

“You can scarcely tell the difference between them except in price,” he said. [Medicare](#) pays about \$50,000 to treat prostate cancer with protons, almost twice as much as with X-rays.

Proponents, however, are adamant that proton centers provide better treatment.

“It all comes down to the physics,” said Dr. Jerry D. Slater, the head of radiation medicine at Loma Linda University Medical Center in Southern California. “Every X-ray beam I use puts most of the dose where I don’t want it.” By contrast, he said, proton beams put most of the dose in the [tumor](#).

Loma Linda built the nation’s first hospital-based proton center in 1990 and has treated about 13,000 patients. Its success has inspired others.

Companies have sprung up to help finance, build and operate the proton centers. In some cases, local and state governments, seeking to attract medical tourists, have chipped in. Such financing is allowing proton centers to be built by community hospitals or groups of physicians.



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One of the biggest and most costly projects, with a bill exceeding \$140 million, is being undertaken by Hampton University in Virginia, a historically black college that does not have a medical school.

“Here at Hampton we dream no small dreams,” said William R. Harvey, the president. He said a proton center would help African-Americans, who have higher rates of some cancers than whites. And he said a medical school was not needed — that doctors would be hired to run the outpatient center.

Some of the planned centers will be very close together, raising the odds of overcapacity. Two proton centers are planned for Oklahoma City, for example, and two more in the western suburbs of Chicago.

The institutions building the centers say there is a need for many more of them. The existing centers, which collectively can treat only several thousand patients a year, are turning people away. And patients who are accepted often have to spend weeks in a city far from their homes.

Proponents say that more than 800,000 Americans — representing nearly two-thirds of new cancer cases — undergo radiation therapy each year. If only 250,000 of them could benefit from protons, they would fill more than 100 centers.

“If they built one across the street I wouldn’t worry about it,” said James D. Cox, chief of radiation oncology at the M. D. Anderson Cancer Center in Houston, which opened a \$125 million proton center last year.

X-rays, which are high-energy electromagnetic waves, pass through the body, depositing their energy all along the way, not just in the tumor. By contrast, protons — subatomic particles with a positive electrical charge — can be made to stop on the tumor and dump most of their payload there.

Tumors in or near the eye, for instance, can be eradicated by protons without destroying vision or irradiating the brain. Protons are also valuable for treating tumors in brains, necks and spines, and tumors in children, who are especially sensitive to the side effects of radiation.

When 10-year-old Brooke Bemont was about to undergo X-ray treatment for a [brain tumor](#) last summer, a doctor warned her mother, “Do not plan on your daughter ever going to Harvard.” The radiation would damage Brooke’s mental capacity, she said.

So the family, from St. Charles, Ill., spent five weeks in Boston as Brooke was treated with protons at Massachusetts General Hospital Cancer Center. “If there was a potential to save even a little of her brain tissue, there was no question that we would do it,” said Christal Bemont, Brooke’s mother. She added that Brooke was now apparently cancer-free and doing fairly well.

Head, spine and childhood cancers are rare, though. Most people undergoing proton treatment are men with localized prostate cancer.

Proton therapy can help avoid the worst side effects, like [impotence](#), by exposing the bladder and rectum of a prostate patient to less radiation than X-rays. The stray radiation, though, from the newest form of X-rays, called intensity-modulated radiation therapy, is already low, diminishing any advantages from proton therapy.

“There are no solid clinical data that protons are better” said Dr. Theodore S. Lawrence, the chairman of radiation oncology at the [University of Michigan](#). “If you are going to spend a lot more money, you want to make sure the patient can detect an improvement,

not just a theoretical improvement.”

An economic analysis by researchers at Fox Chase Cancer Center in Philadelphia found that proton treatment would be cost-effective for only a small subset of prostate cancer patients.

Lack of data aside, men are flocking to proton treatment.

“I’m 67 years old, and the last thing I want to do is wear a diaper for the rest of my life,” said Pete Freeman of Spokane, Wash., who was undergoing treatment at Loma Linda.

Some men hear about proton therapy from the Brotherhood of the Balloon, a group of 3,000 men who have had the treatment. (A balloon is inserted into the rectum and filled with water to immobilize the prostate during treatment.)

The organization, which now gets some financial support from Loma Linda, was founded by Robert J. Marckini, a former Loma Linda patient who calls himself Proton Bob.

At Loma Linda, prostate cancer treatment requires about two months of daily sessions. The actual irradiation, which the patient does not feel, takes only about a minute. Most men with early prostate cancer have no symptoms from their disease and many say the treatment has few immediate side effects, other than fatigue and an urgency to urinate.

“We go have our treatments, and we go out and play golf,” said Harold J. Phillips, an accountant from Tacoma who was being treated recently at Loma Linda.

Doctors are also learning how to use protons to treat lung and [breast cancer](#). And over time, doctors say, costs should come down as the technology improves and it becomes more routine to build and operate proton centers. One company is trying to develop a \$20 million proton system and has received orders from several hospitals.

On the horizon is therapy using beams of carbon ions, which are said to be even more powerful in killing tumors. Touro University says it will build a combined proton and carbon therapy center outside San Francisco, to open as early as 2011. The [Mayo Clinic](#) is also seriously considering one. Such centers will cost even more — as much as \$300 million.

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