Overcoming Barriers to FDG-PET Imaging in Fargo, North Dakota

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The use of positron emission tomography (PET) to detect and stage disease or monitor therapy for certain cancers is increasing. The predominant tumor imaged by PET centers is non-small cell lung cancer, because PET can characterize indeterminate pulmonary nodules and help stage this cancer. Furthermore, PET imaging with fluorine-18-labeled fluorodeoxyglucose (18F-FDG) has been shown to be accurate for diagnosing cancer of the brain, and head and neck. Despite these benefits, a number of barriers have slowed the widespread use of FDG-PET. First, dedicated PET equipment is expensive, limiting the technology to major research institutions in large cities. Second, introducing FDG-PET into a facility requires extensive planning, including facility renovation and additional education for staff. Finally, radiology and oncology providers often must battle insurance companies to obtain reimbursement for FDG-PET services.

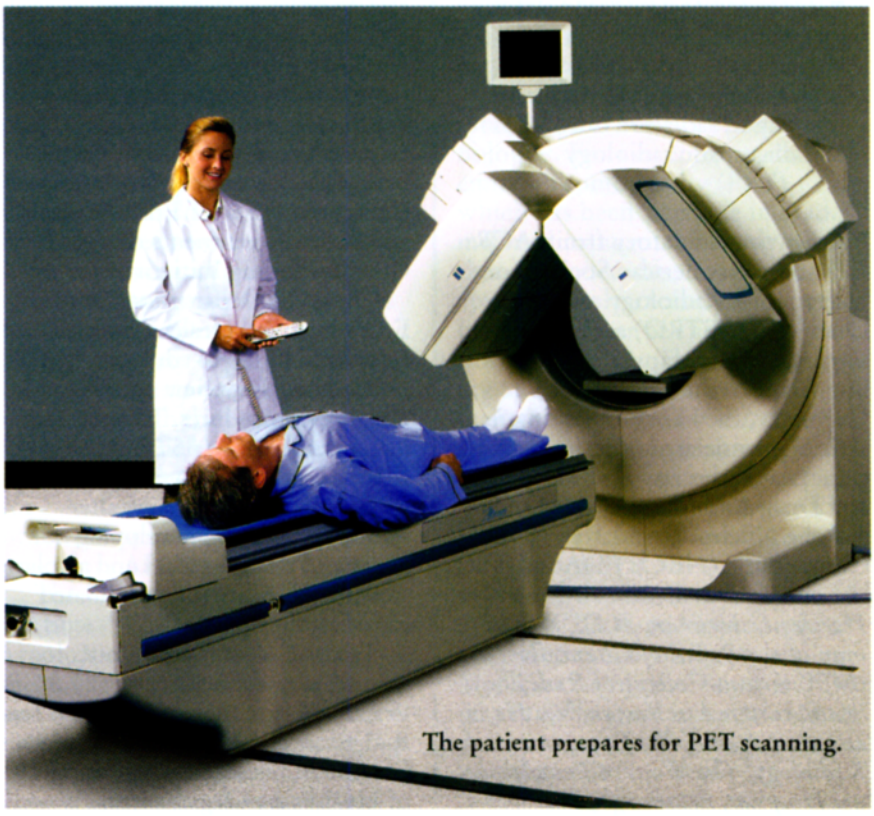
These obstacles would seem to make MeritCare Medical, a 350-bed nonprofit hospital in Fargo, N.D., an unlikely provider of FDG-PET imaging. With diligence, however, our staff was able to overcome these barriers and introduce the technology to North Dakota patients in 1999. Here's how we did it.

Equipment. Conventional PET imaging centers have a dedicated scanner and a cyclotron to produce radionuclides. Establishing such a center is expensive, with the PET scanner averaging $2 million and the cyclotron adding another $2 million.

Fortunately, "hybrid" systems have been developed that use modified dual-headed coincidence gamma cameras with a special crystal attachment. These hybrid systems cost $500,000 to $750,000, putting PET technology within reach for smaller institutions. At MeritCare Medical, we installed a Picker/Marconi dual-head Axis gamma camera with a five-eighth inch crystal. Although image clarity is not identical to that obtained with a dedicated PET scanner, hybrid systems are highly sensitive and can provide data unobtainable with other imaging techniques such as CT, MRI, or ultrasound.

For facilities that cannot produce their own radiopharmaceuticals, the FDG isotope is available from companies such as PETNet, which operates 14 distribution centers in the United States. Because FDG has a half-life of only 102 minutes, the isotope must be received in a timely manner. Our institution obtains FDG from the PETNet facility in Omaha, Nebr., hiring charter pilots to transport the doses to Fargo.

Although this system works well, we have run into obstacles. Occasionally, a pilot has refused to fly with the radioactive material. Other times, flights have been grounded due to stormy weather.



The patient prepares for PET scanning.

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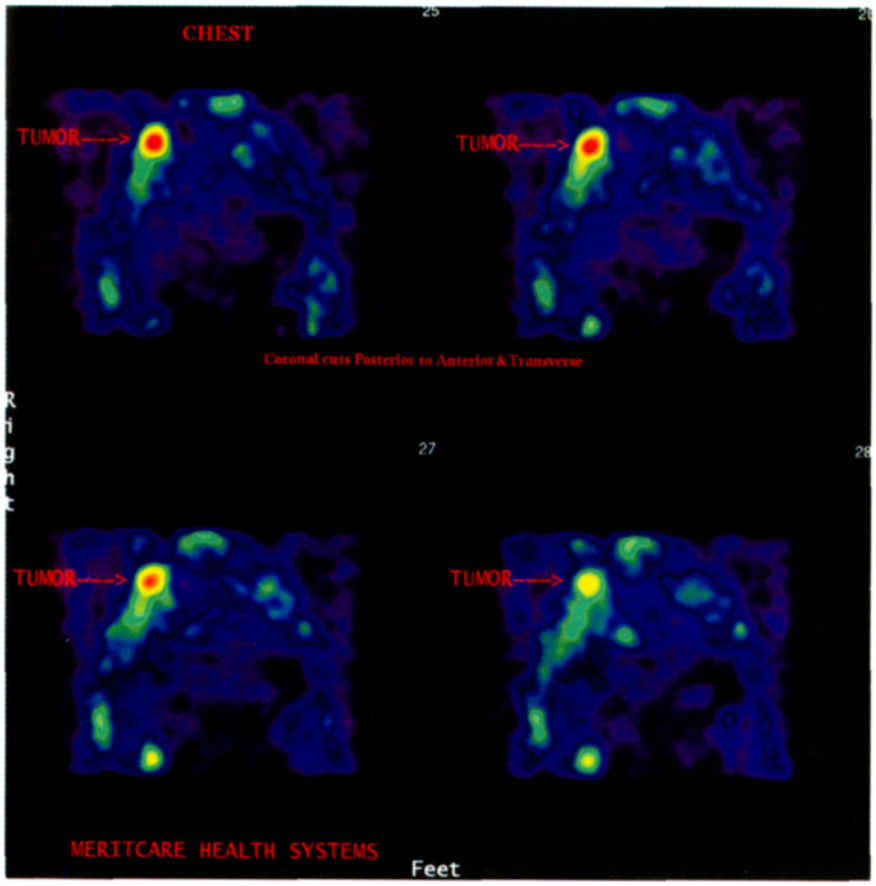

This PET image is a coronal view of a 62-year old female. She presented in the ER for right-sided chest and shoulder pain. She said that the pain started in the back of her right shoulder and radiated around to her right chest. The pain became worse with a deep breath and with certain movements.

A chest X-ray was ordered, which showed a lesion in the right superior lung. A CT scan showed two focal abnormalities in the right upper lobe. Although the lower one was unchanged when compared to a CT study done in 1997, the upper one had increased significantly in size. The edges were somewhat indistinct. It appeared that two blood vessels might be extending into this area. The two etiologies for consideration were 1) a vascular abnormality, which had bled and caused the chest pain, or 2) a possible neoplastic process.

An FDG PET scan was performed to distinguish between the two etiologies. The scan showed intense fluorodeoxyglucose uptake within the right upper lobe mass, highly consistent with malignancy. No other physiologic uptake was present in the brain or abdomen. Because only one lesion was found, this patient was scheduled for resection and has a high probability of cure.

If a flight is delayed, the doses arrive decayed or expired, and procedures must be rescheduled. PETNet plans to open additional distribution centers in the future, which may alleviate some of these problems.

Planning and personnel. Introduction of FDG-PET into a facility requires meticulous planning. At MeritCare, the first item that needed attention was asking the state to amend our radioactive material license to allow us to use 18F-FDG. Several months were required to change the license, frustrating physicians and patients who were counting on FDG-PET to proceed with their treatment plans.

We also had to implement new radiation safety precautions. The exposure rate of 10 millicurie (mCi) of 18F-FDG is approximately seven times greater than that of 10 mCi of Tc 99m at a distance of eight inches. To protect the public and personnel from sources of radioactivity, our nuclear medicine department had to modify its barriers and shielding. We added two inches of lead around the dose calibration well and L-block shield, and we purchased larger shields specifically designed for high-energy PET radiopharmaceuticals.

Once the department was ready, we had to ensure that staff members were ready as well. Additional training was provided to ensure that the nuclear medicine technologists minimized patient-contact time after dose administration, maximized distance from high radiation sources, and properly used available shielding. Training materials were difficult to find. Much information is available on the operation of dedicated PET cameras, but not on hybrid systems. In addition, image samples and proper filter and processing parameters were hard to locate as well. Fortunately, as the use of FDG-PET imaging has spread, the number of training materials has increased as well.

Reimbursement. We quickly learned that providers of FDG-PET services must be resourceful when seeking reimbursement. Because PET is still considered investigative by many insurers, we go through a lengthy pre-approval process for most studies. MeritCare's staff has found that educating the insurance companies is the key to success. Although time-consuming, informing third-party payers about the effectiveness of FDG-PET has resulted in fewer of our studies being denied.

Researchers continue to find new uses for PET technology. Modified PET scanners have reduced the cost of the procedure, and more radioisotope distribution centers are opening. What's more, insurers are becoming familiar with the procedure's benefits. We look forward to the day when FDG-PET imaging is available at facilities throughout the country, improving the care that patients receive.