

## Scanning technology on surgery's cutting edge

Abbott Northwestern unveils a \$9 million operating room with an MRI that guides brain surgeons in mid-operation.

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It's like a scene from a James Bond movie. In a room with gleaming steel walls, double doors slide open to reveal a doughnut-shaped machine large enough to engulf a person. People start backing away. The machine advances smoothly on ceiling tracks until it starts to swallow the top half of the young woman lying prone on the operating table. Something beeps. The machine stops. "Did we hit something?" someone asks. "No," comes the answer, and the machine inches forward again. This summer, Abbott Northwestern Hospital in Minneapolis unveiled its most expensive operating room to date, built and outfitted at a cost of \$9 million. It's used for brain surgeries and includes a magnetic resonance imaging (MRI) machine that slides in and out of the room during intervals in surgery. Surgeons use the images to guide their instruments and make sure they haven't left part of a tumor behind, improving the odds for recovery. "It's better than the eye of a surgeon, better than a CT scanner, better than an ultrasound," said Dr. Douglas Yock, MRI director at Abbott Northwestern. He said the investment will help the hospital maintain its lead in neurosurgery. It's the latest salvo in the Hospital Wars. The tale of how Abbott got its new operating suite may not include spies or espionage. But it does include seven years of investigation, dispatching scouts to foreign locales and tracking the moves of rivals. It also illustrates how hospitals constantly try to best each other in the pursuit of the newest technology as they strive to raise

their profiles and increase patient referrals that are their lifeblood.

**Arms race in technology** "It's a very thorny problem," said Dr. Robert Harbaugh, a spokesman for the American Association of Neurological Surgeons and chairman of neurosurgery at Penn State. "There is what amounts to an arms race in a competitive market, especially in neurosurgery, where it's very technologically sophisticated. If one hospital gets a new gadget, then the other hospital needs to get the new technology to compete." Abbott says it has the first such MRI machine in Minnesota, the fourth in the country and the fifth in the world. But that depends on how you define "first." The Mayo Clinic unveiled its own version in Rochester nine months ago, and Mayo doctors say it is superior. Regions Hospital in St. Paul has had a smaller, portable one for a year, which it describes as more "cost-efficient." Then there's the one at the University of Minnesota Medical Center-Fairview, installed medical light years ago, in 1996. Physicians have used it for pioneering work on deep brain stimulation for diseases such as Parkinson's. And starting in September, United Hospital in St. Paul can boast another first -- a movable MRI machine connected to not one, but two operating rooms. The proliferation of the high-tech machines has made the Twin Cities and Boston the leading centers for this type of surgery in the United States, said Dr. Chip Truwit, chief of radiology at Hennepin County Medical Center. (HCMC has an MRI machine that can be used for minimally invasive procedures, but isn't a big center for brain surgery.) "It's now the standard of care for brain tumors in this city," Truwit said.

**Choosing the right machine** Abbott is one of three hospitals in Minnesota that regularly makes the list of best hospitals in America for neurology and neurosurgery, as ranked by U.S. News & World Report. This year, Abbott ranked 22nd, the University of Minnesota Medical Center-Fairview was 20th and the Mayo Clinic in Rochester was No. 1. Abbott does 400 brain operations a

year and it is reimbursed from \$12,000 to \$65,000 each time, depending on the complexity of the case and the type of insurance contract. In 2000, the hospital began its search for an MRI machine to guide brain surgery. The technology helps neurosurgeons visualize tumors even before the first cut. Also, tissue can move during a procedure, making some pre-surgery images obsolete. The MRI machines typically are housed in their own rooms for safety, because their powerful magnets can turn surgical tools into missiles. Abbott physicians began by looking at ways other hospitals have tried to bring MRI technology into surgery. Some surgeons were operating from behind an MRI machine, a tight squeeze, using instruments made of nonmagnetic materials. Others were placing MRI machines next to operating rooms and carefully transporting patients in and out during mid-surgery. In 2004, Yock and his team went to Germany to visit BrainLAB AG. It made an MRI machine attached to an operating table that rotated 180 degrees in and out of the MRI cavity. Yock felt that having the large machine in the room during surgery hampered movement. But he liked how the system combined MRI images with navigation software and displayed them on wall screens, much as GPS maps help drivers. The Abbott team also visited a start-up firm in Winnipeg named IMRIS, which made an MRI machine that moved on ceiling rails. It was a novel concept, because many doctors fear that moving an MRI machine can throw off the accuracy of its magnet, a divide in opinion that still exists. (For that reason, the Mayo Clinic chose a stationary MRI machine and moves the patient instead.) IMRIS designers worked with industrial engineers to overcome that problem. Last year, Abbott settled on a hybrid system that combined the IMRIS machine with BrainLAB's software. The equipment cost \$6 million. Building the room and related relocations added \$3 million.

**Catching the tumor's edge** Since mid-June, Abbott surgeons have performed close

to 20 procedures in the new operating room. Some benefits are already apparent. Last week, Dr. John Mullan was operating on a patient in his 50s who had an "infiltrative tumor," where small tumor cells had permeated the brain. Not only was it hard to see the edge of the tumor, it was dangerously close to an area that controlled the patient's movement on his left side. After Mullan thought he had finished, his team brought in the MRI machine. Mullan was shocked to see 30 to 40 percent of the tumor still in the brain. He took out more, then did another MRI. Again, Mullan saw some leftover tumor, which he removed before closing the incision. "For me, that was a dramatic example," he said. Abbott says it doesn't charge extra for surgeries with the new technology, and a scan costs the same as a regular diagnostic MRI, usually performed a day after a procedure. Even Minnesota insurers, who have clamped down on high-tech outpatient imaging in recent months, have good things to say. Said Dr. Pat Courneya, a medical director at HealthPartners, "This is one of those happy circumstances where this does have value when used well." Chen May Yee • 612-673-7434 Chen May Yee • [mychen@startribune.com](mailto:mychen@startribune.com)