

For a **WEB EXTRA** with a video of the wireless "somersaulting pill," see [dartmed.dartmouth.edu/f10/we03](http://dartmed.dartmouth.edu/f10/we03).

## Geography affects diagnoses, too

**M**edicare enrollees in some regions of the country are more likely to be diagnosed with certain chronic conditions than are similar patients in other regions, according to researchers at the Dartmouth Institute for Health Policy and Clinical Practice (TDI).

Research from Dartmouth has long shown that there are widespread variations in the use of many medical and surgical procedures. The new study, published in the *New England Journal of Medicine*, reveals that it is not just in treating patients that there are extensive variations but also in diagnosing them.

**Intensity:** The researchers, led by Elliott Fisher, M.D., divided the nation's 306 hospital referral regions (each of which comprises an area within which patients are likely to receive subspecialty care) into five quintiles based on the intensity of the medicine practiced there. Then they identified Medicare enrollees who moved sometime between 2001 and 2003 to a referral region in a different quintile to see if moving to a locale providing more-intensive or less-intensive care would affect the likelihood that a patient would be diagnosed with one of nine chronic conditions.

The study showed that Medicare enrollees who moved from a lower- to a higher-intensity region received more medical attention, such as doctors' visits and diagnostic tests, than they would have if they had not moved. The result was an increase in the likelihood of a diagnosis. For every step up in intensity—for example, for a patient who moved from the lowest to the second-lowest quintile—there was a 5.9% increase in the average number of diagnoses. And enrollees who moved to regions in the highest-intensity quintile had, on average, 19% higher risk scores (using a Medicare formula that measures the health of a population) than those who moved to a region in the lowest-intensity quintile. In other words, similar patients appeared to be in worse health in higher-intensity than in lower-intensity regions.

But the relative risk of death one year and three years after the patients' moves was the same, regardless of where a patient moved. So there seemed to be no survival benefit from the added diagnoses.

**Implications:** The authors concluded that the findings could have implications for attempts to compare the effectiveness of care or to develop new payment models. Such efforts often build in adjustments that take into account the relative health of different populations. That is, if patients in one city are sicker than patients in another city, then it would be expected that patients in the first city would require more medical care. But relying on diagnoses alone may introduce bias if the rate of diagnoses depends on the local medical culture.

As a result of this new finding regarding the impact of geography on care, says Fisher, "it will be important to account for the severity of a condition, not just its presence or absence." AMOS ESTY



The new maneuverable wireless capsule is just about the size of a quarter.

## A somersaulting, picture-taking pill

**I**magine swallowing a capsule that's like a Swiss Army knife, says DHMC gastroenterologist Richard Rothstein, M.D. It could have a tiny forceps that would open up and snip off tissue for a biopsy, or maybe a little laser wand or a heat probe.

Such a device doesn't exist quite yet, but a step in that direction came with a study Rothstein led at DHMC—the first use in a human of a wireless capsule externally controlled by magnets. The hope is that it will improve the diagnosis of gastrointestinal (GI) problems.

Wireless capsules have long been used to examine the GI tract, but most go straight through the body, snapping photos without stopping. Rothstein and his collaborators—including Paul Swain, M.D., of London's Imperial College, the inventor of the wireless capsule—took a different approach. They started with a capsule that has a camera capable of transmitting four images per second to real-time video. Then they added a stack of magnets to the capsule.

**Magnet:** After a volunteer (Swain) swallowed the capsule, Rothstein maneuvered a handheld magnet across Swain's body to guide the capsule around inside him. Another researcher inserted a video-gastroscope into Swain's esophagus so the team could study the coordination of the handheld magnet with the capsule's movements.

For the most part, the researchers found it quite easy to manipulate the capsule. They moved it up to the cardia (where the esophagus opens into the stomach), held it in place against gravity, and then let it drop to a lower part of the stomach. Rotations and somersaults were also possible, allowing the capsule to take images of the cardia from many different angles. Pulling the capsule up and down the esophagus and stopping its motion there was more difficult, since the distance between the inner and outer magnets was greater, but rotating it in the esophagus worked well. The results of the study were published in *Gastrointestinal Endoscopy*.

Thanks to its unique maneuverability, says Rothstein, the new capsule promises to help locate a bleeding site or diagnose Crohn's disease, for example. "Eventually we'll be able to take full biopsies by having . . . a little guillotine-like biopsy port on a capsule," he says. "We're only limited by our imagination." MATTHEW C. WIENCKE