THE NEXT MAYO / REMAKING A MEDICAL GIANT

MAYO SEEKS TO DOMINATE WITH DATA

● It sees the field as a critical strategy to treat the sick and boost its standing.

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John Penrod, one of the architects of the computer system in Eden Prairie that powers Optum Labs' partnership with Mayo Clinic.

ROCHESTER – The patients arrive at the Mayo Clinic from all over the world, thousands a day, each presenting a different medical challenge.

Some have illnesses so rare that even medical journals don't offer a time-tested treatment plan. Others bring a complicated combination of ailments — diabetes with heart failure and kidney disease — that offer conflicting treatment options.
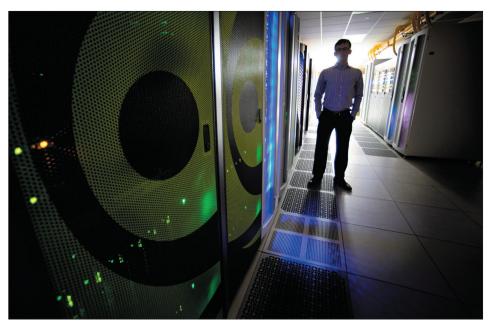
Each scenario is like a math problem with too many variables for a human doctor to fully consider.

But not for a computer.

For decades, doctors, pharmacies and insurance companies have routinely collected vast troves of information about the care and well-being of millions of Americans for their own use. Now, aided by technology and driven by unrelenting pressure to reduce costs, the industry is scrambling to connect all of this disparate data in hopes of finding the best ways to treat the sick.

"It's like you wanted to build a house, but never had bricks," said Dr. Rozalina McCoy, a Mayo Clinic endocrinologist who is working on more than a dozen "big data" research projects. "I'm able to ask all of these questions that haven't been answered before — because they couldn't be answered before."

Mayo Clinic sees the emerging field of big data analytics as a crucial strategy to defend and reinforce its standing as an elite medical institution, particu-

larly as health reform efforts and federal belt-tightening change the way doctors get paid.

Although the Rochester-based health system is investing in a number of promising big data projects, an unfolding partnership with insurance giant UnitedHealth Group is its most ambitious.

The two Minnesota powerhouses are leading an effort to pool data from a wide range of health care organizations in a business venture known as Optum Labs. Leaders say the database is the nation's largest and most comprehensive health care database.

"What we're trying to find out, if we can, is what does health care cost, and what of that spend really adds value to a patient's outcome over time, especially with these high-impact diseases," said Mayo Clinic CEO Dr. John Noseworthy. "Ultimately, we as a country have to fig-

ure this out, so people can have access to high-quality care and it doesn't bankrupt them or the country."

Researchers who query the Optum Labs database can access millions of patients across the decades, and compare whether one treatment worked better than another and how much was spent.

As the world's largest private medical practice, Mayo can influence a large swath of the U.S. medical system, and it intends to use whatever it learns through Optum Labs and other big data projects to do just that.

With more than 59,000 employees, Mayo's geographic footprint includes major campuses in Minnesota, Arizona and Florida, as well as a system of regional hospitals and primary-care clinics. But its sphere of influence is growing exponentially as more health systems join the Mayo Clinic Care Network, which

enables physicians at 31 health care organizations in 18 states, Puerto Rico and Mexico to consult directly with Mayo specialists.

"Obviously, we want to publish papers and get our information and knowledge out there more broadly," said Mark Hayward, senior administrator at Mayo's Center for the Science of Health Care Delivery. "But we won't be successful unless we've made changes in our practice based on that."

Big savings promised

Big data is a broad term for any collection of information so vast and complex that it can't be handled with traditional data-processing tools. Its growth in the field of health care has been fueled by a $40 billion federal effort to urge the nation's health care practitioners to replace their manila folders with computers.

In 2008, just 17 percent of doctors' offices in the United States had an electronic health record system. By the end of 2013, more than half of physicians and 80 percent of Medicare eligible hospitals were using computerized patient files, according to the federal government.

For the first time, it is possible to connect tens of millions of data sets from almost every facet of the health system — office visits, surgeries, lab tests, images, medical devices, prescriptions and more — and judge whether people got better or worse depending on what kind of care they got.

"This is a key point in history, where data that's already being collected is really going to become the dominant driver in what happens in health care," said Philip Bourne, who is leading the federal government's push into big data for the National Institutes of Health.

Mayo researchers such as McCoy and other big data believers are hopeful that research will bridge gaps in the nation's fragmented health care system, where the quality of care varies greatly from clinic to clinic and region to region.

Data level the playing field. What might seem like a rare case in one clinic — breast cancer in Hispanic women who once smoked, for example — can become a virtual clinical trial using the power of big data.

"Out of more than 100 million patients, somebody's got to be just like your patient — or close enough," McCoy said.

At top, Mayo Drs. Jay Talwalkar and Peter Noseworthy discussed the Optum Labs partnership. At center, April Horne, Mayo program manager, demonstrated the Natural History of Disease research database. Below, Dr. Nilay Shah, who is leading Mayo's data effort at Optum Labs, said the partnership "gives us a sense of what are the long-term outcomes?"

Big data, bigger questions

Mayo's partnership with UnitedHealth took root several years ago when Noseworthy visited UnitedHealth Group CEO Stephen Hemsley at his Minnetonka office. The leaders quickly realized the power of combining forces to share data. In a handshake deal, they laid the cornerstone for what would become Optum Labs, whose name is a nod to the innovative Bell Labs and UnitedHealth's IT service's division, Optum.

UnitedHealth contributed 20 years of its claims records on 150 million people to the project, which was launched two years ago near the Massachusetts Institute of Technology campus in Cam-

bridge. Claims records have since been stripped of identifying information and will eventually be linked to 44 million medical records, including 5 million from Mayo.

A growing list of partners from across the health care ecosystem have joined the venture, some contributing health data, others contributing expertise. Partners include consumer advocate AARP, pharmaceutical giant Pfizer, medical device maker Boston Scientific, plus doctors' groups, employers and academic centers, including the University of Minnesota Nursing School.

Few other big data initiatives have brought so many divergent health care players into the fold with the sole mission of fixing the nation's system.

"Ours is unique, because each group is learning from the other," said Optum Labs CEO Dr. Paul Bleicher. "There's a tendency to create automated approaches that spit out solutions. We have a charge to make this practical — and actually innovate and invent and prototype and develop."

Unlikely partners

In the days before health reform began forcing hospitals and doctors to take more financial responsibility for overtesting and unnecessary re-hospitalizations, Mayo might never have sought out a business partner like UnitedHealth Group, a $122 billion corporation whose leaders answer to Wall Street, not to patients.

But the changing health care landscape has made allies out of organizations that once were at odds.

Insurers have the data doctors need to see if their efforts are working, because claims records follow people when they move among health systems. Claims records show whether a patient filled a prescription, showed up for physical therapy or wound up in the emergency room because something went wrong. Insurers know these things even when doctors don't.

"Candidly, it was a bold move," Noseworthy said of the partnership with UnitedHealth. "We had to be careful about it because it could have been an emotionally charged issue. This could have gone sideways pretty fast."

Laying the groundwork took nine months of secret preparations as Nose-

worthy sought to head off a potential culture clash between the nation's largest insurance company and Mayo, a nonprofit that has been led by doctors for 150 years.

Mayo Clinic insisted that the for-profit Optum Labs venture be an "open R&D lab," focused less on making money than on finding solutions for patients that would be publicly shared. In the end, teaming up with UnitedHealth turned out to be an easy sell, Noseworthy said, because everyone saw the potential of big data to make great leaps in improving care.

"With Mayo being a referral center, people come here and they leave. We don't always know what happens to them," said Nilay Shah, a health data scientist who is leading Mayo Clinic's big data effort at Optum Labs. "Optum Labs gives us a sense of what are the long-term outcomes? What should we be shooting for? And what are things that make some places better than others?"

Mayo makes it easy for staff to tap into the Optum Labs database, requiring only a simple two-page summary of their research question — a far cry from the unwieldy process of applying for government research grants.

Interest is high, said Shah, with six to 10 project applications coming in each week. Hypothetical queries or those that don't directly help patients are rejected.

To date, more than 90 projects are in the pipeline. Mayo clinicians have published four papers in medical journals and presented 13 abstracts at medical conferences.

McCoy, a self-described "research nerd," is using big data to research risk factors for people with multiple chronic illnesses and "waste" in the system from treatments that don't help or end up costing more. She already has co-published a paper that compared common medications for Type 2 diabetes, finding that an older and cheaper drug worked as well or better, and cost less than newer and more expensive drugs.

The NIH is now conducting a clinical trial asking similar questions, which will cost millions of dollars and take decades to complete and analyze.

"Clinical trials are important," McCoy said. "But ultimately with scarce resources, what if we can answer the question in a year by running models? It's not a replacement for clinical trials, but it's food for thought about research funding."

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