Capturing medical data in the EMR

By Kateri Clemons

More than 100 years ago, Dr. Henry Plummer began a career that spanned the formative years of Rochester, MN’s Mayo Clinic — from 1900 until his death in 1936. Plummer developed what he called the “unit record.” His theory was that all of a patient’s records should reside in a single file that travels with the patient and is stored in a central repository. Plummer’s record-keeping system replaced an inefficient ledger system. On an initial visit by a patient, a record was entered in a ledger book. On subsequent visits, doctors had to locate and update the original record. When the ledger page filled up, entries were added in the margin. Worse still, multiple ledger books were maintained in different medical offices and departments. A single patient record could be in any ledger book.

On July 1, 1907, Dr. Henry Plummer and his assistant inaugurated Mayo’s system of patient registration and medical record keeping. His single-unit record brought together a patient’s clinical visits, hospital stays, laboratory tests, and doctor’s notes, quickly becoming the standard for around the world. After Plummer investigated how factories managed information, Mayo then built a system of conveyers and pneumatic tubes to transport patient records and correspondence throughout the clinic.

Today, Dr. Plummer likely would be pleased to find that Mayo patient records are electronic. In 2005, electronic records replaced Mayo’s color-coded paper records of more than 6.2 million patients dating back to 1907. From physician notes, lab reports, and surgical dictations, to copies of correspondence and appointment schedules, to X-rays, ultrasounds, CT and MRI scans, and echocardiograms, everything related to a patient’s care is instantly available to the Clinic’s caregivers via more than 16,000 computer terminals on Mayo’s three campuses: Rochester, Jacksonville, and Scottsdale. With 3,000 physicians and 47,000 allied healthcare professionals, Mayo’s electronic medical record (EMR) is one of the largest such systems in the world. The e-files are more secure than the paper system because only authorized users who are readily identifiable can view them.

Future benefits of EMRs

Generating new knowledge to provide efficient, coordinated, safe, high-quality care was the goal of a set of technology initiatives developed prior to the records changeover. Researchers then extended the value of the patient EMRs by analyzing large amounts of patient information, including those early records, in order to apply their findings to improve patient care. The EMR allows them to efficiently search patient medical information by medical condition, date of treatment, physician name, and test category, and more quickly 1) focus their attention on medical information that supports their research efforts; 2) develop databases to study patient outcomes; and 3) cross-check complex medical information.

The EMR is also a key part of collaboration between Mayo and IBM, which designed a system to take advantage of an explosion in new medical data to create tighter linkage between research and the practice of medicine to achieve breakthroughs. The collaboration will focus on new techniques to harness patient data to improve diagnoses; deep computing power to model diseases to find cures; and new devices to access information to transform how patients and physicians interact, leading to more individualized care.

From a single-unit concept to world record-holder

Plummer’s simple turn-of-the-20th-century concept of a centralized medical record capable of traveling with the patient and of being stored in a single repository has resulted in a system at Mayo that averages 7.5 million transactions processed between 8:00 a.m. and 9 a.m., with 15 million transactions being processed by noon. In Rochester’s site alone, more than 64,000 clinical notes are entered weekly. To visualize the EMR’s impact on that laboratory in 2005 alone, lab results and reports totaled 325,708,896; lab results stored since 1994 totaled 200,676,063.

Moving to an integrated EMR was a large, multiphase project involving careful planning, coordination, hard work, and inspiration from many Mayo employees. The project began in 1994 when
Mayo developed a plan to apply state-of-the-art technology to managing patient information. In designing the system, Mayo considered usability, security, and stability to be paramount. Mayo put safeguards in place to protect the privacy of patient medical information and has the ability to control and audit access. The technical infrastructure ensured that medical record information would be available in a timely manner and have appropriate back up.

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Mayo’s EMR was designed to be one of the most extensive patient information systems in the world. Original estimates were that it would cover for Rochester’s clinic about 1.5 million outpatient visits and 60,000 hospital admissions annually. More than 15,000 care providers and support staff would be using it. It was theorized that every week, about 55,000 clinical notes would be added to the system, and 125,000 outpatient orders would be made electronically for diagnostic tests, medications, or consultations.

Extent of EMR’s value
The benefits of the electronic medical record were immediately recognized in the care of patients and the efficiency of operations. “I can quickly and easily pull up test results in the exam room to review with my patients,” says Sandhya Pruthi, MD, a Mayo internist. “I also can verify when they had past exams or procedures. I can even show them results of their imaging tests on the screen.”

Multiple care providers, in different locations, can simultaneously view a patient’s medical record on their computers and get up-to-the-minute information on test results and other doctors’ recommendations. This collaboration enables care providers to determine if further consultation or testing is required. The record also provides important information about medications, including the dosage and time for renewal, and a complete record of immunizations and allergies.

“Mayo’s integrated medical record has helped to maintain high standards of quality because the ‘open book’ serves as an excellent means of peer review,” says George Bartley, MD, CEO at Mayo’s Jacksonville clinic. “It is harder for a single doctor to get too far off the track when others can carefully scrutinize the thinking that led to the diagnosis and treatment plan.”

Bartley says that the next advances in quality improvement likely will come from the ability of the computer to offer diagnostic possibilities for a certain combination of signs, symptoms, and test results, or to recommend various therapeutic options for a problem, such as the best antibiotics for a particular infection.

As Mayo Clinic continues to partner with IBM with its myriad goals based on the electronic medical record, its experience over the past seven years has proven that its initial goals of increasing clinic efficiency and improving patient care have been and continue to be met.

Denis A. Cortese, MD, Mayo’s president/CEO, says, “Patients come to Mayo Clinic expecting the best that medicine has to offer. Patients and their families call Mayo Clinic a place of caring, confidence, and hope. The trust patients place in Mayo says a lot about the expectations we need to live up to each time a patient comes through our doors. The outstanding staff at Mayo Clinic has been and continues to be the hallmark of this organization. Providing the highest quality care means meeting the needs of each and every patient, and putting into place the most efficient systems and technology in support of our clinical care and advancing medicine through research and education.”

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