What happens if your medical records are incomplete?

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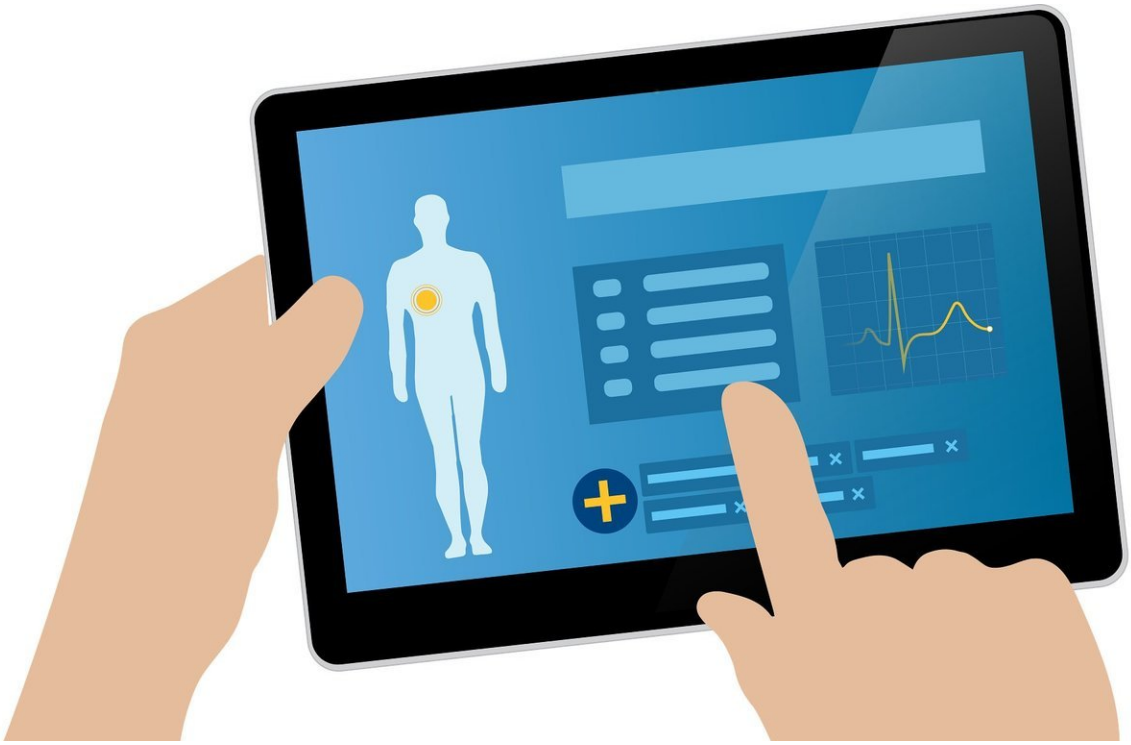

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Your entire medical journey lives in digital health records, but how do you know if those records are wrong, incomplete or missing important information? That's the focus of research done by Varadraj Gurupur, associate professor in UCF's School of Global Health Management and Informatics.

His latest project has created an algorithm that can predict and measure the incompleteness of electronic health records—in everything from your lab results to disease diagnoses, medical history to prescription records.

Missing information in the electronic health records (EHR) that hospitals and doctor's offices keep is like a leaking pipe, he says. If you don't know where the leak is, you can't fix it, and soon the house can flood. The same dangers can happen in healthcare. A recent study by Gurupur revealed that a critical percent of digital health records contained missing information.

His algorithm uses mathematics and computer science to answer, "Where is the water leaking?" he says. The analysis performed by Gurupur and his team found that the level of incompleteness per year varies and there is no pattern of where missing data occurs. His algorithm helps identify attributes that have a higher tendency to be incomplete—the areas of the water pipe that are more vulnerable and can break more frequently.

His previous studies have documented that the biggest reasons for missing health information are communication and education. Communication between patients and their providers isn't always clear—especially if the patient is interacting with a healthcare professional who does not speak their native language. Cultural barriers may keep patients from sharing important information with their providers. Digital technology also creates its own challenges. Providers may not fill out electronic records until day's end—and forget what the patient said or not have it accurately in their notes. Hospitals and clinics switch electronic health record systems, requiring extensive new retraining which results in a learning curve for providers. Some healthcare workers, especially those who did not grow up with technology, may not be adept at using EHRs.

"Missing health information can sometimes be as simple as a person who isn't sure what button to push in the new system," Gurupur says.

Ayan Nasir is finishing his internal medicine residency at Mayo Clinic in Jacksonville, Florida. As a UCF undergraduate and medical student, Nasir did research with Gurupur on health informatics. Before entering the medical field, Nasir worked in finance and says he was amazed at the quality control and data accuracy differences difference between banking and health records. Those discrepancies inspired him to make improving health informatics the subject of his two-year Focused Inquiry and Research Experience (FIRE) project at the medical school, where Gurupur served as his research mentor.

His residency has reinforced his passion for improving health informatics.

"When I see a patient, what I put in the electronic health record reflects one episode of their care," he says. "But that information is going to guide every future medical decision. That's why electronic records must be complete."

Gurupur gave this example to highlight the impact of incomplete health data. A patient with limited English skills visits a new provider who does not speak the patient's native language. With their communication challenges and the rush of a clinical practice, the patient forgets to mention that they are on a particular drug for Type 2 diabetes. There is nothing about previous diabetes treatment in the electronic health record so the provider prescribes a standard drug in a standard dosage for that condition. Now the patient might be receiving twice the recommended amount.

Medicine is looking at ways to use more big data—artificial intelligence—to diagnose and provide more evidence-based treatments.

But that computer analysis relies on complete patient data, Nasir points out.

"When it comes to medicine, you're only as good as your data," he says.

Gurupur says developing reliable algorithms for missing data is also important to health systems. Recent studies have shown that hospitals can lose an average of $5 to $8 million a year because of missing data that impacts their insurance reimbursement rates. With the algorithm, hospital leaders can learn exactly where missing information is coming from—a particular floor, department, service—and address it.

Both Gurupur and Nasir believe health informatics is at a critical tipping point. Health systems rely on electronic records but must develop ways to ensure all the information they collect is complete and accurate. Nasir is working toward his master's in health informatics at Northwestern University and points out that such graduate medical training programs show the increasing importance of using data to better care for patients. He believes future health technology will improve care even more—computers will translate conversations between providers and patients directly into the electronic record, reducing the need for providers to input data manually after each visit, for example.

"We are just at the beginning of this transformation," he says. "It's exciting to be part of this work."

More information: Varadraj P. Gurupur et al, Analyzing the Data Completeness of Patients' Records Using a Random Variable Approach to Predict the Incompleteness of Electronic Health Records, *Applied Sciences* (2022). DOI: 10.3390/app122110746