Electronic health records fail because they are merely digital remakes of paper charts

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Once hailed as essential to advance health care into the 21st Century, electronic health record (EHR) systems have increased rather than decreased physician work load, contributed to physician burn out, and returned little back to patients in improved health care quality. Writing in a new Perspective published in the *New England Journal of Medicine*,

researchers from Penn Medicine's Center for Health Care Innovation argue that the same record systems can be reconfigured to achieve their original promise. The authors suggest restructuring EHRs from mere digital remakes of their old pen and paper ancestors into platforms that allow doctors to "subscribe" to their patients' clinical information to receive real-time updates when an action is required, similar to social media feeds and notifications.

"When the first movies were made, they were really just plays made permanent on film. It took time before film editing and special effects turned the two dimensional images on the screen into something more immersive than what could be performed on stage," said senior author David A. Asch, MD, MBA, executive director of the Penn Medicine Center for Health Care Innovation. "Current EHRs haven't taken the step they need to. They are still just putting plays on film. Health care is suffering today in part because health records haven't yet made the transformation that nearly all other industries have achieved as they have gone digital."

Co-authors include Katherine Choi, MD, a clinical innovation manager at the Center for Health Care Innovation, and Yevgeniy Gitelman, MD, a clinical informatics manager at the Center for Health Care Innovation. "The same doctors who, on their way into work, are getting news feeds on their favorite sports teams, still have to 'go to the chart' to check up on their patients," says Choi. "If you can subscribe to feeds about a football team, why can't you subscribe to Mrs. Jones in room 328?"

The researchers point to several examples implemented within the University of Pennsylvania Health System that reveal how record systems can be reconfigured into subscription services.

For one, receiving important patient information could depend less on physicians remembering to search the chart. For safety reasons, Penn

established automatic medication expiration dates for antibiotics and antiepileptics for inpatients, for instance, but the system initially required physicians to remember when to renew the expiring prescriptions. As a result, medications were not ordered 10 percent of the time because physicians didn't check the chart in time or notice the need for renewal. To address this, Penn developed a web application that, among other features, allowed residents to receive push notifications on their mobile devices. The result? The number of missed renewals was cut by one-third.

"It was one more checklist item that providers were relieved to have off their minds," the authors wrote. "When your record systems require that physicians go to the chart to learn important information, you are relying on the hope that they get there on time, see what they need to see, and then do what they need to do," says Gitelman, "You're just creating opportunities for error and delay."

Choi adds, "We need to move beyond passive engagement with the medical record to the approach people expect in other parts of their lives—that important information comes to them."

These push notifications—which are sent using a HIPAA compliant messaging platform—can also shorten the lag time between when information becomes available and when it's used. An older approach at Penn waited until morning rounds were over to evaluate whether patients on ventilators in the intensive care units could breathe without assistance. Now, digital information has both enabled patients to be automatically evaluated and clinicians to receive prompts to act when patients meet the readiness criteria. The new process has reduced delays so patients spend, on average, half a day less on ventilators.

Not all information needs to be known as soon as it becomes available: it's about sending the right message at the right time. Push notification

services can filter what's important and relevant, just as news feeds and alerts are managed on smart phones. That requires that systems be carefully designed to reduce the risk of alert fatigue, the authors wrote.

"And not everyone needs to know everything at the same time," says Choi. "Of course the primary team may be concerned with the whole picture, but the renal doctors may only need to act on specific alerts relevant to kidney function, and only the important changes in that. Reimagining EHRs so that they are no longer only charts but are now seen as subscription services allows for the selective filtering of information."

Asch says, "When I read the newspaper—which I do in its digital form—I go for the top stories and the editorials. I browse through the obituaries when I have the time. I completely skip the automotive section. In fact, the top stories are pushed to me without me going to find them. Yet, we've been treating the electronic health record as a communal trough of information that we all have to sift through when we don't do that in any other part of our lives."

Beyond one-off intervention alerts, these notifications can also manage panels of both inpatients and outpatients, according to the authors. One program at Penn monitored the 30 patients with the highest use of care in one of its hospitals, using a dashboard to follow their needs, such as the best way to communicate with them, engage with their family, and next steps for setting up social services. The multidisciplinary team covering the patients was automatically alerted to a patient's arrival in the emergency room and pointed to the action plan in real time. One year after implementation, 30-day readmissions and total days in the hospital for this group of patients decreased by 67 percent and 56 percent, respectively.

"Treating clinical data as static files to be retrieved misses opportunities

to relieve physicians of outdated, unnecessary burdens," the authors wrote. "But most electronic systems and most health care organizations haven't made this shift. Whereas movies can now enrich stories using technology unavailable on the stage, we still await the main act of EHRs' digital evolution."

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