Computer-generated doctor explains test results to patients

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University of Illinois educational psychologist Daniel Morrow is leading a project aimed at helping people with low health literacy better understand their health data. Credit: L. Brian Stauffer

If viewing your latest medical test results on your doctor'ss online portal

leaves you scratching your head and wondering whether to start planning your 100th-birthday bash or begin writing your will, you're not alone.

Imagine how different that experience might be if instead you were able to view a video in which a physician explained your test results to you in layman's terms, and used graphics to compare your test scores with ideal scores and convey your risks of having a heart attack, stroke or other serious health condition.

A computer-generated physician, now under development, explains diabetes and cholesterol test results to would-be patients in videos designed for viewing on electronic medical record portals.

The physician—or computer agent, as it's called in a new paper about the project—was developed collaboratively by scientists at the University of Illinois' Beckman Institute for Advanced Science and Technology and Carle Foundation Hospital's Research Institute. The goal of the project is to make electronic medical record portal messages more useful and engaging for patients, particularly older adults with lower levels of health literacy.

"The dialogue delivered by the computer agent is similar to that which would occur during a routine office visit with a physician," said co-author Dr. William Schuh, Carle's chief medical information officer. "The videos are intended to supplement, not replace, physician-patient interaction, promoting patients' understanding of their health conditions and their performance of self-care behaviors."

"On one side of the screen, you have your test scores embedded in the graphic, and on the other side, you have the physician telling you what this means, such as, 'Your LDL cholesterol is elevated, and that's not good because it poses risk," said lead author and U. of I. educational psychologist Daniel Morrow. "Overall, your test results indicate a high

level of risk for cardiovascular illness. It concerns me; I really think you need to come in and talk to us and develop a plan to address these issues."

Patient portals to [electronic health records](#) often are underutilized, particularly by older adults, because these systems tend to display data and may not necessarily provide explanations or other information about that data, Schuh said.

"Patient portals have really great potential for expanding patient-centered care because they provide patients with ready access to information about their own health status, treatments and medications," Morrow said. "However, the way portals are typically designed poses a challenge for anybody, but they are particularly problematic for older adults who may be less familiar with or comfortable with technology."

Numeric literacy tends to decline with age as well, making interpreting tables of numeric data more challenging for older adults. Some doctors also have expressed concern that electronic portals may increase rather than decrease clinicians' workloads because some patients become confused while viewing their results and call their doctors' offices to get help interpreting the findings, according to the study.

"Because older adults are often self-managing chronic illnesses, they are the most frequent users of medical services and might benefit the most from access to their test findings and to educational and motivational health information," Schuh said.

In the project's two pilot studies, [older adults](#) who ranged in age from 65 to 89 played the roles of patients, viewing or listening to messages in which the computer agent explained hypothetical [test results](#) and the accompanying disease risks. Afterward, the patients were tested on their comprehension of the information presented and whether they found the

material useful.

A retired physician recorded scripts for the patient portal messages and other text needed to develop the computer agent's commentary, and the researchers also explored whether patients' gist memory of the medical information differed depending on whether the computer agent spoke in a natural voice or a computer-generated voice.

Participants' ability to understand and remember the content of the messages was accurate regardless of which voice the computer agent spoke in, the researchers found, although slightly more of the participants preferred the natural-sounding voice to the synthesized voice.

A team led by U. of I. engineering professors and co-authors Mark Hasegawa-Johnson and Thomas Huang created the computer agent's realistic 3-D appearance using a 2-D frontal image of the participating physician's face. Team members then programmed the agent to display context-appropriate facial expressions, gestures and other affective cues that would promote patients' understanding if the findings were being discussed by a human rather than a computer avatar.

Morrow said the system is a long way from being implemented with Carle's patients or those of other providers. The next step will be to obtain a grant to fund refinements to the design and possibly a pilot study in which patients utilize the system through a provider's web portal
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  More information: Daniel Morrow et al, A multidisciplinary approach to designing and evaluating Electronic Medical Record portal messages that support patient self-care, *Journal of Biomedical Informatics* (2017). DOI: 10.1016/j.jbi.2017.03.015

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