Want 'Watson' in the exam room?

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Are you ready for Watson to join you and your doctor in the examining room? That could be the outcome of a collaboration under way between Watson's creators at IBM and experts at the University of Maryland's School of Medicine in Baltimore.

They have begun work on merging the speech recognition and question-answering skills of Watson - the computer that beat two humans on "Jeopardy!" last week - with the vast stores of clinical knowledge and analytical skills in the medical profession.

If it all works out, the end product could be a "Dr. Watson" in hospitals and physicians' offices.

"In the future, I see the software sitting with the physician as he is interviewing the patient, and processing information in real time, and correlating that with the patient's medical record and other records," said Dr. Eliot Siegel, director of the Maryland Imaging Research Technologies Lab at the University of Maryland School of Medicine in Baltimore.

Watson, he said, "has incredible potential to revolutionize how we interact with medical records; to be a really valuable assistant to me; to read all the literature pertinent to my practice ... to always be at my side and help suggest problems, things in the medical records I need to know about; to suggest diagnoses and treatment options I may not have considered," he said.

For example, Siegel said, if a patient comes to him with a brain tumor, with a Dr. Watson "we have the capability of not just looking at the latest article on a new drug approach that worked with 50 percent of patients, but being able to look at genomic and clinical data ... so I can personalize my treatment for that patient, because I have a database of patients with similar laboratory and imaging findings."

Robotic artificial intelligence is not entirely new in medical applications, said Dr. Mark Krasna, director of the Cancer Institute at St. Joseph Medical Center in Towson, Md., (and an "avid" "Jeopardy!" fan).

The Catholic Health Initiative uses remote telemedicine technologies to link doctors in rural hospitals with experts elsewhere in the system.

"What you're talking about is expanding that to the next level, and having a physician's assistant at the bedside," he said. "Assuming that is done with the appropriate (federal, medical privacy) regulations so that the information that's being shared electronically is appropriately firewalled, I think it's a wonderful way to bring a massive amount of information to the physician's fingertips faster than they can do alone."

Even so, Krasna added, "especially in the area of hands-on physical examination, and some of the interpersonal, psychosocial and ethical issues that come up every day in a practice, I don't see Watson ever replacing physicians."

Siegel is a professor and vice chairman of the radiology department at Maryland's medical school. He's also at the Veterans Affairs Hospital in Baltimore and has worked for years to develop computer applications and digital imagery systems in that hospital's radiology department.

His work with IBM brought him into contact with the team in Armonk, N.Y., that was developing the Watson software for the "Jeopardy!"

challenge.

"I suggested to them it would be an amazing next project, after 'Jeopardy!' to look at real-world applications for the technology, and apply it to medicine," Siegel said.

That led to a grant from IBM to develop a version of Watson that could serve as a doctor's assistant. The project would combine IBM's Deep Question Answering, Natural Language Processing and Machine Learning software, with Nuance Communications Inc. speech recognition and Clinical Language Understanding software.

"Combining our analytics expertise with the experience and technology of Nuance, we can transform the way that health care professionals accomplish everyday tasks by enabling them to work smarter and more efficiently," said IBM's director of research, John E. Kelly III.

Siegel's team at Maryland is looking at how Watson can best interact with medical practitioners, while partners at Columbia University Medical Center are contributing further medical expertise and research.

IBM and Nuance believe the first commercial applications could be available in as little as 18 months. Siegel says a fully integrated Dr. Watson system is probably still years off.

"In three, five, seven years or so, we will start to see software beginning to look at patterns (in medical records) and suggest different diagnoses of patients, and begin to look at safety issues," he said.

But even high-speed IBM computers make mistakes, and Siegel acknowledged that Watson's performance on TV was not perfect.

In fact, Watson offered an answer that had just been ruled incorrect

when spoken by a human competitor. It also answered "Toronto" to a question that called for the name of a U.S. city.

But "physicians make mistakes, as well," Siegel argued. So do their assistants.

"Having a fellow or a medical student with me who has already read the medical records and synthesized the records for me, and come up with a possible diagnosis, is invaluable," Siegel said.

Sometimes their suggestions are "dumb," but some will also "come up with brilliant diagnostic possibilities." He sees Dr. Watson in a similar role.

Nancy Knight, chairwoman of the radiology department's Ethics Roundtable and a member of Siegel's team, said the physician will remain the final arbiter of diagnoses and treatment choices.

"We certainly want to make sure nobody thinks we're moving towards doing some sort of 'HAL for medicine' that's going to take over from physicians," she said.

"HAL" was the homicidal computer aboard a manned spacecraft in the 1968 science fiction movie "2001: A Space Odyssey." HAL, like Watson, was capable of natural language processing, but that wasn't all. It sent one of the astronauts on the ship to his death after using lip reading to discover the crew was trying to pull its plug.

Dr. Watson's role would be to support the humans, not compete against them, Knight said.

"Given the size of the current medical databases, no physician has the time to immediately review it all. It (Watson) is leveraging the growing

amount of medical information we have on each patient, and (medical) conditions in general, in support of the physician's decision-making," she said.

Nor would Dr. Watson leave the human doctor with no options.

"I don't think anybody is envisioning a scenario where a physician types in five things and looks at a single answer and says, 'This is what the patient has,'" Knight said.

Instead, she said, Dr. Watson would "synthesize a range of information and provide pointers to other information, and reminders to the physician that certain tests might be in order - the kind of support information that allows physicians to make the best-informed decisions possible."

Siegel sees it as an adjunct to, and improvement over, today's first-generation electronic medical records.

Even after a patient's old paper records have been digitized, he said, they often are not yet fully searchable.

"You can't ask the medical records for all the other instances for that patient where she mentions a rash," he said. "Nor can you search across all other (patients') medical records."

Worse, he said, some of the information "looks like e-mails and text messages, full of misspellings and problems with abbreviations and inconsistent information."

The Maryland team is helping the Watson software developers understand these problems with today's electronic records, and to develop ways to extract information from them. They are also working

on software to mine medical journals for information and speed up diagnoses.

Efforts in the 1970s and 1980s to develop artificial intelligence for medical diagnoses failed in part, Siegel said, because they were too labor-intensive for physicians. They sometimes required a 90-minute interaction with the physician to reach a diagnosis, and then offered only one possibility.

"And it would assume that all the information was correct," he said. In reality, some information in medical records is inconsistent or incorrect. "It never came to clinical acceptance."

Today, Siegel believes the IBM "Jeopardy!" team has brought artificial intelligence to a point where it can be made to work efficiently with physicians, with positive implications for patient care.

"I don't see it as a replacement, but as an excellent medical tool," he said.

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