IBM has collaborated with several cancer care providers to develop and train the IBM supercomputer Watson to help clinicians make informed treatment decisions. When a patient is seen in clinic, the oncologist can input all of the clinical information into the computer system. Watson will then review all of the data and recommend treatment options based on the latest evidence and guidelines. Once the oncologist makes the treatment decision, this information can be sent directly to the insurance company for approval. Watson has the ability to standardize care and accelerate the approval process, a benefit to the healthcare provider and the patient.

At a Glance

- Cognitive technology will increasingly play a role in cancer care.
- Cognitive technology is being used and refined by various comprehensive cancer centers around the United States.
- This new technology has the potential to provide all clinicians working in oncology with the latest practice guidelines and clinical trial availability.

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The two best Jeopardy! players the show ever had, Brad Rutter and Ken Jennings, took on a supercomputer named Watson, developed by IBM and named after the company’s founder, Thomas Watson. The two contestants lost to Watson in 2011 by a large margin, and Jennings said in his final answer, “I for one welcome our new computer overlords” (Ratzule, 2011).

The supercomputer Watson was not connected to the Internet at the time of the match. Watson generated a response using information that it had accumulated as well as statistical analysis. At the time of the Jeopardy! game, Watson was the size of a master bedroom and had to be kept apart from its competitors because of the noise generated from its cooling system. That same year, IBM executives discussed the possibility of using this same technology in health care (IBM Watson, 2014b).

What is IBM Watson?

IBM Watson is a cognitive technology that processes information similarly to a human by understanding natural language and analyzing unstructured data. When Watson is asked a question, it relies on hypothesis generation and evaluation to quickly analyze the evidence and, through repeated use, Watson continually gets smarter by tracking the feedback from its users and learning from success and failure (IBM Watson, 2014b). According to Reuters, IBM Watson has shrunk from the size of a master bedroom to the size of three stacked pizza boxes. It has also increased its processing speed by about 240% (Leske, 2014).

Watson and Oncology

Healthcare providers practicing in the rapidly changing field of oncology must keep up with the latest research findings and guidelines to better manage their patients. With the volume of published research available on an annual basis, this can be very difficult to do. Comprehensive cancer centers typically have oncology teams focusing on a particular cancer type, with the team conducting clinical trials and remaining updated on the latest research and guidelines. This is a different scenario from the community oncologist who manages patients with all types of cancer diagnoses. The ability to remain current on all of the latest cancer studies is a near impossible task. Because of the complexity of cancer treatment, a new technology that can help oncology practices in various locations and settings by choosing appropriate treatment options based on the evidence has the potential to be very beneficial to patients and practitioners.

IBM Watson and Memorial Sloan Kettering Cancer Center Collaboration

In 2012, IBM partnered with Memorial Sloan Kettering Cancer Center (MSKCC). The goal of this collaboration was to bring the supercomputer to healthcare providers, allowing personalized patient care through computer-generated identification of the most up-to-date,
evidence-based treatment options. The process of training Watson has been led by a team of physicians and analysts at MSKCC. The physicians, initially focusing on breast and lung cancers, trained IBM Watson to compare a patient’s medical information against treatment guidelines, published research, genetic data, and patient records to choose the best evidence-based diagnostic and treatment plans. MSKCC has been able to train Watson using its own large database named Darwin, which includes information from 1.2 million inpatients and outpatients from longer than 20 years (Bassett, 2014).

When a healthcare provider inputs a clinical question into the system, Watson generates a list of hypotheses in response to the question. The program then assigns a ranking to the answers based on analyses of the data. It then generates a confidence level for each of the likely answers. Watson will notify the healthcare provider if additional information is needed and will revise recommendations based on additional data received. The healthcare provider has the option of asking Watson to supply all of the literature citations that support the computer recommendations (IBM, 2014a). Although the tool had originally been programed to focus on breast and lung cancers, it has since been expanded to include colon, prostate, bladder, ovarian, cervical, pancreatic, kidney, liver, and uterine cancers, melanoma, and lymphoma (Bassett, 2014).

**IBM Watson and University of Texas MD Anderson Cancer Center**

In October 2012, IBM Watson announced a pilot program at the University of Texas MD Anderson Cancer Center. The institution has been using Watson in its leukemia practice and has designated the tool as the Oncology Expert Advisor (OEA). Similar to what has been occurring at MSKCC, Watson has been given millions of pages of medical literature and practice guidelines and, with that information, is able to analyze the data and rank potential treatment options based on the evidence. The OEA system continues to learn through research and clinical data from all patients, provided by clinical experts.

Koichi Takahashi, MD, presented an abstract at the June 2014 American Society of Clinical Oncology annual meeting that reviewed the accuracy of the OEA system by comparing its treatment suggestions with those of University of Texas MD Anderson Cancer Center physicians. The system has a false positive if it recommends an incorrect answer with high confidence; it has a false negative if it recommends a correct answer with low confidence. When the OEA treatment recommendations of 200 leukemia cases were reviewed, the system had a false positive rate of 2.9% and a false negative rate of 0.4%. The overall accuracy of the standard of care recommendations was 82.6% (American Society of Clinical Oncology, 2014). One issue the cognitive computer system encountered was a variation of nonstandard terminology or acronyms by individual physicians making it difficult to read the source documents. The future for the OEA looks promising. OEA is expected to be accessible to the cancer center’s network of clinicians through a computer interface and supported by mobile devices. A long-range goal is to share this technology with oncologists worldwide (University of Texas MD Anderson Cancer Center, 2014).

**IBM and WellPoint, Inc. Collaboration**

In 2011, IBM had also partnered with one of the largest for-profit managed healthcare companies, WellPoint, Inc., to develop a technology that streamlines the review process for medical treatments. Throughout the use management pilot, WellPoint, Inc. nurses put in more than 14,700 hours of hands-on training, using 25,000 test-case scenarios and 1,500 real-life cases to train the supercomputer to review authorization requests for procedures and treatments. WellPoint, Inc. is calling its new system the Cancer Care Quality Program. This program incentivizes oncologists for choosing evidence-based treatment options. As of July 2014, this program exists in Indiana, Kentucky, Missouri, Ohio, Wisconsin, and Georgia. By early to mid-2015, this program will also exist in New York, Connecticut, Maine, New Hampshire, and Virginia (IBM Watson, 2013; Verdon, 2014).

**Conclusion**

Watson has the ability to dramatically change the way in which cancer care is prescribed through its ability to answer complex questions with speed, accuracy, and increasing confidence. Information can be processed quickly through a system that includes the healthcare provider and health insurance companies. This could lead to a faster and easier authorization process. Future benefits could include the ability to match patients to clinical trial opportunities and possibly gather data that may lead to the development of new clinical trials. The hope is that this tool will increase the number of patients receiving the most evidence-based treatment and minimize the current variability of treatment decisions that exist today.

**References**


