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Pairing cancer genomics with cognitive computing highlights potential therapeutic options

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A University of North Carolina Lineberger Comprehensive Cancer Center-led study has demonstrated the ability of cognitive computing to scour large volumes of data from scientific studies and databases to identify potentially relevant clinical trials or therapeutic options for cancer patients based on the genetics of their tumors.

The researchers said their findings, published in the journal *The Oncologist*, suggest that cognitive computing applications could help physicians to stay abreast of an ever-expanding body of scientific literature as well as highlight potential therapeutic options, specifically as it relates to cancer genetics.

"Our findings, while preliminary, demonstrate that cognitive computing might have a role in identifying more therapeutic options for cancer patients," said UNC Lineberger's William Kim, MD, the study's corresponding author and an associate professor of medicine and genetics in the UNC School of Medicine. "I can tell you that as a practicing oncologist, it's very reassuring for patients to know that we're able to explore all possible options for them in a very systematic manner."

The study's first authors were Nirali Patel, MD, formerly of UNC Lineberger, and Vanessa Michelini of IBM Watson Health, Boca Raton, Florida. IBM Corp. provided in-kind access to the Watson technology

for the study, as well as technical expertise.

The researchers used IBM Watson for Genomics to assess whether cognitive computing was more effective than a panel of cancer experts in identifying therapeutic options for tumors with specific genetic abnormalities. They compared Watson's ability to identify possible therapeutic options tied to potentially clinically significant genetic mutations with the findings of UNC Lineberger's molecular tumor board.

In a retrospective analysis of 1,018 cancer cases, the molecular tumor board identified actionable genetic alterations in 703 cases, which Watson also confirmed. In addition, Watson for Genomics identified additional potential therapeutic options in 323 patients, or one third of the cases reviewed that the molecular tumor board hadn't identified. Of these, 96 were not previously identified as having an actionable mutation.

"To be clear, the additional 323 cases of Watson-identified actionable alterations consisted of only eight genes that had not been considered actionable by the molecular tumor board," Kim said. In most of those cases, Watson identified a new clinical trial. One of those trials had opened within a week of Watson's analysis.

The study drew on data from UNCseq, a UNC Lineberger clinical trial that used next-generation sequencing to analyze the genomics of a participant's tumor with the goal of matching tumor abnormalities with a targeted therapeutic. Next-generation sequencing is "fundamental" to the promise of precision medicine, the researchers reported, but sequencing can uncover many different alterations in hundreds of genes, and the "majority of such events have no known relevance to the treatment of patients with cancers."

"The major finding is that cognitive computing augmented the molecular tumor board process for the interpretation and collection of information regarding a patient's genomic profile," Kim said. "The study was not designed to analyze whether or not this helps patients in regard to outcome as defined by prolonged survival or treatment response."

The program did identify new possible options for some patients. The findings were not relevant to most patients because the majority of the patients did not have active cancer, or had died by the time of the retrospective analysis. But for 47 patients with active disease, and needing additional options, the findings were reported to their treating physicians.

"To my knowledge, this is the first published examination of the utility of cognitive computing in precision cancer care," Kim said. "I'm optimistic that as we get more sequencing data, well-annotated treatment information, as well as therapy response, tools like Watson for Genomics will begin to show their true promise. But, of course, we still need to formally answer these questions."

Provided by UNC Lineberger Comprehensive Cancer Center