Scientists develop non-invasive method to predict onset of dementia

February 11 2020

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At least 50 percent of older primary care patients living with Alzheimer's disease and related dementias never receive a diagnosis. And many more live with symptoms for two to five years before being diagnosed. Currently, tests to screen for dementia risk are invasive, time-consuming and expensive.

"The great thing about this method is that it's passive, and it provides similar accuracy to the more intrusive tests that are currently used," said lead researcher Malaz Boustani, M.D., MPH, a research scientist at Regenstrief Institute and a professor at Indiana University School of Medicine. "This is a low cost, scalable solution that can provide substantial benefit to patients and their families by helping them prepare for the possibility of life with dementia and enabling them to take action."

Developing machine learning algorithms for predicting dementia

The research team, which also included scientists from Georgia State, Albert Einstein College of Medicine and Solid Research Group, recently published its findings on two different machine learning approaches. The paper published in the *Journal of the American Geriatrics Society* analyzed the results of a natural language processing algorithm, which learns rules by analyzing examples, and the Artificial Intelligence in Medicine article shared the results from a random forest model, which is built using an ensemble of decision trees. Both methods showed similar accuracy at predicting the onset of dementia within one and three years of diagnosis.

In order to train the algorithms, researchers gathered data on patients from the Indiana Network for Patient Care. The models used information on prescriptions and diagnoses, which are structured fields, as well as medical notes, which are free text, to predict the onset of dementia. Researchers found that the free text notes were the most valuable to helping identify people at risk of developing the disease.

"This research is exciting because it potentially provides significant benefit to patients and their families," said Patrick Monahan, Ph.D., study author from IU School of Medicine and a Regenstrief affiliate scientist. "Clinicians can provide education on behavior and habits to help patients cope with their symptoms and live a better quality of life."

Zina Ben Miled, Ph.D., M.S., a study author from the Purdue School of Engineering and Technology at IUPUI and a Regenstrief affiliate scientist, said, "The early risk identification allows an opportunity for doctors and families to put a care plan in place. I know from experience what a burden it can be to deal with a dementia diagnosis. The window provided by this test is so important to help improve the quality of life for both patients and their families."

In addition to the benefit to families, these methods can also provide significant cost savings for patients and health systems. They replace the need for expensive tests and allow clinicians to screen entire populations to identify those most at risk. Delaying the onset of symptoms also saves a significant amount of money on treatment.

The next step is to deploy these machine learning algorithms in real-life clinics to test if they help identify more true cases of dementia as well as to learn how they impact a patient's willingness to follow up on the results.

More information: Malaz Boustani et al, Passive Digital Signature for

Early Identification of Alzheimer's Disease and Related Dementia, *Journal of the American Geriatrics Society* (2019). DOI: 10.1111/jgs.16218

Provided by Regenstrief Institute