Using a patient's own words, machine learning automatically identifies suicidal behavior

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Using a person's spoken or written words, new computer tools can identify with great accuracy whether that person is suicidal, mentally ill

but not suicidal, or neither.

A new study shows that computer technology known as machine learning is up to 93 percent accurate in correctly classifying a suicidal person and 85 percent accurate in identifying a person who is suicidal, has a mental illness but is not suicidal, or neither. These results provide strong evidence for using advanced technology as a decision-support tool to help clinicians and caregivers identify and prevent suicidal behavior, says John Pestian, PhD, professor in the divisions of Biomedical Informatics and Psychiatry at Cincinnati Children's Hospital Medical Center and the study's lead author.

"These computational approaches provide novel opportunities to apply technological innovations in suicide care and prevention, and it surely is needed," says Dr. Pestian. "When you look around health care facilities, you see tremendous support from technology, but not so much for those who care for mental illness. Only now are our algorithms capable of supporting those caregivers. This methodology easily can be extended to schools, shelters, youth clubs, juvenile justice centers, and community centers, where earlier identification may help to reduce suicide attempts and deaths."

The study is published in the journal *Suicide and Life-Threatening Behavior*, a leading journal for suicide research.

Dr. Pestian and his colleagues enrolled 379 patients in the study between Oct. 2013 and March 2015 from emergency departments and inpatient and outpatient centers at three sites. Those enrolled included patients who were suicidal, were diagnosed as mentally ill and not suicidal, or neither - serving as a control group.

Each patient completed standardized behavioral rating scales and participated in a semi-structured interview answering five open-ended

questions to stimulate conversation, such as "Do you have hope?" "Are you angry?" and "Does it hurt emotionally?"

The researchers extracted and analyzed verbal and non-verbal language from the data. They then used machine learning algorithms to classify the patients into one of the three groups. The results showed that machine learning algorithms can tell the differences between the groups with up to 93 percent accuracy. The scientists also noticed that the control patients tended to laugh more during interviews, sigh less, and express less anger, less emotional pain and more hope.

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