

Improving health outcomes with a little help from our friends—and artificial intelligence

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Dr. Chanita Hughes-Halbert of the Medical University of South Carolina and Hollings Cancer Center studies social determinants of health and health disparities. Credit: Sarah Pack, Medical University of South Carolina

We fare better during health challenges when we have a little help from

our friends, family and community. And perhaps an assist from artificial intelligence.

Researchers at the Medical University of South Carolina (MUSC) trained natural language processing (NLP) software to look for mentions of social isolation in clinical notes in the electronic [health](#) record (EHR). NLP is a type of artificial intelligence that tries to make human language "readable" to computers. Once trained by the MUSC team, NLP identified socially isolated [patients](#) with 90 percent accuracy. The findings are reported in *BioMed Central Medical Informatics and Decision Making*.

Social isolation is one of the "social determinants of health," aspects of a person's life that affect well-being and health. Other examples of social determinants are income, education, race, and marital status. These social determinants have been shown in [clinical trials](#) to affect health outcomes as much as usual suspects such as blood pressure and diabetes.

"We know from careful evidence that social determinants are important to [health care](#) and health outcomes," says Chanita Hughes-Halbert, Ph.D., senior author on the article.

"Social isolation is a really important social determinant because it reflects the extent to which people perceive they have a high level of connectedness and support."

Hughes-Halbert is professor of Psychiatry & Behavioral Sciences at MUSC. She also directs a center funded by the National Institutes of Health (NIH) focused on precision medicine and minority men's health at MUSC Hollings Cancer Center.

"The mission of our center is to identify the ways in which social, clinical, psychological and behavioral data and genomic information

interact with each other to lead to disease risk and affect how men respond to treatment options," explains Hughes-Halbert.

"As part of that, we're really interested in the role that social determinants play."

Like many teams using artificial intelligence to unlock the insights embedded in the EHR, the MUSC team paired a subject matter expert, Hughes-Halbert, and a bioinformatics team.

The bioinformatics team was led by Leslie Lenert, M.D., MS, Chief Research Information Officer for MUSC and director of MUSC's Biomedical Informatics Center (BMIC). Other team members included Vivienne Zhu, M.D., M.S., first author of the article, and Jihad Obeid, M.D, both of BMIC, and Brian Bunnell, Ph.D., of the Department of Psychiatry & Behavioral Sciences.

The team came together to find a way to help physicians provide care informed by an awareness of their patients' social determinants of health, including social isolation.

The National Academy of Medicine has called for physicians to document social determinants in the EHR. However, busy physicians do not always have the time to do so. Even when they do, the current EHR has no place to enter information on a number of the social determinants as coded data. At best, physicians can mention a discussion with a patient about social isolation in their clinical notes.

"When people go to the doctor, they do talk about social isolation and other determinants of health. But you won't find that in the coded data," explains Zhu.



Dr. Leslie Lenert (left), the Chief Research Information Officer for the Medical University of South Carolina (MUSC) and director of MUSC's Biomedical Informatics Center (BMIC), and Dr. Vivienne Zhu (right), also of BMIC. Credit: Sarah Pack, Medical University of South Carolina

"You have to look at the clinical notes—that's where the information is embedded."

It would take a human many months to sort through the notes looking for mentions of social isolation. In contrast, the NLP software combed through the 55, 516 clinical notes comprising 150,990 documents from 3138 prostate cancer patients in the training data set in just eight seconds.

"There were I don't know how many hundreds of thousands of documents in this prostate cancer data set," explains Lenert.

"It's too many for a human being to read through to do the abstractions, but it's relatively easy for a computer."

Once trained, NLP was able to analyze a new set of documents from 1057 patients and identify patients who were socially isolated with 90 percent accuracy.

"It's pretty darned accurate," says Lenert. "It performed well, but the problem remains that some physicians do not comment on these issues and so don't leave a trail for NLP to follow."

Artificial intelligence could help here too. Lenert and the bioinformatics team hope that they can use another type of [artificial intelligence](#) known as machine learning to identify which clinical and other traits characterize socially isolated patients. Machine learning could then search for patients with that constellation of traits in the EHR. It would be able to identify socially isolated patients even when the physician made no explicit mention of social isolation in the clinical notes.

Future studies will be needed to develop and test Interventions for socially isolated patients. For now, these patients can be referred for hospital- and community-based support services.

The NLP strategy developed by the MUSC team can be applied to other [social determinants](#) of health, particularly those that cannot be entered as coded data, and to other diseases. The team is already using NLP to identify patients with financial insecurity and alcohol abuse.

MUSC owes its expertise in NLP in part to the NIH-funded South Carolina Clinical & Translational (SCTR) Institute. SCTR is a Clinical

and Translational Science Award hub housed at MUSC.

"The general expertise in NLP, the infrastructure for the access to the notes, and some of the support for the software comes through SCTR," says Lenert.

In a sense, NLP can help physicians "listen" to their patients better, understand their health challenges in the broader context of their lives, and provide more informed and nuanced care.

"Sometimes physicians focus excessively on the 'medical' problems and don't pay enough attention to the context that people live in and the social aspects that influence their health," says Lenert.

"Our study once again highlights the importance of knowing this information in order to provide patients our very best care."

More information: Vivienne J Zhu et al, Automatically identifying social isolation from clinical narratives for patients with prostate Cancer, *BMC Medical Informatics and Decision Making* (2019). [DOI: 10.1186/s12911-019-0795-y](https://doi.org/10.1186/s12911-019-0795-y)

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