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Big data model improves prediction of key hospital outcome

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More than half of hospital deaths in the United States are related to severe infections, or sepsis. Yale researchers developed a prediction model, drawing on "big data" about local patients and using machine-learning methods, that proved better at identifying at-risk patients than existing clinical practices.

Currently, emergency physicians can use simple calculators or point-scoring systems known as clinical decision rules to determine which hospitalized patients might die from sepsis. However, these methods often fail to identify patients most at risk because they are based on limited information, derived from models that are unable to capture the complexity of data, and developed using different patient populations.

The new model developed by researchers at Yale School of Medicine and the University of Washington uses a large amount of data collected in electronic health records of local patients. Known as random forest modeling, the method draws on and learns from patient data to make predictions. Their big-data method outperformed existing models and has the potential to correctly classify an additional 200-300 patients per 5,000 with severe sepsis.

"By using the machine-learning technique and incorporating a large amount of variables—over 500—we created a model that has the potential to better predict sepsis mortality in patients admitted to the hospital," said Dr. R. Andrew Taylor, assistant professor of emergency medicine and first author on the study. Having proved the concept, Taylor and his colleagues hope to test the model in real-time with patients in New Haven while also promoting the big-data approach. "Our goal is to make patients' data work for them and create learning health systems where predictive models are developed and ultimately applied to improve patient care," he said.

The study published on this month in *Academic Emergency Medicine*.

More information: R. Andrew Taylor et al. Prediction of In-hospital Mortality in Emergency Department Patients with Sepsis: A Local Big Data Driven, Machine Learning Approach, *Academic Emergency Medicine* (2015). DOI: 10.1111/acem.12876