State-of-the-art technology will allow physicians to identify patients who are at risk for serious illness ahead of time

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A new technology developed at Tel Aviv University will make it possible, using artificial intelligence, to identify patients who are at risk

of serious illness as a result of blood infections. The researchers trained the AI program to study the electronic medical records of about 8,000 patients at Tel Aviv's Ichilov Hospital who were found to be positive for blood infections. These records included demographic data, blood test results, medical history and diagnosis. After studying each patient's data and medical history, the program was able to automatically identify medical files' risk factors with an accuracy of 82%. According to the researchers, in the future this model could even serve as an early warning system for doctors, by enabling them to rank patients based on their risk of serious disease.

Behind this groundbreaking research with the potential to save many lives are students Yazeed Zoabi and Dan Lahav from the laboratory of Prof. Noam Shomron of Tel Aviv University's Sackler Faculty of Medicine, in collaboration with Dr. Ahuva Weiss Meilik, head of the I-Medata AI Center at Ichilov Hospital, Prof. Amos Adler, and Dr. Orli Kehat. The results of the study were published in the journal *Scientific Reports*.

The researchers explain that [blood](#) infections are one of the leading causes of morbidity and mortality in the world, so it is very important to identify the risk factors for developing serious illness at the early stage of infection with a bacterium or fungus. Most of the time, the blood system is a sterile one, but infection with a bacterium or fungus can occur during surgery, or as the result of complications from other infections, such as pneumonia or meningitis. The diagnosis of infection is made by taking a blood culture and transferring it to a growth medium for bacteria and fungi. The body's immunological response to the infection can cause sepsis or shock, dangerous conditions that have high mortality rates.

"We worked with the medical files of about 8,000 Ichilov Hospital patients who were found to be positive for blood infections between the

years 2014 and 2020, during their hospitalization and up to 30 days after, whether the patient died or not," explains Prof. Noam Shomron. "We entered the medical files into software based on artificial intelligence; we wanted to see if the AI would identify patterns of information in the files that would allow us to automatically predict which patients would develop serious illness, or even death, as a result of the infection."

To the researchers' satisfaction, following their training the AI reached an accuracy level of 82% in predicting the course of the disease, even when ignoring obvious factors such as the age of the patients and the number of hospitalizations they had endured. After the researchers entered the patient's data, the algorithm knew how to predict the course of the disease, which suggests that in the future it will be possible to rank patients in terms of the danger posed to their health—ahead of time.

"Using artificial intelligence, the algorithm was able to find patterns that surprised us, parameters in the blood that we hadn't even thought about taking into account," says Prof. Shomron. "We are now working with medical staff to understand how this information can be used to rank patients in terms of the severity of the infection. We can use the software to help doctors detect the patients who are at maximum risk."

Since the study's success, Ramot, Tel Aviv University's technology transfer company, is working to register a global patent for the groundbreaking technology. Keren Primor Cohen, CEO of Ramot, says, "Ramot believes in this innovative technology's ability to bring about a significant change in the early identification of patients at risk and help hospitals reduce costs. This is an example of effective cooperation between the university's researchers and hospitals, which improves the quality of medical care in Israel and around the world."

  More information: Yazeed Zoabi et al, Predicting bloodstream infection outcome using machine learning, *Scientific Reports* (2021).