Predicting blood clots before they happen in pediatric patients

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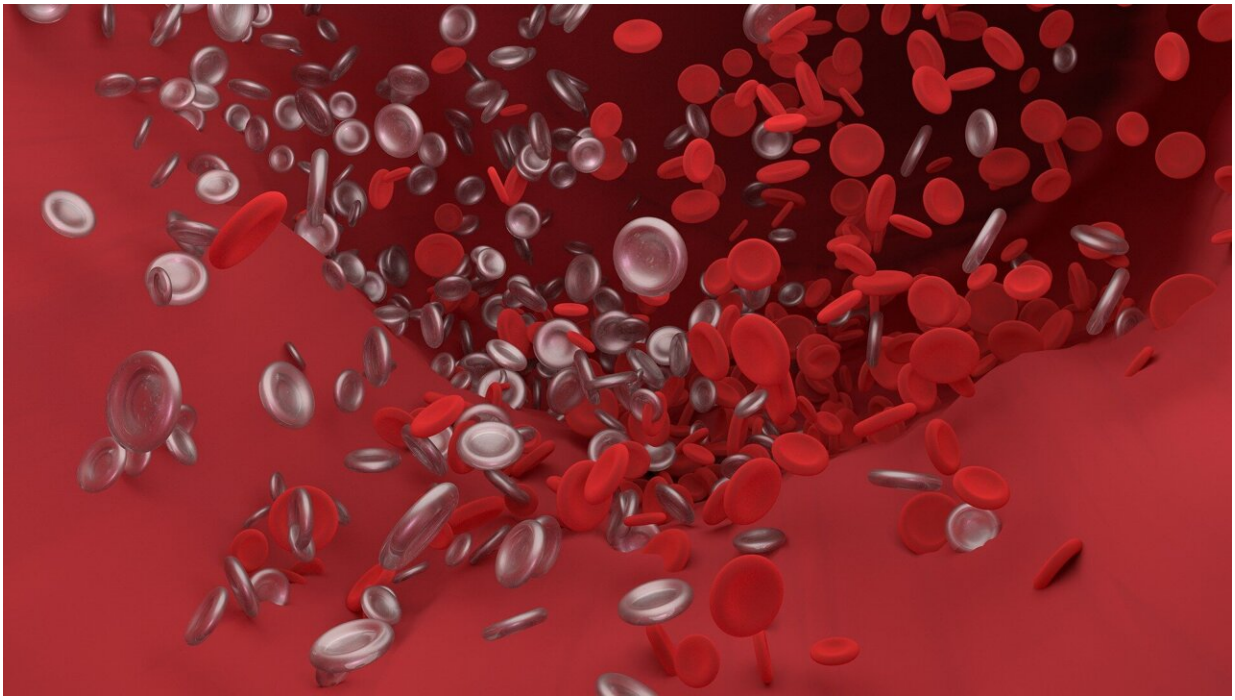

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Monroe Carell Jr. Children's Hospital at Vanderbilt has launched a study to determine the impact of a predictive model for identifying pediatric patients at risk for developing blood clots or venous thromboembolisms (VTEs).

The study uses advanced predictive analytics to inform medical teams of

patients at risk for blood clots before they happen.

"Hospital-associated blood clots are an increasing cause of morbidity in pediatrics," said the study's principal investigator, Shannon Walker, MD, clinical fellow of Pediatric Hematology-Oncology at Children's Hospital.

While these events are more rare among children than they are among adults, Walker noticed that blood clot development was on the rise.

"The reason children get blood clots is very different from adults," said Walker, who worked with mentors Allison Wheeler, MD, MSCI, assistant professor of Pediatrics and Pathology, Microbiology and Immunology, and C. Buddy Creech, MD, MPH, director of the Vanderbilt Vaccine Research Program and associate professor of Pediatric Infectious Diseases.

"There was no standardized protocol for preventing clots in pediatric patients. As we noticed that the rate of blood clots was going up and recognized that the adult strategy wasn't going to work for our patients, we wanted to look at each patient's individual risk factors and see how we could focus our attention on targeted blood clot prevention."

The study, set to be published in *Pediatrics*, describes how the team built and validated a predictive model that can be automated to run within the electronic health record of each patient admitted to the hospital.

The model includes 11 risk factors and was based on an analysis of more than 110,000 admissions to Children's Hospital and has been validated on more than 44,000 separate admissions.

Currently the team is studying using this model along with targeted intervention in the clinical setting in a trial called "Children's Likelihood of Thrombosis," or CLOT.

The prediction model is used in this way: every child admitted to the hospital has a risk score calculated. The patients are randomized, so in half of the patients, elevated scores are reviewed by a hematologist, and then discussed with each patient's medical team and family to determine a personalized prevention plan. All patients, regardless of randomization, continue to receive the current standard of care.

"We are not utilizing a one-size-fits-all plan," Walker said. "This is an extra level of review allowing for a very personalized recommendation for each patient with an elevated score. Each day the score is updated, so as risk factors change, the scores change accordingly.

"We are, in real-time, assessing the use of this model as a clinical support tool. We saw a clinical opportunity of something we could improve and have moved forward with building the model—to identify high-risk patients and are currently performing the CLOT trial, which will run through the end of the year."

Walker's study was possible with the help of the Advanced Vanderbilt Artificial Intelligence Laboratory, or AVAIL. Only in its second year, the program is leading the way supporting artificial intelligence tools at VUMC through project incubation and curation, including facilitating clinical trials to assess their effectiveness.

"AVAIL served as a catalyst, in this instance by bringing experts in a complex trial development into proximity so that a great synthesis could happen," said Warren Sandberg, MD, Ph.D., executive sponsor of AVAIL, along with Kevin Johnson, MD.

"What is unique about this particular project is that we were not only able to predict complications but also able to test the model in a rigorous, pragmatic, randomized, controlled trial to see if it benefits patients," said Dan Byrne, senior biostatistician for the project and director of artificial

intelligence research for AVAIL.

"The future of this kind of work is unlimited," he said. "We can hopefully use this approach to predict and prevent pressure injuries, sepsis, falls, readmissions or most any complication before they happen. At Vanderbilt, we are raising the bar when it comes to the science of personalized medicine and application of artificial intelligence in medicine in a way that is both ethical and safe."

Provided by Vanderbilt University Medical Center