Intraoperative massive hemorrhage can be associated with high mortality if not treated promptly. Lee et al conducted a prognostic study incorporating intraoperative hemodynamic monitoring data into a validated artificial intelligence (AI)-assisted massive transfusion prediction model. The authors compared the ability of an AI prediction model using intraoperative hemodynamic monitoring with a current reference-standard model (using only preoperative data) to detect need for massive transfusion intraoperatively—10 minutes before the need for massive transfusion occurred. The massive transfusion index prediction model outperformed the standard model in the internal and external validation single-center cohorts (area under the receiver operating characteristic curve, 0.972 vs area under the curve, 0.824). The authors' novel use of real-time intraoperative data to predict upcoming need for a massive transfusion is intriguing and pushes the limits of most current AI clinical applications.

The importance of having the ability to predict resource needs rapidly, before an event occurs, is as important now as ever. At a tertiary referral center, resources like massive transfusion protocols, blood availability, and surgical expertise can be quickly mobilized in the setting of an acute surgical emergency. However, these resources are not universally available. In settings where immediate support is not present, such as rural or resource-limited settings, having lead time to predict an event like the need for massive transfusion may well mean the difference between life and death for a patient. Once the authors' algorithm has been clinically validated with a broader patient population, we think the use of this AI predictive model could be helpful in resource-limited hospital settings, prompting resource allocation prior to an event occurring, rather than playing catch-up. Even more importantly, knowing a patient is at risk of an event, before the event occurs, may encourage and enhance communication between surgical and anesthesia teams helping mitigate the event entirely, or minimizing any untoward downstream effects.

There are important limitations to this study to keep in mind. There was lack of granular detail on what operations had been performed and little information about surgical technical factors that could have occurred intraoperatively prior to transfusion administration. Furthermore, the exclusion of pediatric patients limits generalizability, and there was a small sample size in the validation cohorts that met the massive transfusion threshold. Additionally, as the authors point out this was performed in a population from a single country. Follow-up prospective studies are encouraged to record the communication between anesthesia and surgical teams, capturing the richness of the experience around a massive transfusion event. Analyses of how application of this tool impacts both the massive transfusion event (if it ends up occurring) and other longer-term patient outcomes, such as...
the need for an intensive care unit, hospital length of stay, and surgical site infection rate, is also warranted.

In summary, machine learning and AI algorithms are increasingly utilized with electronic medical record data to alert hospital staff on changes in patient clinical trajectory. The novel use of real-time intraoperative data to provide an early-detection warning system for the anesthesia team has the potential to improve patient outcomes but requires further clinical validation in prospective or randomized clinical control trials.

ARTICLE INFORMATION
Published: December 14, 2022. doi:10.1001/jamanetworkopen.2022.46648
Open Access: This is an open access article distributed under the terms of the CC-BY License. © 2022 Villarreal JA et al. JAMA Network Open.

Corresponding Author: Joshua A. Villarreal, MD, Department of Surgery, Stanford University, 300 Pasteur Dr, H3638, Stanford, CA 94305 (jdf1@stanford.edu).

Author Affiliations: Department of Surgery, Stanford University, Stanford, California.

Conflict of Interest Disclosures: Dr Forrester reported receiving grants from the Surgical Infections Society and receiving funding from Varian outside the submitted work. No other disclosures were reported.

REFERENCES