**Study Purpose**

Current methods to detect and diagnose DCI have limitations. Transcranial Doppler (TCD), the only noninvasive surveillance tool to detect angiographic vasospasm, is limited by poor sensitivity and interrater reliability. Besides, it is heavily relied on technician and cannot produce enough ultrasonography test to all patients. Electroencephalogram, the other approach to diagnose DCI, requires 24 hours continuous monitoring and clinical expert artifact reconciliation. These methods are manually performed, heavily relied on expert or technician. To reduce the reliance, researchers aim to create a continuous, automated DCI monitoring tool, and to develop hourly risk scores using routinely collected clinical data to detect DCI.

**Methods**

Data is collected from patients with aneurysmal subarachnoid hemorrhage (aSAH) admitted to the neurological intensive care unit (NICU) at New York-Presbyterian Hospital– Columbia University Irving Medical Center (Columbia) from 2006 to 2014, Rheinisch-Westfälische Technische Hochschule Aachen University (Aachen) from August 2018 to May 2020, and the University of Texas McGovern (Houston) from March 2018 to November 2019. For comparison and model training, researchers describe routinely collected grading scales of injury severity and outcome prediction. Outcome variables are in-hospital mortality, length of stay in the NICU, and modified Rankin Scale at discharge, 3- and 12-months post-discharge. Researchers apply an ensemble machine learning approach to build classifiers trained on Columbia data with the plan to externally validate on the Houston and Aachen data. Choosing the Columbia classifier that best performed for the institution’s dataset, researchers generate hourly risk scores indicating the current likelihood of DCI using the Ensemble classifier.

**Results**

Of the 310 patients included in model creation, 101 (33%) developed DCI while 209 (67%) did not. Eighty-eight (28%) were enrolled with a HH grade of 4 to 5 and 121 (39%) with an mFS of 3 to 4. Researchers select Ensemble classifier, as random forest models are prone to overfitting. The Ensemble classifier created with the most vital sign data (the 7 days before anchor) perform the best on the Houston dataset, while the classifier with the least amount of vital sign data (12 hours before anchor) performs best on the Aachen dataset. The hourly risk scores are computed using the Ensemble classifiers. With model M1 and an optimal threshold of 0.41, our model predicted 90.9% of DCI events 12 hours before perfusion DCI, that is, 1.6 true alerts for every false alert.

**Questions**

1. *The target classification outcome of the study was DCI.* What does target classification outcome mean?

Limitations