

# Development Of A Mobile Application For



**Weill Cornell  
Medicine**

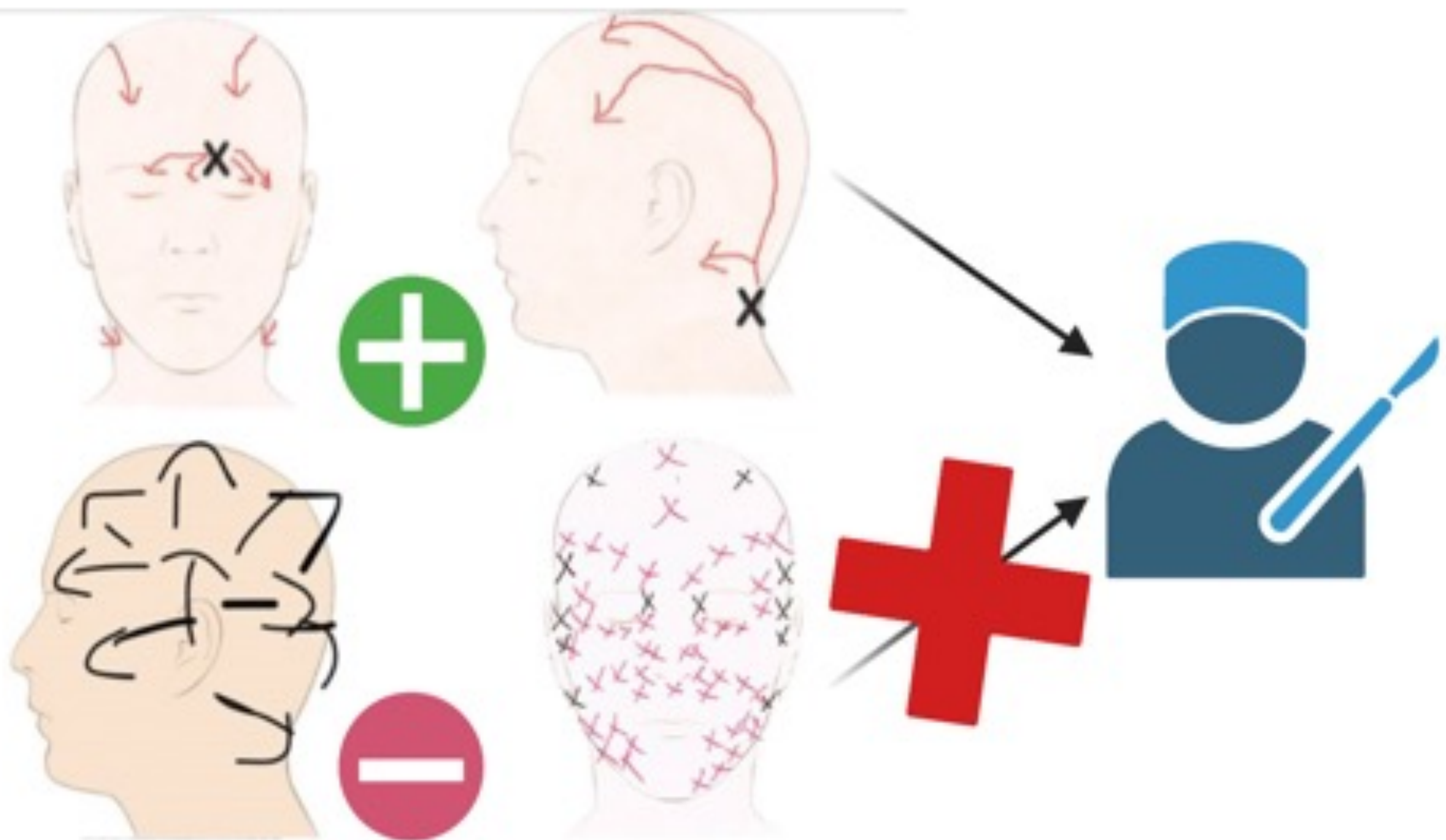
# Patient Screening In Headache Surgery — **NewYork- Presbyterian**

Leonard Knoedler MD<sup>1,2</sup>, Siddharth Simon<sup>1</sup>, Ankoor A. Talwar MBA<sup>1</sup>, Shaan Arora<sup>1</sup>,  
William G. Austen MD<sup>2</sup>, Lisa Gfrerer MD PhD<sup>1,2</sup>

<sup>1</sup>Division of Plastic and Reconstructive Surgery, Weill Cornell Medicine, New York, NY 10065  
<sup>2</sup>Division of Plastic and Reconstructive Surgery, Massachusetts General Hospital, Harvard Medical School, Boston, MA 02114

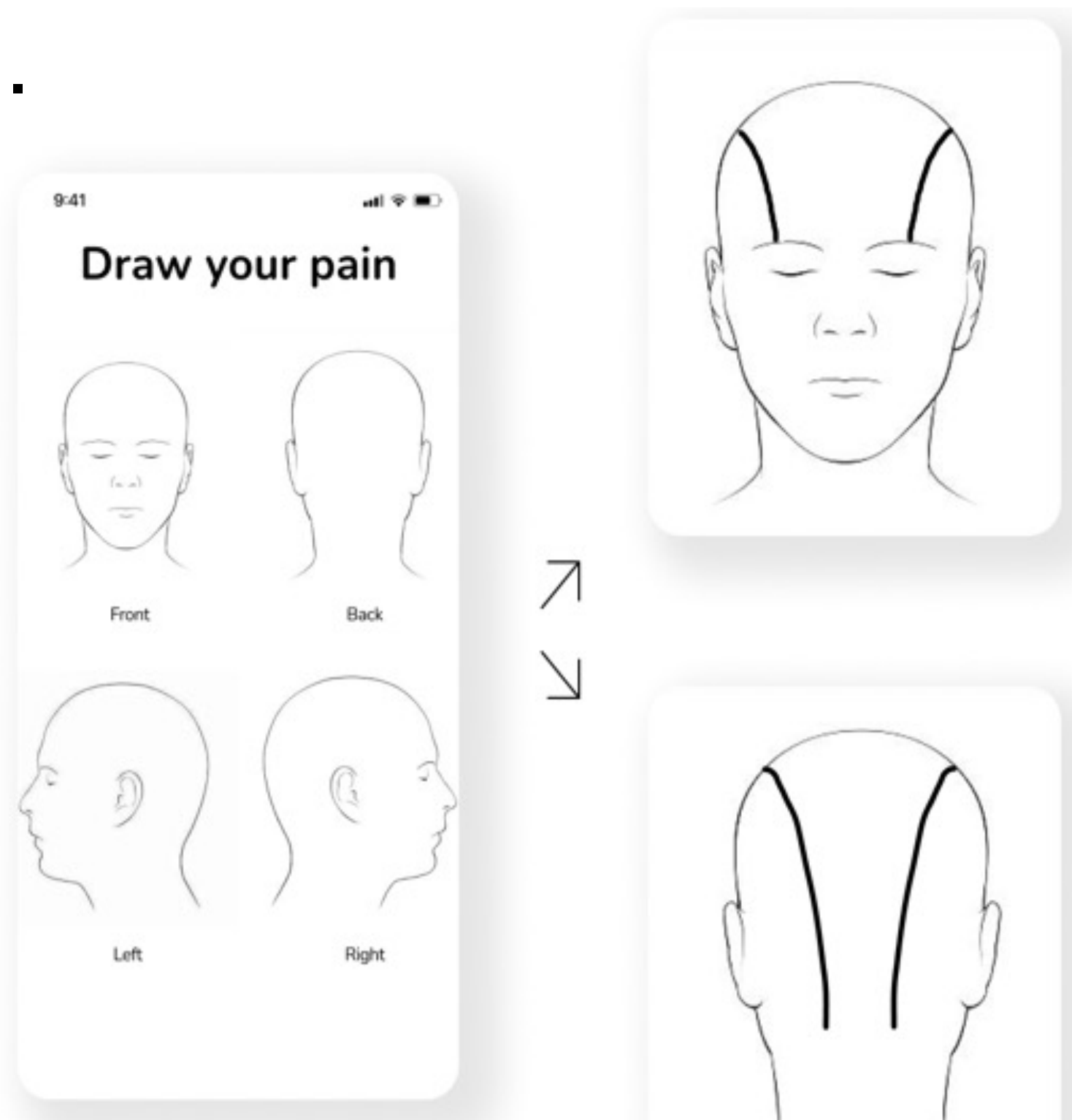
## Purpose

**Patient selection** is crucial for optimizing outcomes in headache surgery. Pain drawings are an important tool for patient screening, but interpretation requires extensive training. We sought to create a machine learning (ML) model, integrated into a mobile application, to facilitate screening for providers.



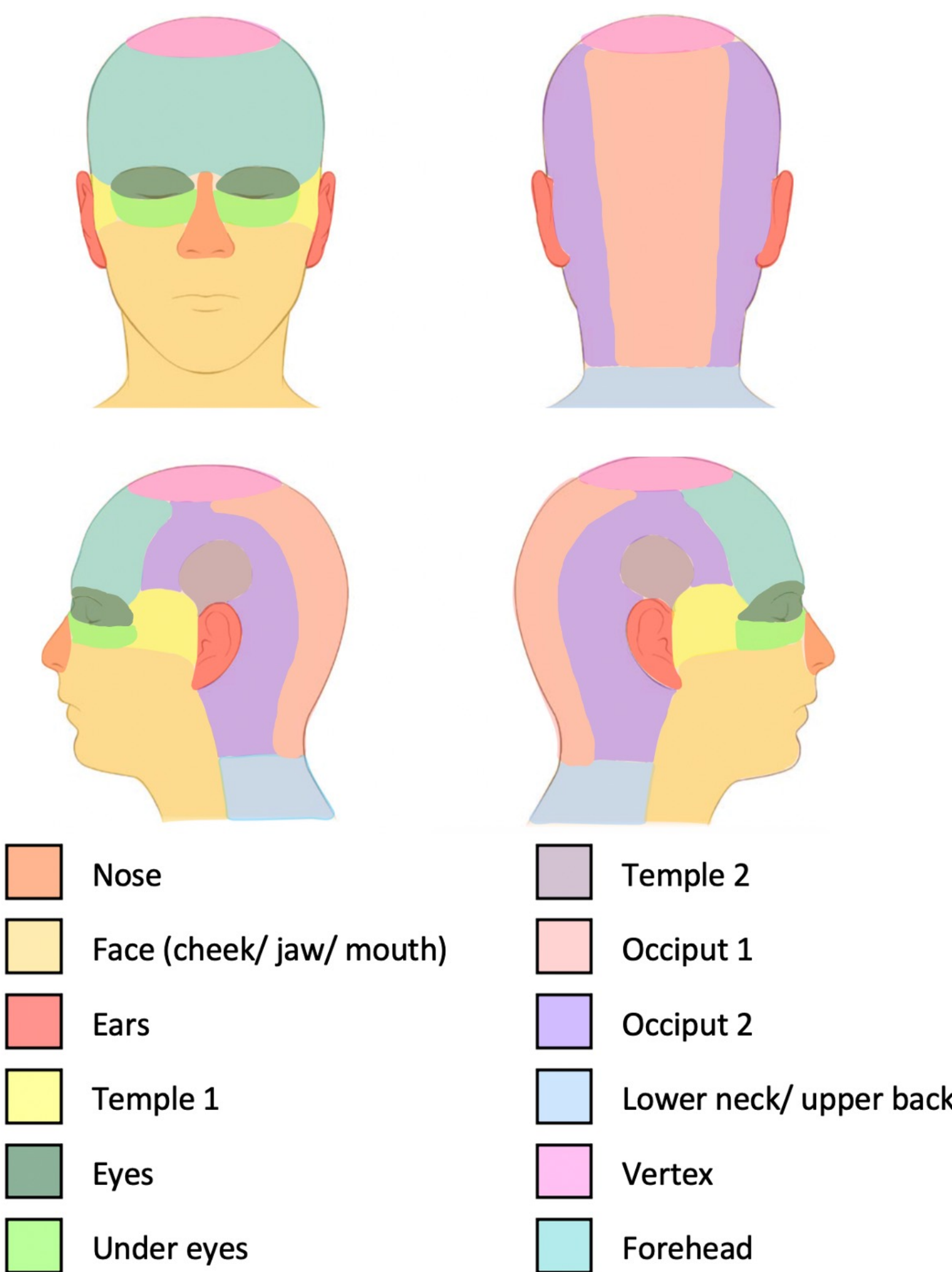
## Methods

**115 pain drawings** created by patients were analyzed and categorized for presence of nerve pain, anatomic distribution of pain, as well as candidacy for surgery by two headache surgery experts (WGA and LG). A **random forest ML algorithm** was developed based on this analysis and trained using **3208 copies** of the initial patient drawings. The algorithm was asked to evaluate 200 randomly selected drawings. Android Studio 2.0 was used to create a mobile application.



## Results

The algorithm correctly determined nerve pain, the anatomic pain distribution of pain, and candidacy for surgery in **97.5%** of test drawings (195/200). Across the different anatomic pain distributions, the mean  $\pm$  SD **accuracy was  $98.4 \pm 1.3\%$** . The mobile application surface enabled non-surgical providers to successfully use the algorithm.



## Conclusion

ML can be used in the interpretation of patient pain drawings. The integration of this **screening tool** into a mobile application will enable **non-surgical providers** such as neurologists and primary care physicians, as well **patients** to screen for nerve related headache increasing the likelihood of timely referral to a qualified headache surgeon.

