

# **An Artificial Intelligence Tool to Prevent Wrong-Side Orthopedic Surgery: A Feasibility Study**

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**INTRODUCTION:** In a survey of ASSH hand surgeons, 16% reported preparing to operate on the incorrect hand but catching the error, and 21% reported performing at least one wrong site surgery during their career. Despite mandated implementation of preoperative checklists, the persistence of wrong-side surgeries highlights the potential for improvement and innovation. We hypothesized that an artificial intelligence (AI) tool which can identify and confirm the laterality of a surgery with high accuracy would represent a possible adjunct to minimizing human error.

**METHODS:** We fine-tuned a pretrained Convolutional Neural Network model (CNN) on a large open dataset (11k Hands). The dataset is diverse in terms of skin tone, age, and sex, and consists of images of either the dorsal or palmar surface of hands centered against a white background. The data is split into 80% training, 10% validation, and 10% test images, and the model is trained to identify the proper hand laterality (right/left) directly from the image. The test set is untouched in training and used to calculate area under the receiving operator curve (AUROC), precision, and recall statistics. The model was then integrated with each patient chart to crosscheck the predicted side with the intended side of planned surgery.

**RESULTS:** The model accurately identified 100% of testing images. The AUROC, Precision, and Recall were all 1.0, indicating high performance.

**DISCUSSION AND CONCLUSION:** As surgical site errors occur <1% of the time, it is critical that an AI tool is essentially 100% accurate. This novel model meets this criterion, achieving full performance on tested statistics. However, this model is a proof-of-concept, and has not been tested in the surgical setting with hands actually prepped for surgery. That said, the findings show that AI models may serve as an additional guardrail to existing protocols for prevention of wrong site surgery – with potential utility in conjunction with evolving augmented-reality wearable tools.