

# Expanding Access to Surgical Simulation: Apple Integration of the SkinFlaps Soft-Tissue Surgical Simulator

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## Introduction

- Surgical simulation:
  - Supports rehearsal of complex repairs
  - Prediction of post-operative outcomes
  - Trainee exposure to infrequent procedures
- SkinFlaps Soft-tissue Surgical Simulator
  - Open-source software developed by Drs. Cutting, Wang, and Sifakis
  - Historically only available on Windows
- MacOS predominates in academic and clinical personal computing
- Restricted practical access to a top-tier surgical simulation tool

**Aim:** Extend the availability of SkinFlaps to macOS, without altering simulation behavior

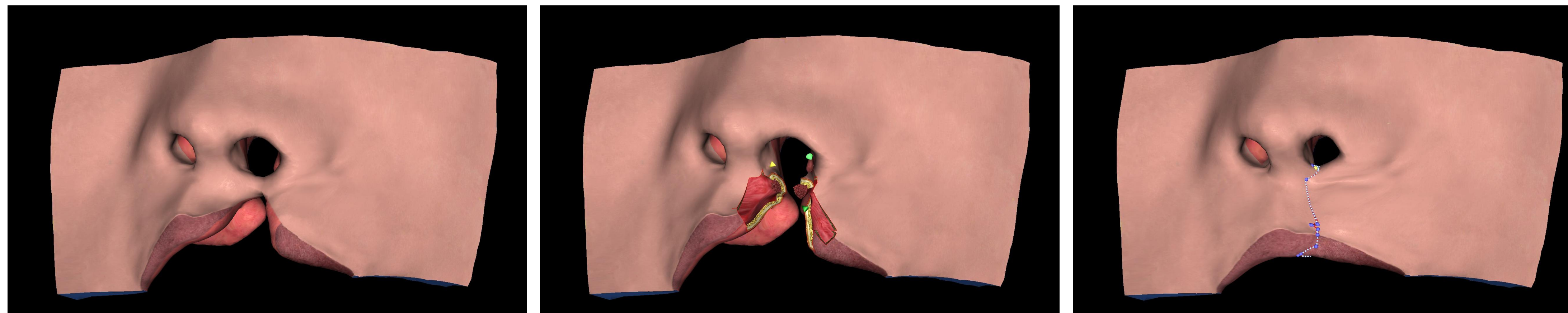
## Methods

- **Approach:**
  - Artificial intelligence was leveraged to perform swaps of windows-specific dependencies for Apple-native equivalents.
  - The surgical interface, tissue physics, and clinical models were left unchanged.
- **Validation:**
  - Simulated tissue deformation was compared to and validated against the reference Windows program across the simulator's procedure library.

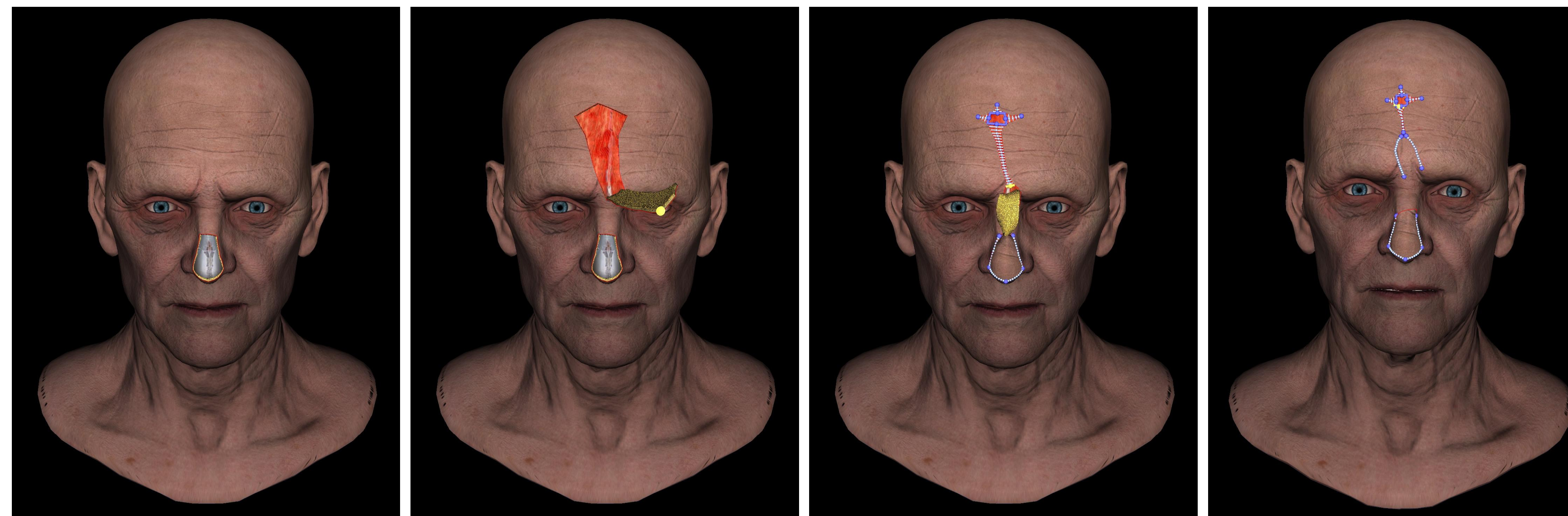
## Results

Representative procedures shown below

### Cleft Lip Repair (Fisher Technique)



### Forehead Flap to Nose



### Tenzel Semicircular Flap



## Discussion

Surgical simulation tools have limited clinical impact if surgeons cannot run them on the hardware they actually use.

This port preserves validated clinical behavior while removing a platform-level barrier to adoption

This is particularly beneficial in pediatric plastic surgery, where simulation allows for practice of infrequent procedures with high stakes outcomes

### Conclusions & Future Directions:

- This work extends the availability of the SkinFlaps program, expanding access to high fidelity surgical simulation and education.

### Future Directions:

- Open-source code will be shared to Github at the time of publication
- Implementation of realistic tissue biomechanics
- Integration of 3D imaging to SkinFlaps pipeline to generate digital twins

Try it out:



## References

1. Wang et al., "Computer-based Simulation of Facial Flap and Cleft Lip Reconstruction," PRS Global Open, 2025
2. SkinFlaps source repository, University of Wisconsin Graphics Group. [github.com/uwgraphics/SkinFlaps](https://github.com/uwgraphics/SkinFlaps)