



Alternative Ways to Facilitate Learning for Surgical Procedures

Tahir Hamza*, Robert Conca, Irina F. Dragan



Tufts
UNIVERSITY

School of
Dental Medicine

Abstract

Introduction: As the COVID-19 pandemic continues to limit human interaction, advancements in technology progress rapidly. During the past few months studies have shown a spike in the usage of mobile applications across many domains. In the field of medicine and dentistry, the use of a surgical simulator application has bridged the gap between didactic learning and clinical training. One surgical simulator which provides a unique platform for surgical training is Touch Surgery (TS) Application. This review highlights the use of cognitive task analysis training in TS and the role of surgical simulators in continuing education courses for medical and dental professionals.

Methods: It is well documented that simulators play a key role in the education of dentistry, but also other healthcare professionals. With the advent of sophisticated mobile technology, simulators have become less costly and more accessible. Touch Surgery is one such mobile application simulator. Cognitive task analysis (CTA) is the underlying methodology used in the Touch Surgery app. Surgical procedures on Touch Surgery are created with leading surgical experts in the field, using a CTA approach. This creates a map of an operation. The medical visualization team layers this onto a VR patient. Cognitive Task Analysis helps you unpack the thought processes of experts, so you can teach them to others. CTA breaks a procedure into its cognitive steps, with particular focus on decision-making.

Results: Meta-analytic research on instructional studies, where CTA is used as part of the design of instruction, provide strong evidence for its benefits. One study analyzed 38 comparison studies and reported an overall average post-training learning and performance gain of about 46 % for CTA training when compared to more traditional training design using expert-based task analysis. Research shows that the implementation of applications in pedagogy have improved knowledge retention, boosted confidence, provided easier access to educational materials, and reduced levels of anxiety with learning.

Conclusion: Simulation experiences can be realistic, highly engaging, and immersive, such that users feel that they are performing on a live patient. It is increasingly important to maximize preoperative learning and postoperative knowledge consolidation, as well as to provide educational tools that can be utilized outside of the hospital to allow surgical training to thrive.

Methods

With the advent of sophisticated mobile technology, simulators have become **less costly and more accessible**. One such mobile application surgical simulator which provides a unique platform for surgical training is Touch Surgery (TS) mobile app (figure 1). Cognitive task analysis (CTA) is one of the fundamental methodologies utilized within the TS app (figure 2). This has been introduced in various virtual residency programs in medical school around the U.S. (figure 3).

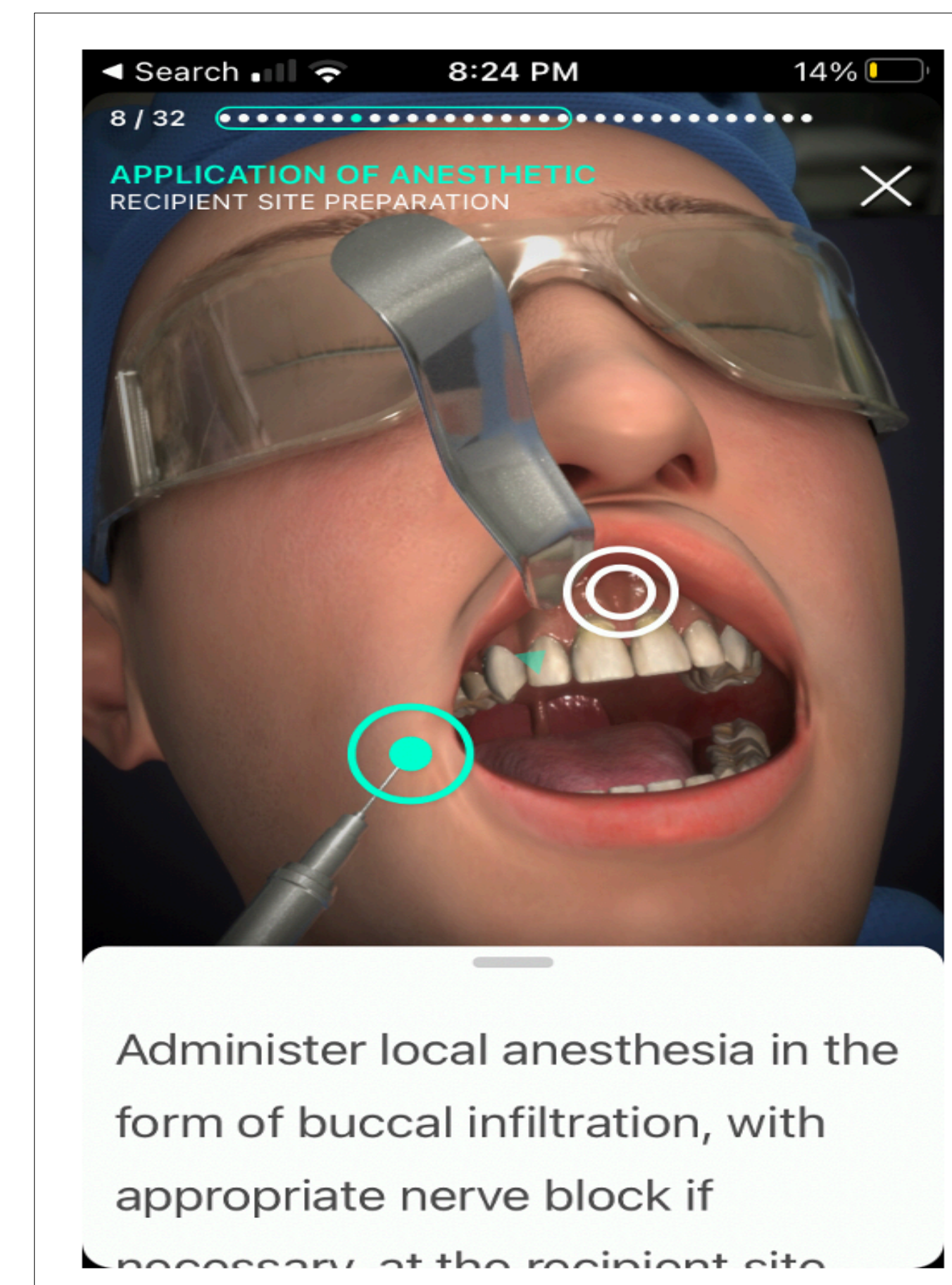


Figure 1. Overview of Touch Surgery mobile app.

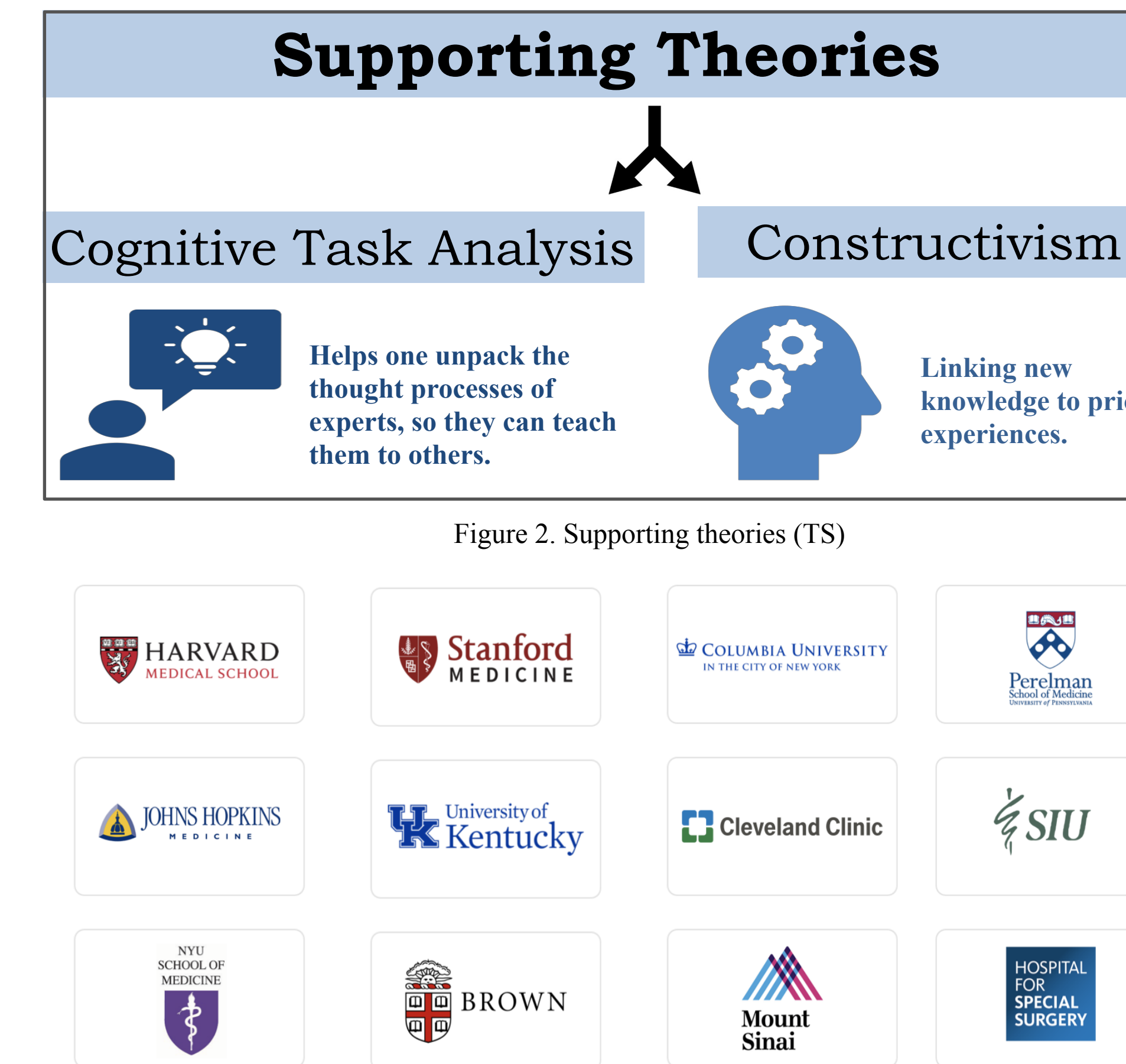


Figure 2. Supporting theories (TS)

Figure 3. Academic institutions integrating TS in their surgical training.

Results

CTA utilizes tools that are also being used to contribute to training and instruction design by providing learners with comprehensive knowledge on how to execute target tasks at high level of competence. These techniques have a higher amount of valuable knowledge about the successful performance of tasks than other information recognition methods. Meta-analytic research provides strong evidence on the CTA use.

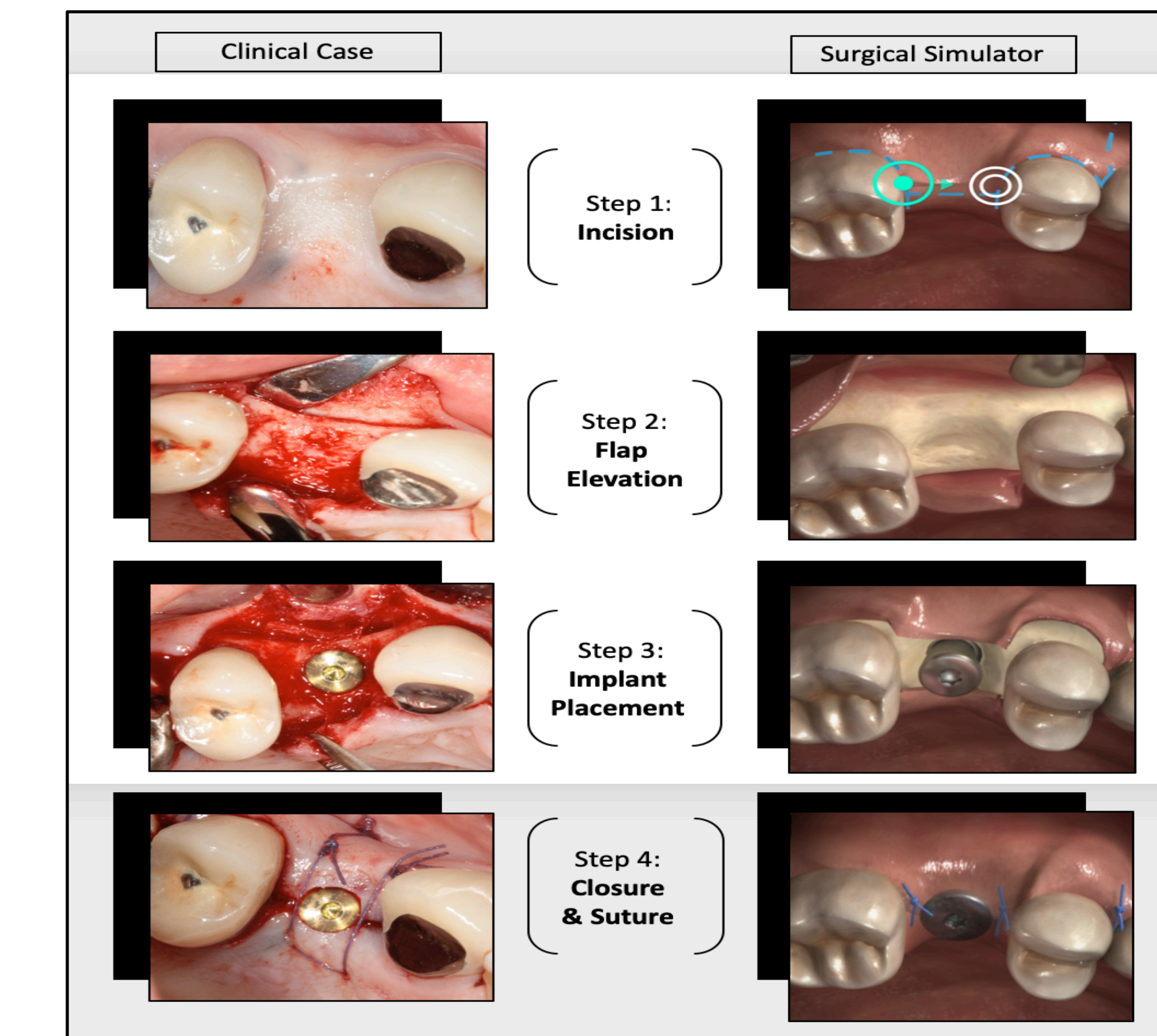


Figure 4. Showing a comparison of implant placement: clinical scenario vs. surgical simulator.

Simulation experiences can be realistic, highly engaging, and immersive, such that users feel they are performing on a live patient (figure 4). It is important to provide educational tools that can be utilized outside of the hospital to allow surgical training to thrive. In a time when surgical training is limited, surgical simulators can be used as a viable alternative.

Conclusion

The COVID-19 pandemic shed a stream of light on an area of learning that has since then progressed tremendously. This area is simulated learning and it has bridged the gap between lecture recordings and clinical experience. Surgical simulators have been implemented into many different healthcare programs around the world for several reasons: **boost patient care confidence, reduce the patient risk, useful in conjunction with traditional teaching methods, increase clinical advancement and facilitate knowledge retention**. Using the cognitive task analysis, the simulator can assess the learners' performance, in both academic institutions and continuing education programs. Surgical simulation is a technique that will continue to grow as more dental institutions and their stakeholders lean more towards standardizing the simulation tools.

Contact person: Tahir.Hamza@tufts.edu

The references can be viewed by scanning the QR code with a phone camera.

