An iPad Simulation of Skin Prepping

D. Lizdas, BS[1,2]; N. Gravenstein, MD[1,2]; I. Luria, MS[3]; S. Lampotang, PhD[1,2]

[1]Department of Anesthesiology, College of Medicine, University of Florida, Gainesville, Florida

[2]Center for Safety, Simulation & Advanced Learning Technologies (CSSALT), University of Florida, Gainesville, FL

[3]College of Medicine, University of Florida

CSSALT Center for Safety, Simulation & Advanced Learning Technologies

Introduction

- Hospital acquired infection (HAI) is a major patient safety concern that includes surgical site infection [1]. Incorrect skin prepping techniques that do not thoroughly disinfect the skin, for example prior to surgery or central venous access, are suspected to be contributory factors to HAI. To better sanitize the skin and effect some exfoliation, modern skin preparation practice has evolved to using "repeated back-and-forth strokes of the sponge for approximately 30 seconds" [2] rather than making an outward overlapping spiral (Figure, left insert).

- The "back-and-forth" technique (Figure, right insert) requires experienced clinicians to unlearn ingrained habits such as the traditional outward spiral scrubbing pattern, a learning/unlearning task that we believed might be facilitated by simulation.

- Tablet computers such as the iPad (Apple, Cupertino, CA) have become popular with clinicians; their small footprint and instant-on capability have promoted their adoption and a transition away from traditional laptops and netbooks. The portability and popularity of tablets increase the likelihood that a simulation customized for a tablet might be at hand when bedside or point of care learning or instruction might occur or be needed.

- We consequently converted and enhanced an existing simulation of skin prepping previously developed for Windows laptops with Director (Adobe, San Jose, CA) [3] so that it would run on an iPad 2 and include a contoured 3D body surface (Figure).
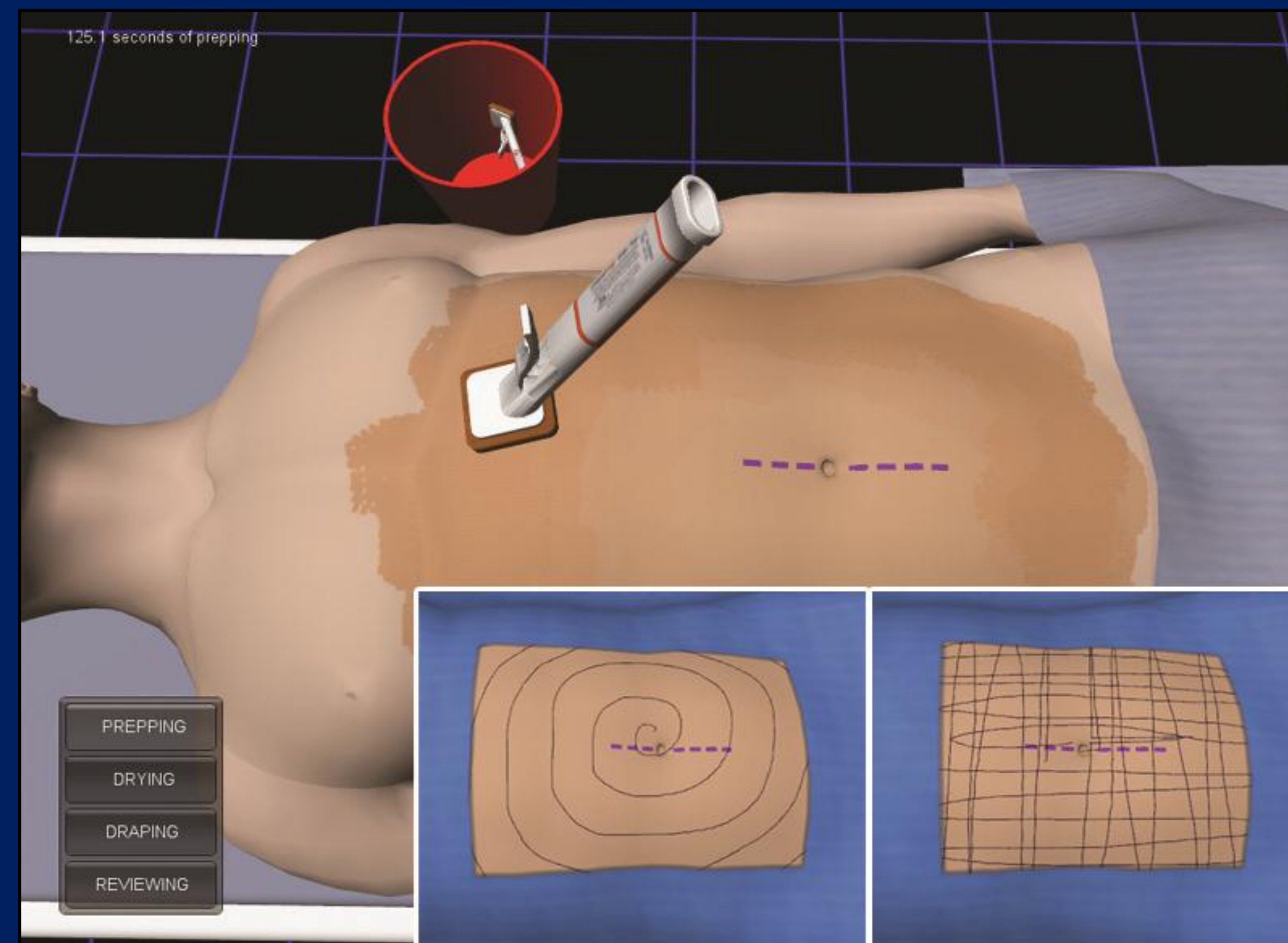
Description

- The simulation was optimized for the iPad 2 touchscreen display to convey the following learning objectives as it relates to skin prepping for an intended midline abdominal incision with a 26 ml applicator that uses a chlorhexidine gluconate (2% w/v) and isopropyl alcohol (70% v/v) solution as the disinfectant (ChloraPrep®, CareFusion, Leawood, KS):

  - use a back-and-forth motion of the applicator instead of an outward spiral trajectory;

  - scrub for at least 30 seconds with the applicator,

  - allow at least 3 minutes for the alcohol in the disinfectant to dry before draping (to minimize the risk of surgical fires) and

  - drape such that the exposed skin is less than the maximum coverage area if only one applicator is used.

- An automated scoring algorithm was developed so that an objective and consistent score is automatically generated immediately after a simulated skin prep procedure, including a detailed breakdown of the score and a graphical record of the applicator path to provide debriefing feedback to the trainee about what was done well and what could be improved. Multi touch feature was used.

- A substantive user interface difference compared to the laptop is that users use the iPad touchscreen feature and move the applicator directly via their fingers over the 3D representation of the abdomen instead of via a pointing device such as a mouse or trackpad. A video of the simulation can be viewed at http://vam.anest.ufl.edu/videos/SkinPrepiPad.wmv. The 3D representation (including the 3D applicator) made use of 63,318 polygons.

Conclusions

- The standardized configuration of the iPad hardware and operating system (compared to the many different permutations and combinations of video display resolution, graphic card capability, RAM, CPU speed, OS, font set, color palette, etc. in a Windows laptop) facilitated development of software that takes full advantage of the iPad processing power and optimization of the skin prep simulator while ensuring a stable platform for all users.

References

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Samsun (Sem) Lampotang, PhD slampotang@anest.ufl.edu

UF&Shands
The University of Florida Academic Health Center