A cross-sectional literacy and ultrasound skills trainer cal and Translational Lampotang S, Lizdas D, Gravenstein N, Ihnatsenka B **Science Institute** Department of Anesthesiology, Center for Safety, Simulation & **UNIVERSITY** of FLORIDA Advanced Learning Technologies, Clinical and Translational Science Institute Simulation Core, University of Florida College of Medicine, Gainesville, FL

Introduction

- as traditional 2D US systems.
- echocardiography.
- the US probe).

Vigilance... Gator Style

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• We introduce the concept of "cross-sectional literacy" as a foundational element that has to be mastered to achieve safety and competency in ultrasound (US) guided medical procedures. A two-dimensional (2D) crosssection of a three-dimensional (3D) object and its 3D surroundings is what a traditional (2D) ultrasound scanner generates. While 3D ultrasound systems have become available, they are more expensive and not as readily available

• Like its literary counterpart, cross-sectional literacy is demonstrated by achieving competency in the 2 "Rs": "Reading" and "wRiting". "Reading" in the case of US imaging means inferring, envisioning, visualizing, identifying a 3D object and its surroundings from a series of 2D cross-sections derived from that same 3D object and its surroundings and nearby landmarks. "wRiting" within the context of US imaging means insonating, obtaining (writing) a desired 2D cross-section (US image) from a 3D shape and its surroundings including any externally introduced objects such as needles. A clinical example of "wRiting" would be obtaining the "standard views" in

• It has been well documented that some humans, especially those with low spatial ability, have difficulty imagining the cross-section of 3D objects. The most common error even has a name: an egocentric error, a descriptive name for the inability to transfer from one's perspective (the view from where one is standing) to the probe's perspective. To visualize the proper cross-section obtained by an US probe, one must be able to abandon a "coordinate system" centered around oneself (i.e., egocentric; with oneself at the origin of the coordinate system) and instead transpose one's perspective as if one were at the US probe (a coordinate system centered on the position and orientation of

Purpose

The purpose of the exhibit is to initiate discussion about the need for cross-sectional literacy to be taught as a fundamental prerequisite skill to clinicians, residents and students as use of ultrasound imaging (which generates a 2D cross-section out of a 3D object) becomes even more widespread in clinical practice. The exhibit consisted of a mixed reality simulator where regular, familiar, 3D objects are virtually embedded into a physical block of gel. Visitors to our scientific exhibit booth will experience hands-on interaction with the simulator by controlling a physical ultrasound (US) probe emulator along its 6 degrees of freedom while working through cross-sectional literacy, US probe manipulation and US image interpretation modules in a structured curriculum.

Learning Objectives

Upon completion of this learning activity, participants should be able to: 1. Numerically evaluate their overall level of cross-sectional literacy compared to their peers in terms of

- the 2 R's (Reading and wRiting cross-sections)
- 2. "Read" cross-sections: correctly infer the 3D shape of 3D objects from which sets of 2D cross-sections are generated as the learner manually controls a physical, simulated ultrasound probe along its 6 degrees of freedom
- 3. "wRite" cross-sections: obtain a requested/desired 2D cross-section from a known 3D object by manually controlling a physically simulated ultrasound probe along its 6 degrees of freedom
- 4. Demonstrate psychomotor and cognitive skills in controlling an ultrasound probe, correctly interpreting an ultrasound image, including recognition of artifacts and safely guiding a needle to its desired target while avoiding undesirable "no-go" areas
- 5. Apply the reading and writing skills learned in the cross-sectional literacy modules and the interpretation skills acquired in the ultrasound trainer modules to ultrasound (US)-guided and USassisted needling in their clinical practice







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