

## INTRODUCTION

Residents and medical students have reported that they do not receive adequate training and feel unprepared to perform invasive types of procedures on patients during residency (1).

Ultrasound (US) guidance stands out as a universally applicable skill that decreases complication rates and increases success rates in new learners when used to guide procedures (2–6). Its use spanning multiple clinical disciplines, is low risk to patients, and is readily accessible to novice users.

Formalin-embalmed cadavers are available at many medical education institutions and can be used to create realistic, cost effective, and low stress training simulations in ultrasound-guided procedures (11,12).

## OBJECTIVES

**The primary aim of this study is to develop a practical, realistic, and inexpensive method of teaching medical students to perform US-guided access and drainage of synthetic cysts in formalin embalmed cadaver tissue.**

## METHODS

### Equipment

- Three Mindray MX7 ultrasound systems equipped with L12-3RC linear transducers (Mindray Global, Shenzhen China) were used to guide 18g 2-inch hypodermic needles on 30cc syringes during cyst access and drainage.

### Subjects

- 30 Geisel School of Medicine at Dartmouth College students. Approval of the study was granted by Dartmouth Committee for the Protection of Human Subjects (#00032735).

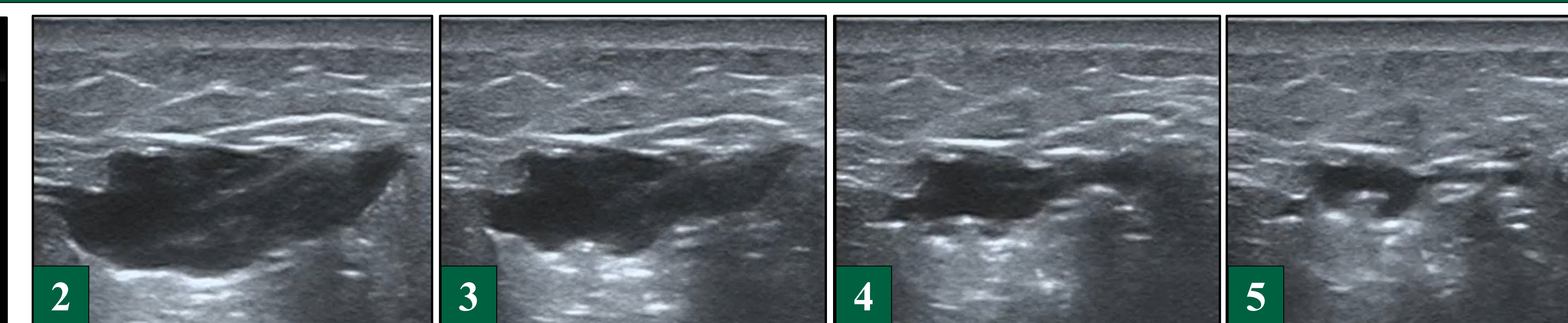
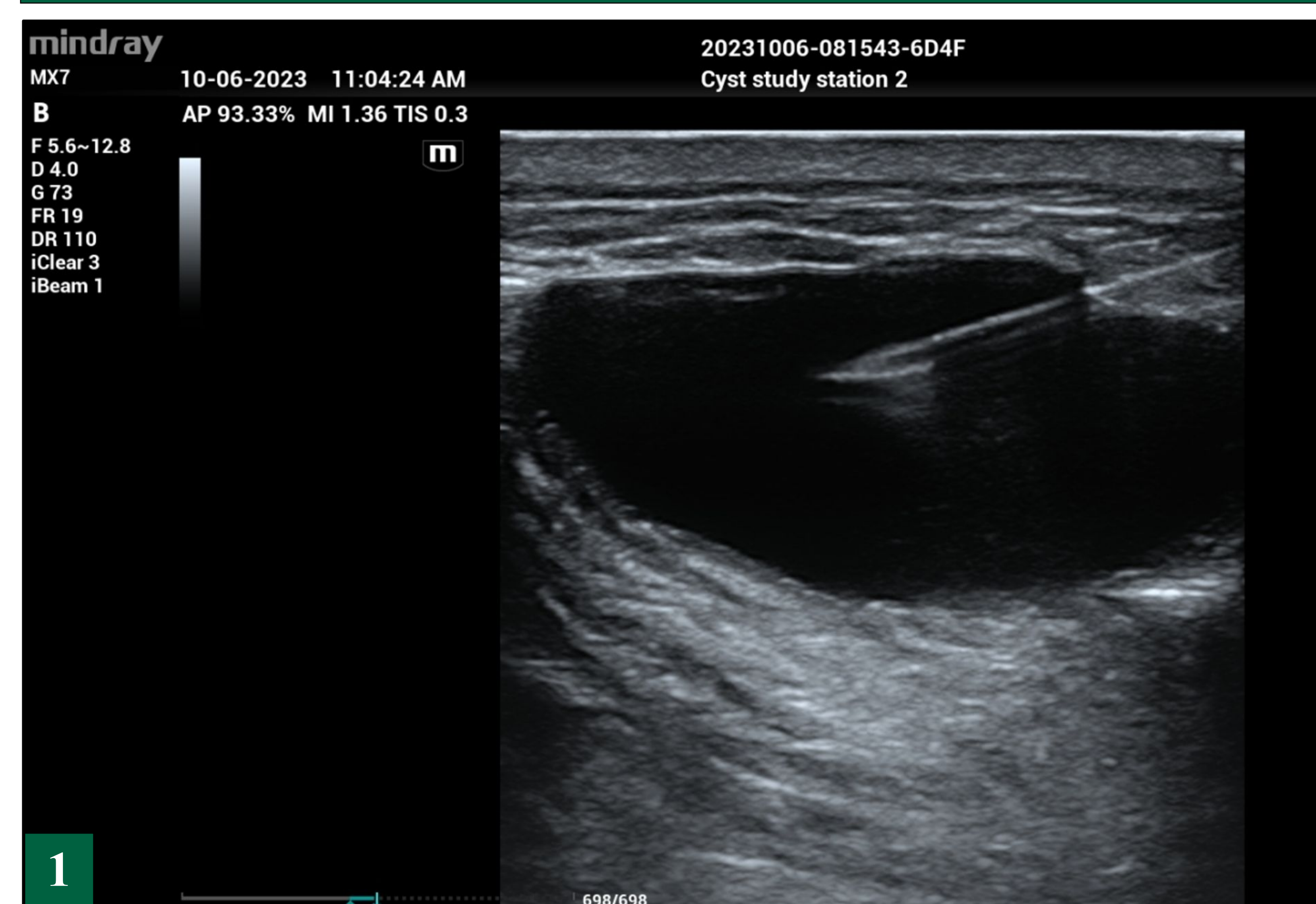
### Procedure

- Participants took a pre-training survey that used a 5-point Likert scale to gauge their self-confidence in performing various aspects of the procedure, gathered demographics, and experience level with ultrasound. Next, participants watched a 15-minute training video covering the basics of imaging synthetic cysts and the steps required to drain them under ultrasound-guidance. During the training workshop, participants were allotted 20 minutes to use a procedure simulation station to practice the procedure in a low stress, low stakes environment with one-on-one instructor, three synthetic cysts, and unlimited attempts to practice the procedure.
- Participants were given 5 minutes, and three cysts to pass a skills assessment during which they were required to image and drain ("full drain" was defined as  $\approx$ 15-20 CCs as confirmed by the instructor) of the fluid from a single cyst independently. Metrics regarding performance was recorded by an instructor using a procedure assessment rubric previously validated global ratings scale (13)
- Following skills evaluation a post-training survey was administered. Questions on this survey mirrored the pre-training survey with the addition of an open-ended opportunity for participants to share their thoughts regarding the training program.

### Statistics

- Pre vs. post improvement was expressed in percentages however all assessments for association performed on the pre vs. post were performed using paired t-tests on the actual scores.
- All analyses were performed using SAS/STAT v.9.4 (SAS Institute Inc., Cary, NC). Significant differences were declared at  $P \leq 0.05$ .

## RESULTS



A. Scenario Category	Mean score Improvement	Pre vs. Post P-value	Confidence Improvement	Pre vs. Post P-value
All scenarios	35.48%	2.94E-11	17.44%	1.37E-05
By Exam Type				
EFAST	32.26%	1.43E-09	14.32%	1.95E-04
Lung	59.68%	8.27E-08	24.07%	2.28E-05
Echo/pocus pulse	29.03%	2.97E-06	19.97%	1.95E-04
By Decision Type				
Treatment	43.55%	4.40E-11	18.56%	4.40E-05
Receiving facility choice	34.68%	2.87E-07	15.66%	7.86E-05
Receiving facility alert	25.00%	5.02E-05	15.66%	7.86E-05
<b>B. Clinical decision scenarios decision change Pre vs. Post-course for all scenarios Frequency (%)</b>				
Incorrect → Correct	168 (38.71)			
Correct → Correct	226 (52.07)			
Correct → Incorrect	14 (3.23)			
Incorrect → Incorrect	26 (5.99)			

## CONCLUSIONS

- The ultrasound images of the synthetic cysts within formalin-embalmed tissue were very clear and realistic, with excellent needle visibility during access and drainage.
- The simulation stations were created using cheap and readily available materials, making this program feasible and reproducible for any program with access to formalin-embalmed cadavers and ultrasound equipment.
- Medical trainees can use this method to practice cyst drainage under ultrasound guidance and effectively learn to perform the procedure and increase their self-confidence through realistic and repeated practice in a low stress environment that is free from any potential patient discomfort.

## REFERENCES

