

LOW-COST ARTERIAL LINE MODEL IMPROVES PROCEDURAL CONFIDENCE IN TRAINEES

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Introduction:

Arterial cannulation is a must-have skill in fields such as anesthesiology, emergency medicine, intensive care, and cardiology. Traditionally, medical students and residents undergo the model of see one, do one, teach one to learn most of the procedures, however, those who underwent simulation training had decreased complication and higher success rates compared to traditional methods [1,2]. Current arterial line simulation models may not be universally accessible due to factors such as cost and access to simulation rooms. Our team developed a model using common materials and examined participants' changes in confidence levels after training with this model.

Methods:

We developed a cost-effective novel porcine arterial line model using materials commonly found in the anesthesia supply room and hosted a training session for residents. Eleven residents from internal medicine, anesthesiology, emergency medicine, and surgery participated in this study. They were asked to rate their arterial line pre-training overall confidence (OC), hand-eye coordination (HE), and ability to troubleshoot (TS) on a 0-to-10 scale, with 0 as having no confidence, and 10 being fully confident. Then, each resident was given 5 minutes to perform instructor-guided in-plane and out-of-plane arterial line technique using this model. They were asked to rate each aspect on the same scale post-training .

Results:

All participants were able to show improvement in confidence levels in all three sections. Paired-sample t-test was conducted to compare pre-training and post-training self-assessment values. As per Table 1, We found a significant difference between pre- and post-training OC ($M = 2.09$, $SD = 1.30$); $t(10) = 5.333$, $p = 0.0003$. We also found a significant difference between pre- and post-training HE ($M = 1.36$, $SD = 0.67$); $t(10) = 6.708$, $p = 0.0001$. Lastly, we found a significant difference between pre- and post-training TS ($M = 2.18$, $SD = 1.08$); $t(10) = 6.708$, $p = 0.0001$.

Conclusion:

Arterial cannulation is often one of the more difficult techniques for trainees due to its multi-step process, requiring multiple points of troubleshooting and feedback for a successful placement. The current models on the market are cost-prohibitive, often in the thousands-of-dollars range. Our easily constructed model has ultrasound properties similar to that of real human tissue, and generates flashback that mimics real life and can aid in trainees' troubleshooting and intra-procedural decision making. Additional studies are needed to compare efficacy of commercial products v.s. our DIY kit.

References:

1. Hoskote SS, Khouli H, Lanoix R, et al. Simulation-based training for emergency medicine residents in sterile technique during central venous catheterization: impact on performance, policy, and outcomes. *Acad Emerg Med* 2015; 22:81–87
2. Evans LV, Dodge KL, Shah TD, et al. Simulation training in central venous catheter insertion: improved performance in clinical practice. *Acad Med* 2010; 85:1462–1469

Table 1. Pre-training vs Post-training Overall Confidence, Hand-Eye Coordination, and Ability to Troubleshoot

Paired Samples Test											
	Paired Differences					t	df	Sig. (2-tailed)			
	Mean	Std. Dev.	Std. Error Mean	95% Confidence Interval of the Difference							
				Lower	Upper						
Pair OC post-pre	2.09	1.30	0.392	1.22	2.96	5.333	10	0.0003			
Pair HE post-pre	1.36	0.67	0.203	0.91	1.82	6.708	10	0.0001			
Pair TS post-pre	2.18	1.08	0.325	1.46	2.91	6.708	10	0.0001			

OC = overall confidence, HE = confidence in hand-eye coordination, TS = ability to troubleshoot; post-pre = difference between post-training and pre-training. Higher mean difference correlates with improved confidence level.