Creation and Implementation of a Neuraxial Spine Phantom Model and Workshop for Teaching Neuraxial Blocks

Introduction: Simulation has been shown to assist the education of anesthesiology trainees.1 However, cost and availability of models, whether phantom or living, limits access to this training technique.2 The creation of affordable, reproducible, and shelf-stable phantoms can improve access to simulation-based learning and enhance the education of trainees.3-5 This study examined the efficacy of a novel spine phantom combined with an educational, hands-on workshop to improve knowledge of the skills required to perform ultrasound-assisted/-guided neuraxial blockade and ability to demonstrate image acquisition on the phantom for ultrasound views required for blockade.

Methods: Six novel spine phantoms were created by suspending a lumbosacral spine model (SKU 1340-1 x1; Sawbones; Pacific Research Laboratories, Inc, Vashon, WA; $157; Model SP095 x5; XINDAM; amazon.com, $37) in 10% ballistics gel (Clear Ballistics, LLC; Greenville, South Carolina; $136). Total cost per model averaged $103 and resulted in a spine phantom that is stable for use indefinitely. An educational workshop was developed that consisted of a pre-quiz for knowledge and comfort baseline; pre-work with educational tools (one journal article and two videos) relating to acquisition of neuraxial ultrasound images required for spinal and epidural blockade; a one-hour hands-on workshop with brief educator demonstration of scanning techniques on the spine phantom followed by trainee hands-on practice and then demonstration of ability to obtain relevant neuraxial views; and finally a post-quiz for knowledge and comfort post-intervention.

Results: Seven pediatric anesthesiology fellows participated in the workshop. Mean pre-quiz score was 56% correct, with post-quiz mean score increasing to 93% correct, an overall improvement of 37%. Using Likert scale ranking, all trainees reported increased agreement with post-intervention comfort with the use of ultrasound compared to pre-intervention for neuraxial blocks as follows: single shot spinal (pre = 14%; post =71%), single shot caudal (pre = 0%; post = 86%), and neuraxial catheter (pre = 43%; post = 71%). Each of the seven participants was successfully able to demonstrate image acquisition for the following clinically relevant views: paramedian sagittal interlaminar (“horse head” sign) and articular process (“camel hump”) views; midline sagittal transverse process (“trident” sign) view; and transverse sacral cornua (“frog” sign), interspinous process (“bat” or “flying bat” sign), and spinous process views. All participants reported that they are more likely to use ultrasound for neuraxial procedures in patients going forward. Also, they positively agreed that both the pre-work materials and hands-on workshop were helpful and a valuable use of their time.

Conclusions: Based on the study findings, the novel spine phantom is an affordable, effective tool for trainees to gain hands-on practice and improve comfort with neuraxial ultrasound image acquisition. The workshop—consisting of pre-work and hands-on phantom scanning—increased knowledge related to neuraxial ultrasound use in the immediate post-intervention period. A follow up post-quiz at 6 months will be used to assess knowledge retention and behavioral change as it relates to participants clinical practice habits regarding neuraxial ultrasound use for block placement.

References:

1. RegAnesthPainMed 2017;42: 741–750

2. RegAnesthPainMed 2019;44:986–989.

3. JUltrasoundMed 2011; 30:263–272

4. RegAnesthPainMed 2016;41: 151–157

5. RegAnesthPainMed 2012;37: 51Y54"