Creating a Neuraxial Spine Phantom Model and Workshop for Teaching Neuraxial Block Skills

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BACKGROUND

Simulation assists education of anesthesiology trainees[1] but cost and model availability limit accessibility.[2] Affordable, reproducible, and shelf-stable phantoms improve access to simulation-based learning and enhance trainee education.[3-5] This study examined the efficacy of a novel, affordable spine phantom combined with a hands-on workshop to improve knowledge of the skills required to perform ultrasound-assisted/-guided neuraxial blockade and ability to acquire clinically relevant ultrasound (US) images on the phantom.

METHODS

Six novel spine phantoms (Figure 1) were created by suspending a lumbosacral spine in ballistics gel; cost/model averaged $103 with a model stable for use indefinitely. The workshop consisted of a pre-quiz for knowledge and baseline comfort; pre-work with educational tools (journal article and two videos) relating to acquisition of neuraxial US images (Figure 2) required for spinal and epidural blockade; a one-hour hands-on workshop, including brief educator-led 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. Mean quiz score improved 37% (pre = 56%, post =93%) with sample questions shown in Figure 3. All trainees reported increased post-intervention comfort (Figure 4) with the use of US 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%. All participants successfully acquired images of the clinically relevant views: paramedian sagittal interlaminar ("horse head" sign) and articular process ("camel hump" sign); midline sagittal transverse process ("trident" sign); and transverse sacral cornua ("frog" sign), interspinous process ("bat" or "flying bat" sign), and spinous process. All participants reported increased likelihood of US use with future neuraxial procedures and agreement that both pre-work materials and hands-on workshop were a helpful, valuable use of their time.

Figure 1. Spine phantoms.

Figure 2. Sample US images acquired from phantom. US sign: A. Frog. B. Horse head. C. Camel hump. D. Bat wing.

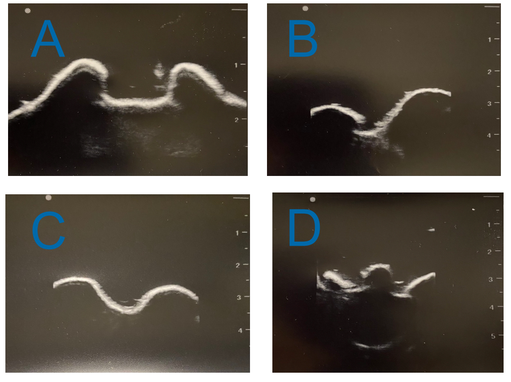


Figure 3. Percentage Correct: Pre- and Post-Test Knowledge Questions

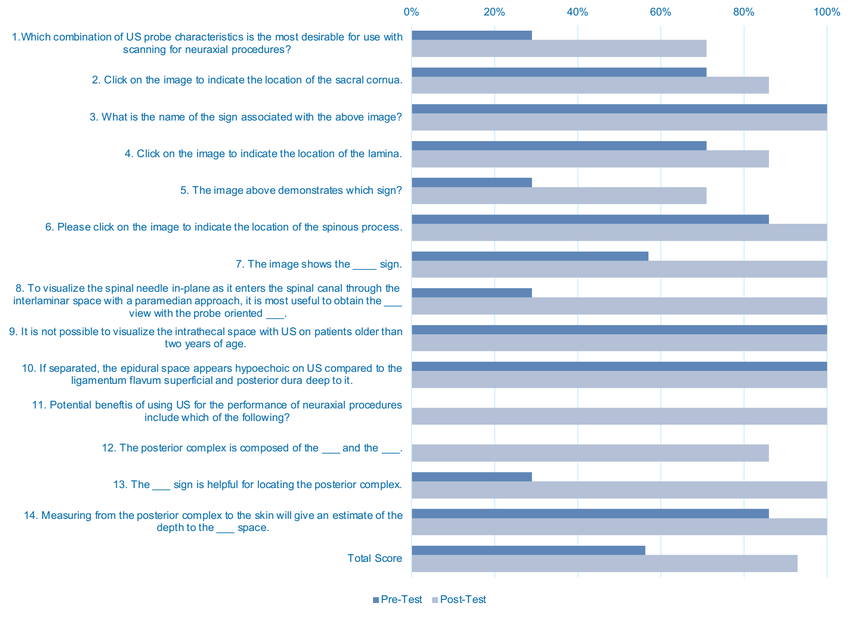
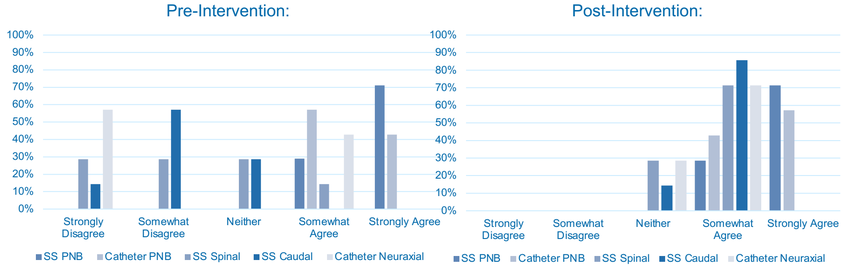


Figure 4. Comfort with US use for individual blocks.



CONCLUSIONS

The novel spine phantom is an affordable, effective tool to gain hands-on practice and improve comfort with neuraxial US image acquisition. The workshop (pre-work and hands-on phantom scanning) increased knowledge related to neuraxial US use post-intervention. 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.

IMPLICATIONS

The techniques for affordable phantom creation and educational, hands-on workshop assessed in this study are potential tools for expanding anesthesiology trainees' access to simulation-based learning with US.

REFERENCES

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