Use of Low-Cost EBUS-TBNA Simulator is Effective in Teaching TBNA

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Introduction:

Endobronchial ultrasound (EBUS) is a procedure performed by pulmonologists to be able to visualize lymph nodes that are adjacent to the airway, primarily in the mediastinum and hila. Transbronchial needle aspiration (TBNA) is performed in conjunction with EBUS as a way of sampling tissue from an airway-adjacent lymph node or mass. Use of simulators and phantoms has helped learners gain procedural skills independent of clinical encounters, thus improving the learning experience for both providers and patients. Gelatin-based phantoms have been used for teaching many types of ultrasound-based procedures. We hypothesized that we could develop a phantom that would be successful in teaching learners to perform TBNA.

Methods:

Through an iterative process, gelatin-based models were developed to practice TBNA procedures. A very low-cost model using unflavored gelatin, psyllium fiber, a wooden dowel, a baking loaf pan, blueberries and grapes was developed. The construction of the model was relatively quick, taking about an hour of hands-on time and then solidifying overnight. The phantom had an airway that traversed through gel, with "lymph nodes" scattered about the sides and above the airway, simulating lymph nodes lateral and anterior to the trachea, though without other anatomic landmarks. A slightly higher cost, more durable model was developed using similar techniques using medical ballistics gel. Pre-testing of fellows' ability to perform a TBNA was performed prior to an instructional session of how to use the TBNA needle with the opportunity for fellows to practice technique on the gelatin phantom. The assessment was done using a 15-point checklist that is part of a validated EBUS assessment (EBUS-STAT). A post-test of TBNA performance was completed following the training session.

Results:

We successfully developed task trainers out of both unflavored gelatin with psyillium fiber, as well as medical ballistics gel. The low-cost model cost less than $10 per model to produce, plus the cost of the reusable baking pan. Cost to produce the more durable ballistics gel model was about $100. The ultrasound characteristics of the very low-cost gelatin-based model was subjectively deemed to be superior to those of the ballistics gel model. Over the course of three sessions, 20 fellows (7 first-year, 7 second-year, 6 third-year) participated in the transbronchial needle aspiration training. On the pre-training assessment, the median score was 4.5 out of 15 points (range 0-15). On the post-training assessment, 85% of fellows scored 15 out of 15 points, with the lowest post-training score being 13/15. The median improvement was 10 points on the 15-point scale.

Conclusions:

We successfully developed two versions of a phantom model that simulated an airway and lymph nodes. These models were successfully used to train fellows in performance of TBNA, and post-training assessments demonstrated both significant improvement and achievement of

proper technique by the majority of fellows. These models could be reproduced and utilized by our fellowship program and others to improve procedural practice and performance of TBNA. Further assessment of TBNA skills is ongoing to evaluate retention of this procedural skill.