Title
Cricothyrotomy: An Inexpensive Training Model

Permalink
https://escholarship.org/uc/item/5wh4279z

Journal
Western Journal of Emergency Medicine: Integrating Emergency Care with Population Health, 18(5.1)

ISSN
1936-900X

Authors
Malik, E
Deutchman, M

Publication Date
2017

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ROAR: Resident Ovation and Appreciation Rewards, on the Path to Wellness in Emergency Medicine

Rainey J, Klyce V, Neugarten C, Chien J, Williams S, Fukumoto K, Mahadevan S/Stanford/Kaiser Emergency Medicine Residency Program, Stanford, CA; El Camino Hospital, Mountain View, CA

**Background:** Residency is challenging: physically, emotionally, and mentally. Numerous studies cite burnout rates amongst residents as high as 76%. Research also demonstrates that physicians who are primed to feel emotionally positive are more effective, ultimately providing higher-quality patient care. With this goal in mind, development of a wellness curriculum for residents could potentially mitigate burnout during training, promote practices that build personal and professional resiliency, and lead to a long and fulfilling career.

**Educational Objectives:**
- To present an inexpensive task trainer for the education and practice of cricothyrotomy
- To compare the effectiveness of teaching with this constructed model against sheep trachea

**Curricular Design:** Ten task trainers were constructed from a Styrofoam head, ribbed garden hose with a cut hole for the cricothyroid space, electrical tape as the cricothyroid membrane, zip-ties to signify the laryngeal prominence and cricoid cartilage, and foam sheets with Tegaderm to represent the subcutaneous layers (Fig. 1). Twenty second-year medical students were given a 10 minute lecture on the standard, surgical cricothyrotomy and then randomly divided into two groups for practice on either the constructed model or the sheep trachea. After 10-15 minutes of practice, students were given a pristine airway of the same model type and evaluated on their ability to correctly perform a cricothyrotomy using a procedural checklist.
Impact/Effectiveness: There was no significant difference in trainee scores on the procedural checklist using the constructed model (mean 18.5; SD 1.6) compared to the animal model (mean 18.0; SD 2.9) (p = 0.64) (Fig. 2). Students completed the procedure faster on the constructed model (mean 84.1 s; SD 17.8 s) than on the sheep trachea (mean 117.5 s; SD 54.3 s) (p = 0.038). These results suggest that learning the procedural steps of cricothyrotomy on our model is equivalent to learning on animal tissue. Students’ ability to complete the steps more quickly on the constructed model may be due the lack of subcutaneous tissue to dissect, simplifying the anatomy. Our model allows trainees to perform many iterations of a cricothyrotomy without the expense or difficulties in procurement and storage with animal or commercially available models. Overall, this model addresses the need for increased access to cheap, hands-on practice of cricothyrotomy for medical trainees.

### Figure 2

Comparison of the trainee performance on the constructed model vs sheep trachea on the procedural checklist. The p value was determined using Fisher’s exact test. Data are expressed as mean (SD).

<table>
<thead>
<tr>
<th>Procedural Step</th>
<th>Constructed Model</th>
<th>Sheep Trachea</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Correctly identifies cricothyroid membrane</td>
<td>2.0 (0.0)</td>
<td>1.9 (0.3)</td>
<td>1.00</td>
</tr>
<tr>
<td>2. Vertical, midline incision, 3-5 cm, stabilized larynx</td>
<td>2.0 (0.0)</td>
<td>2.0 (0.0)</td>
<td>1.00</td>
</tr>
<tr>
<td>3. Bluntly disrupts cricothyroid membrane</td>
<td>1.8 (0.6)</td>
<td>1.8 (0.6)</td>
<td>1.00</td>
</tr>
<tr>
<td>4. Horizontal, 1-2 cm incision in membrane</td>
<td>1.9 (0.3)</td>
<td>1.9 (0.3)</td>
<td>1.00</td>
</tr>
<tr>
<td>5. Index finger of non-dominant hand guards opening</td>
<td>1.8 (0.8)</td>
<td>1.8 (0.7)</td>
<td>0.58</td>
</tr>
<tr>
<td>6. Spreads membrane vertically with clamp</td>
<td>1.9 (0.3)</td>
<td>1.6 (0.8)</td>
<td>0.47</td>
</tr>
<tr>
<td>7. Rotates clamp 90 degrees</td>
<td>1.8 (0.6)</td>
<td>1.5 (0.8)</td>
<td>0.58</td>
</tr>
<tr>
<td>8. Inserts and twists endotracheal tube into place</td>
<td>1.8 (0.6)</td>
<td>1.9 (0.3)</td>
<td>1.00</td>
</tr>
<tr>
<td>9. Blows up cuff with 10 ml syringe</td>
<td>1.8 (0.6)</td>
<td>2.0 (0.0)</td>
<td>1.00</td>
</tr>
<tr>
<td>10. Verbalizes connecting to ventilator, checks CO2</td>
<td>1.7 (0.7)</td>
<td>1.8 (0.6)</td>
<td>1.00</td>
</tr>
<tr>
<td>Total scores</td>
<td>18.5 (1.6)</td>
<td>18.0 (2.9)</td>
<td>0.64</td>
</tr>
</tbody>
</table>

2. **Incorporating an Interesting Case Discussion Board into an Emergency Medicine Clerkship**

Wald D, Fane K, Barrett J/Lewis Katz School of Medicine, Philadelphia, PA

**Background:** With shift work scheduling and students being assigned to geographically separate training sites, student - student collegial interaction is limited. Asynchronous discussion boards may help to address this and allow for more comparable educational experiences across clinical training sites.

**Educational Objectives:** Our goal was to incorporate an asynchronous “Interesting Case” discussion board into a 4th year EM clerkship for students rotating at geographically separate training sites.

**Curricular Design:** Using Blackboard Learning Management System, a student initiated “Interesting Case” discussion board was developed. Guidelines including expectations for participation were reviewed during the clerkship orientation. The discussion board allows students working different shifts and assigned to separate training sites to interact by creating case threads and replying to posts about cases encountered during their EM clerkship. A post clerkship evaluation was administered.

**Impact/Effectiveness:** From May - September 2016, 83 students at 8 clinical training sites participated in the “Interesting Case” discussion board. Students initiated 126 separate threads, 501 total posts. The mean # of threads per rotation was 25 (range 19-29), mean posts per rotation was 100 (range 65 - 159). 131 posts included references or hyperlinks, 49 PDF’s, 44 radiographic images, 16 photographs and 15 EKG’s. More than one third (37.3%) of threads had 5 or more posts. 63 students (75.9%, n=83) completed post clerkship evaluations. Most students (82.5%) favorably viewed our discussion board. Only 8 students (12.7%) report previously participating in a discussion board for medical education purposes. The majority, 55.6% reviewed the discussion board every few days, 22.2% reviewed it weekly. 63.5% of students spent 1-3 hours each week on the discussion board. 77.8 % of students report learning something from participation in the discussion board that they were able to directly apply to patient care during their rotation. 79.4% of students report reviewing articles or linking to websites that were posted. In the first 5 months of use, the discussion board was well received, improved collegial interactions and generated many interesting conversations.