

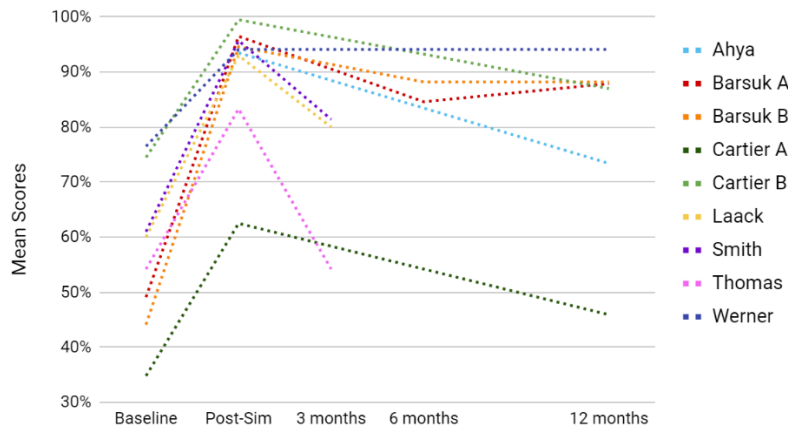
## Data Supplement S1. Supplemental material.

**Table S1.** Electronic search strategies

Note: Searches were conducted as an Ovid multi-database search. Line 1-4 are optimized for MEDLINE. Lines 5-9 are optimized for Embase. Line 10 is optimized for CENTRAL. The next lines isolate the records to the database the search was designed for, combine those sets and then remove duplicate records and final isolate the records from each database again so each can be downloaded and imported into the citation manager using a database-specific import filter.

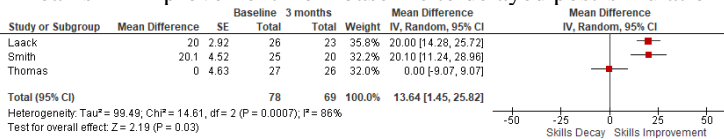
1. Simulation Training/ or Patient Simulation/ or exp Computer Simulation/ or Manikins/ or Models, Anatomic/ or (simulat\* or virtual reality or augmented reality).ti,ab,kf.
2. Clinical Competence/ or Professional Competence/ or Educational Measurement/ or Time Factors/ or (Retention or retain or skill\* or proficien\* or reassess\* or re-eval\* or sustain\* or competen\*).ti,ab,kf.
3. exp Intubation, Intratracheal/ or exp Pericardiocentesis/ or exp Chest Tubes/ or Catheterization, Central Venous/ or Central Venous Catheters/ or (intub\* or cricothy\* or cric or thyrocri\* or inferior laryngotomy or intercricothy\* or coniotom\* or emergency airway puncture\* or pericardiocent\* or pericardi\* tap\* or pericardi\* puncture\* or pericardicentes\* or cardioparacentes\* or pericardial aspirat\* or chest tube\* or chest drain\* or thora\* catheter\* or pleural catheter\* or tube thoracost\* or intercostal drain\* or pleural tap or thoracentes\* or thoracocentes\*).ti,ab,kw. or ((central or peripheral\* or vascular or venous) adj2 (line\* or catheter\* or cannul\* or access\*)).ti,ab,kw.
4. 1 and 2 and 3 and journal article.pt.
5. Simulation/ or Computer Simulation/ or Simulation Training/ or Patient Simulation/ or High Fidelity Simulation Training/ or Simulator/ or Virtual Reality/ or exp Anatomic Model/ or (simulat\* or virtual reality or augmented reality).ti,ab,kw.
6. Competence/ or Clinical Competence/ or Professional Competence/ or Standard/ or Time/ or Time Factor/ or (Retention or retain or skill\* or proficien\* or reassess\* or re-eval\* or sustain\* or competen\*).ti,ab,kw.
7. exp endotracheal intubation/ or exp Pericardiocentesis/ or exp Chest Tube/ or exp Central Venous Catheterization/ or Central Venous Catheter/ or (intub\* or cricothy\* or cric or thyrocri\* or inferior laryngotomy or intercricothy\* or coniotom\* or emergency airway puncture\* or pericardiocent\* or pericardi\* tap\* or pericardi\* puncture\* or pericardicentes\* or cardioparacentes\* or pericardial aspirat\* or chest tube\* or chest drain\* or thora\* catheter\* or pleural catheter\* or tube thoracost\* or intercostal drain\* or pleural tap or thoracentes\* or thoracocentes\*).ti,ab,kw. or ((central or peripheral\* or vascular or venous) adj2 (line\* or catheter\* or cannul\* or access\*)).ti,ab,kw.
8. 5 and 6 and 7
9. limit 8 to embase
10. ((simulat\* or virtual reality or augmented reality) and (retention or retain or skill\* or proficien\* or reassess\* or re-eval\* or sustain\* or competen\*) and (intub\* or cricothy\* or cric or thyrocri\* or inferior laryngotomy or intercricothy\* or coniotom\* or emergency airway puncture\* or pericardiocent\* or pericardi\* tap\* or pericardi\* puncture\* or pericardicentes\* or cardioparacentes\* or pericardial aspirat\* or chest tube\* or chest drain\* or thora\* catheter\* or pleural catheter\* or tube thoracost\* or intercostal drain\* or pleural tap or thoracentes\* or thoracocentes\* or ((central or peripheral\* or vascular or venous) adj2 (line\* or catheter\* or cannul\* or access\*))))).ti,ab,kw.
11. 4 use medall
12. 9 use emczd
13. 10 use cctr
14. or/11-13
15. Remove duplicates from 14
16. 15 use medal
17. 15 use emczd
18. 15 use cctr

## Performance of Central Venous Line Insertion Post-Simulation

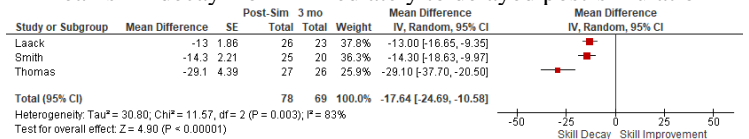


### 3 months post-simulation

#### Mean skill improvement from baseline to delayed post-simulation

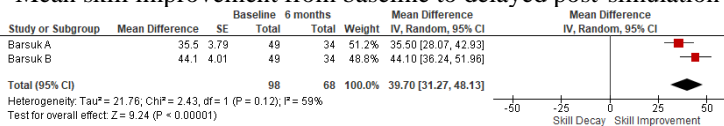


#### Mean skill decay from immediately to delayed post-simulation

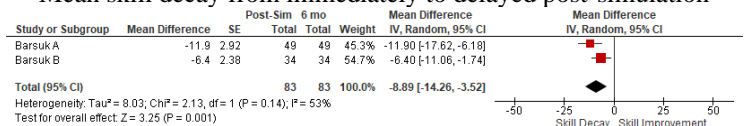


### 6 months post-simulation

#### Mean skill improvement from baseline to delayed post-simulation

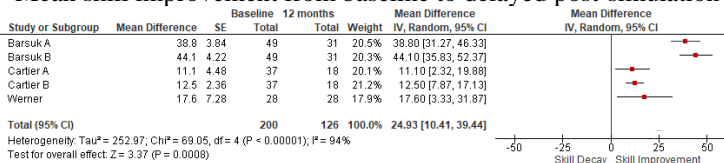


#### Mean skill decay from immediately to delayed post-simulation

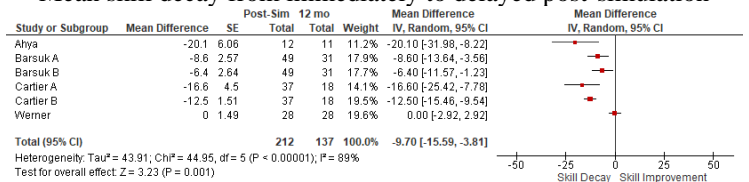


### ≥12 months post-simulation

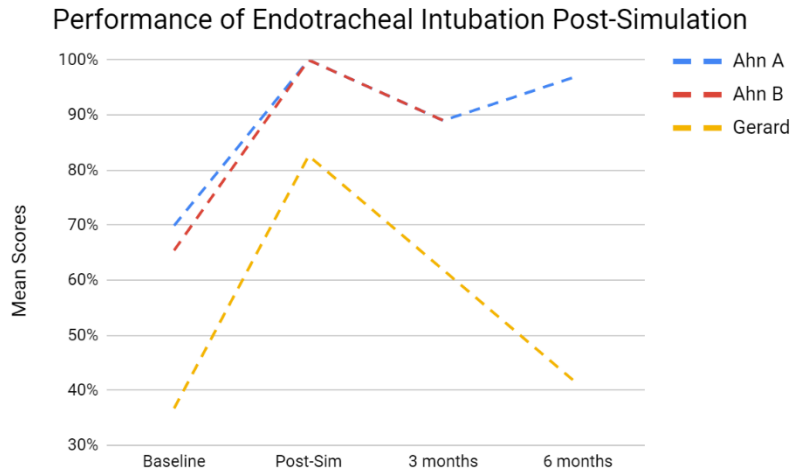
#### Mean skill improvement from baseline to delayed post-simulation



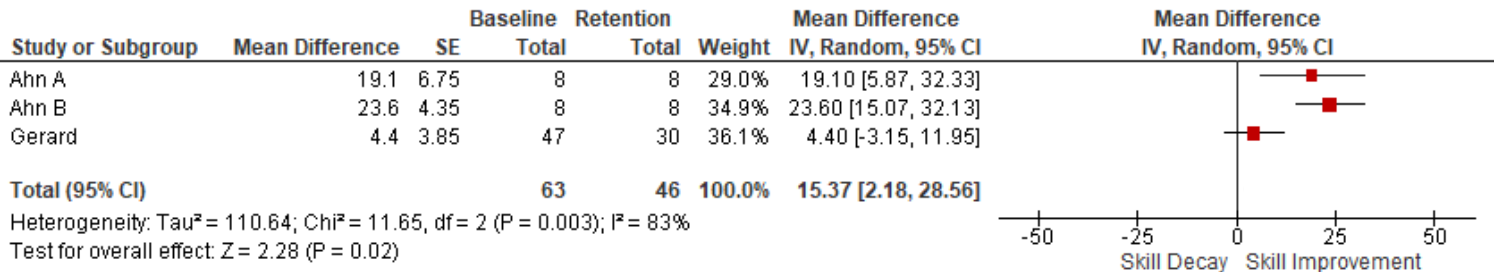
#### Mean skill decay from immediately to delayed post-simulation



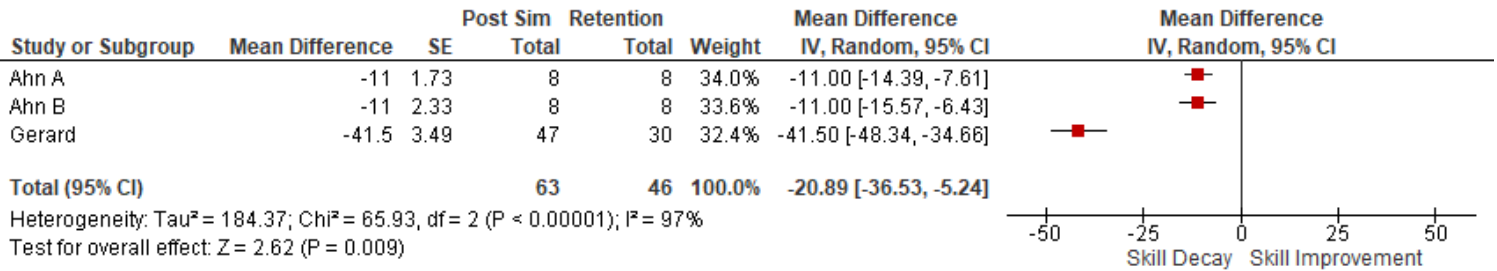
**Figure S1.** Participants' central venous line insertion performance scores at baseline, immediately post-simulation and at 3, 6, and ≥12 months post-simulation. When there was high heterogeneity ( $I^2 > 80\%$ ), no pooled estimate is shown.



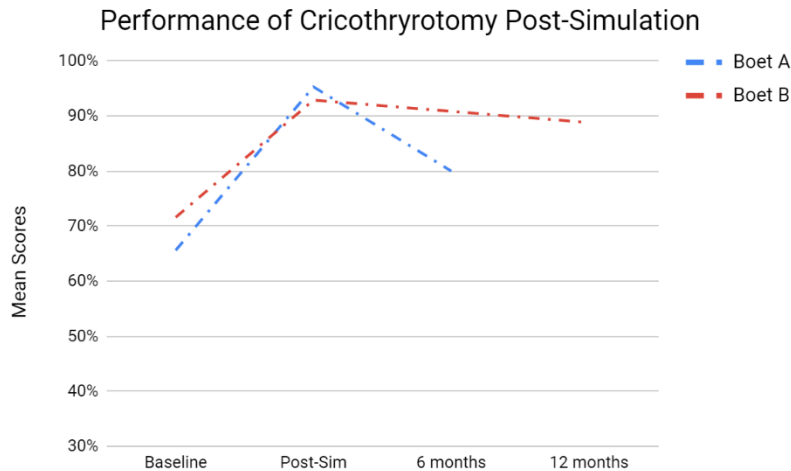
### Mean skill improvement from baseline to delayed post-simulation



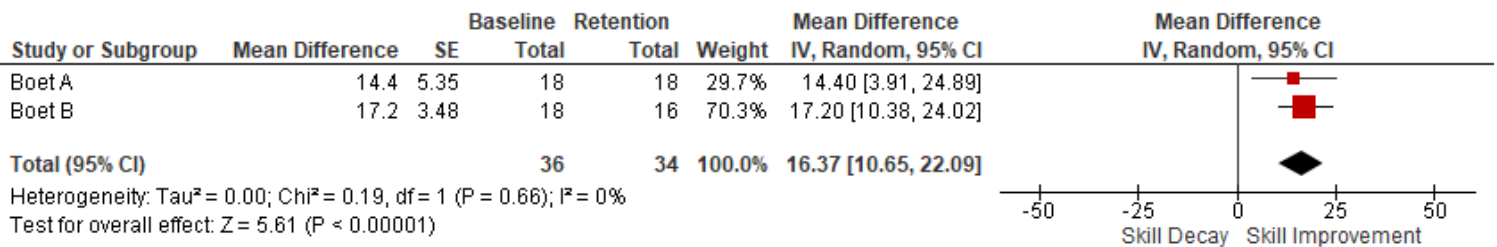
### Mean skill decay from immediately to delayed post-simulation



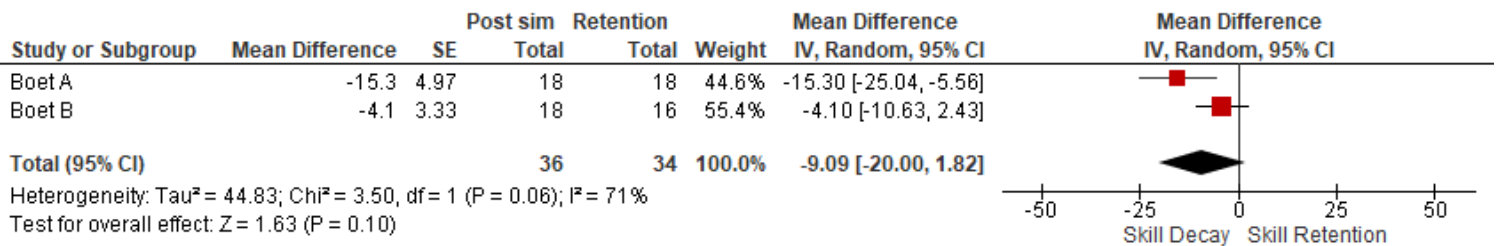
**Figure S2.** Participants' endotracheal intubation performance scores at baseline, immediately post-simulation, and at 3- and 6-months post-simulation. When there was high heterogeneity ( $I^2 > 80\%$ ), no pooled estimate is shown.



### Mean skill improvement from baseline to delayed post-simulation



### Mean skill decay from immediately to delayed post-simulation



**Figure S3.** Change in participants' cricothyrotomy performance from baseline to delayed post simulation (6- and 12-months post), and from immediately post-simulation to delayed post simulation.