

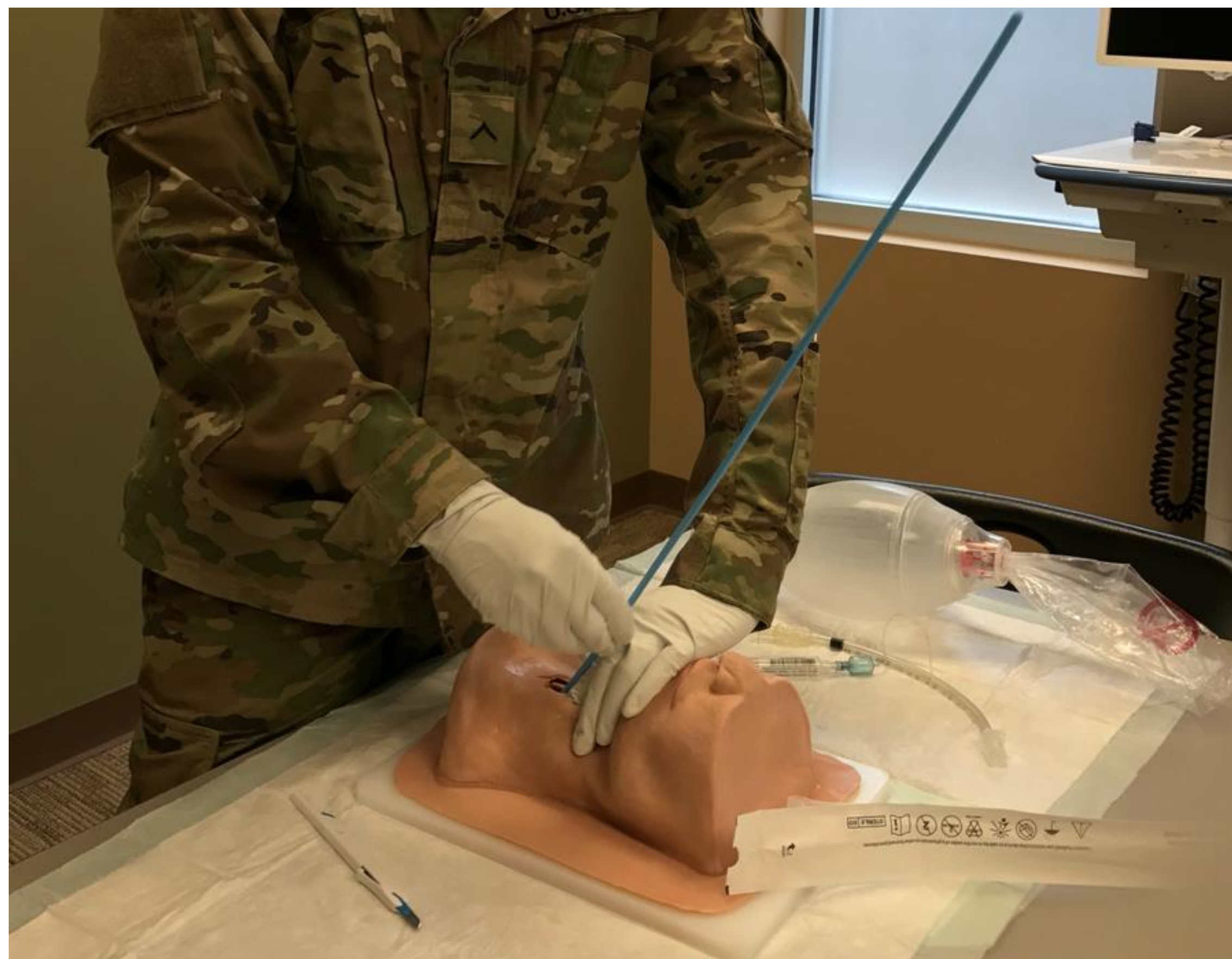
when performed by military medics, with a 33% failure rate cited over the course of Operation Enduring Freedom and Operation Iraqi Freedom. Techniques found to have the highest rate of success should be emphasized in medic training courses.

### Objective

This study compared the first pass success and time to successful placement when performing a standard surgical cricothyroidotomy versus a bougie-aided cricothyroidotomy technique. The primary outcome was first-pass successful airway cannulation. The secondary outcomes were time to successful airway cannulation, number of attempts to successful cannulation, perceived technique difficulty, and technique preference.

### Methods

We conducted a prospective, randomized crossover study comparing standard open surgical cricothyroidotomy with bougie-aided cricothyroidotomy using a cadaver model. Fifteen volunteers were recruited, all active duty US Army 68W medics with no prior experience performing cricothyroidotomy on live patients or cadaver models. Participants were randomized to perform one of the two techniques, then viewed a standardized 5-minute video portraying the relevant anatomy and technique steps. Participants then practiced the assigned technique 5 times on a SynDaver adult airway manikin. The technique was then performed on an adult cadaver model. A blinded investigator timed the event from instruction to “begin” to the participants verbal indication of completion. A separate investigator observed and recorded number of attempts made. After a 15 minute washout period, the sequence was repeated performing the second technique. Placement was confirmed using neck dissection as well as visual confirmation using video laryngoscopy following attempt completion.



2	148	1	Yes*	97	1	Yes*
3	100	1	Yes	74	1	No
4	262	2	Yes	171	1	Yes
5	101	1	Yes*	77	1	Yes*
6	92	1	Yes	73	1	Yes
7	126	1	Yes	237	1	No
8	245	2	Yes	66	1	No
9	467	5	No	126	1	Yes
10	59	1	Yes*	198	3	No
11	104	1	Yes	452	1	Yes*
12	208	2	Yes	144	1	Yes
13	141	3	Yes*	86	1	Yes
14	277	1	Yes*	207	1	Yes*
15	119	1	Yes*	170	1	Yes
* Tracheotomy placement						

### Results

Fifteen participants completed the protocol. Placement of tracheostomies rather than cricothyroidotomies was treated as a success for purposes of this study. First-pass success was 73.3% (11/15) using a standard surgical technique, and 66.6% (10/15) using a bougie-aided technique. Overall success was 93.3% (14/15) using the standard technique, and 73.3% (11/15) using a bougie-aided technique. No significant difference was found by related-samples McNemar’s test in success rates between techniques for either first pass success ( $p = 1.0$ ) or when multiple attempts were included ( $p=0.375$ ).

The mean time to successful cannulation in those achieving first-pass success was 130.05 seconds using a standard surgical technique, and 160.25 seconds using a bougie-aided technique. The mean time to successful cannulation, first pass or otherwise, was 153.30 seconds for the standard surgical technique, and 198.12 for the bougie-aided technique. The overall mean attempt time was 174.19 seconds for the standard surgical technique, and 183.64 seconds for the bougie-aided technique. No significant difference was found by paired samples t-test between techniques in time to first pass cannulation ( $p=0.665$ ) or time to overall successful cannulation ( $p=0.469$ ).

The mean reported ease of procedure by VAS was 37.85mm for the standard surgical technique, and 22.15mm for the bougie-aided technique. No significant difference was found between techniques by paired samples t-test for ease of procedure ( $p=0.127$ ). 11/15 participants (73.3%) reported that they preferred the bougie-aided technique.

- No difference compared to standard surgical
- No difference compared to bougie-aided
- No difference in success rates between techniques for either first pass success or when multiple attempts were included

To our knowledge, this study is the first to compare bougie-aided to standard surgical cricothyroidotomy. Both techniques were approved by the Institutional Review Board, and that both are standard of care. Success rates in this study were high for both techniques yielding 93.3% for standard surgical and 73.3% for bougie-aided. Both techniques yielded high success rates in this study, and both techniques yielded high success rates in combat-related