



Effects of training on resident physician emergency airway management skills

Emily H. Garmon, MD · Eileen M. Stock, PhD · Alejandro C. Arroliga, MD · Jolene D. Bean-Lijewski, MD

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To the Editor,

Emergency airway management is necessary when patients develop acute cardiopulmonary failure. Early intubation prevents hypoxemia from a poor bag-mask seal, but multiple intubation attempts increase the risk of complications.^{1–3} The Canadian Airway Focus Group summarizes the adverse effects associated with multiple intubation attempts in Table 3 of their 2013 publication on difficult tracheal intubation in the unconscious patient.⁴ Highly trained residents in supervised intensive care settings have previously been studied.^{1–3}

In our teaching hospital, resident physicians and nurses on a “code” team respond to hospital ward cardiopulmonary resuscitation events. Resident physicians lacking extensive airway management training are immediately available and provide initial airway management, including direct laryngoscopy and endotracheal intubation. Thereafter, an anesthesiology resident arrives from the operating room to provide further airway assistance with direct laryngoscopy or advanced airway adjuncts, if needed.

Following institutional review board approval, we conducted a prospective, observational study that compared success and complication rates between experienced and inexperienced resident physicians. The code nurse completed a specifically designed event form for adult ward patients intubated during a code from June 2009 through January 2013. Missing event forms were completed using the subject’s resuscitation code form, medical record, and discussion with the code team. Two groups were defined in terms of their expertise:

1. Anesthesiology residents in postgraduate training year two and above *vs* all others (designated non-anesthesiology residents); and
2. Upper-level residents (all residents in postgraduate year two and above) *vs* lower-level residents.

In all, 218 subjects were intubated, among whom 60 required multiple attempts (laryngoscope removed from the oropharynx and subsequently replaced or a new adjunct utilized). Subject demographics were similar. Experience in both training field and training level improved intubation success and reduced esophageal intubation. Overall, 70 of 218 (32%) of subjects experienced complications, including esophageal intubation, regurgitation, and/or aspiration (Table). Subjects with body mass index $> 35 \text{ kg}\cdot\text{m}^{-2}$ had a fourfold increased risk for requiring more than two intubation attempts (relative risk [RR], 4.2; 95% confidence interval [CI], 2.0 to 8.8). Mortality rates were similar for the physician groups. In all, 139 of 218 (64%) of subjects were in pulseless arrest prior to intubation Their 28-day survival was significantly less than that for subjects not in pulseless arrest ($n = 22/138$ [16%] *vs* $n = 47/77$ [61%]; $P < 0.01$).

To our knowledge, this is the first study to compare intubation success and complication rates for resident

E. H. Garmon, MD (✉) · J. D. Bean-Lijewski, MD
Department of Anesthesiology, Baylor Scott & White Health,
Temple, TX, USA

E. H. Garmon, MD · E. M. Stock, PhD ·
A. C. Arroliga, MD · J. D. Bean-Lijewski, MD
Texas A&M Health Science Center College of Medicine, Bryan,
TX, USA

E. M. Stock, PhD
Center for Applied Health Research, Baylor Scott & White
Health, Temple, TX, USA

A. C. Arroliga, MD
Pulmonary Department, Baylor Scott & White Health, Temple,
TX, USA

Table Patient demographics and status of first-intubation care provider attempts ($n = 218$ patients)

Parameter	Total cohort ($n = 218$) n (%)	First attempt by training level		First attempt by training specialty	
		PGY 1 ($n = 37$)	PGY ≥ 2 ($n = 181$)	Non-anesthesiology ($n = 122$)	Anesthesiology ($n = 96$)
Age, mean (SD)	66.0 (14.9)	67.5 (15.9)	65.7 (14.8)	66.0 (15.5)	66.1 (14.3)
Female sex	107 (49%)	17 (46%)	90 (50%)	61 (50%)	46 (48%)
Reason for intubation					
Cardiac arrest	139 (64%)	17 (46%)	122 (67%)	57 (47%)	82 (86%)
Respiratory failure	29 (13%)	7 (19%)	22 (12%)	25 (20%)	4 (4%)
Other (neurologic, mixed)	23 (11%)	8 (22%)	15 (8%)	18 (15%)	5 (5%)
Not indicated	27 (12%)	5 (13%)	22 (12%)	22 (18%)	5 (5%)
Intubation technique					
Direct laryngoscopy	209 (96%)	33 (89%)	176 (97%)	117 (96%)	92 (96%)
Other	9 (4%)	4 (11%)	5 (3%)	5 (4%)	4 (4%)
Number of intubation attempts					
One	158 (72%)	16 (43%)	142 (78%)	80 (66%)	78 (81%)
Two	33 (15%)	12 (32%)	21 (12%)	21 (17%)	12 (13%)
≥ 3	27 (12%)	9 (24%)	18 (10%)	21 (17%)	6 (6%)
Complications					
Esophageal intubation	42 (19%)	14 (37%)	28 (15%)	34 (28%)	8 (8%)
Regurgitation	35 (16%)	6 (16%)	29 (16%)	19 (16%)	16 (17%)
Aspiration	26 (12%)	5 (14%)	21 (12%)	15 (12%)	11 (11%)

PGY = postgraduate year; SD = standard deviation

physicians in lower acuity units without routine faculty supervision. Our results show that experience improves intubation success and that the need for more than two intubation attempts increases the risk of both regurgitation (RR, 2.9; 95% CI, 1.6 to 5.4) and intubation trauma/bleeding (RR, 5.4; 95% CI, 1.5 to 12.1). They further suggest that experience gained during the first postgraduate year of residency increases success later. Limitations include observer, reporter, or recall bias during event form completion. Furthermore, hemodynamic and pulmonary complications were not recorded, and there was no adjustment for confounding.

This study inspired a multidisciplinary team to consider ways to improve first responder performance. We considered requiring resident physicians to demonstrate intubation proficiency in a supervised setting prior to code team participation, but proficiency requires an average of 50 supervised attempts.⁵ Concern was raised that this requirement for such a large number of residents could limit intubation opportunities for other airway management trainees (anesthesiology/emergency medicine residents, pre-hospital emergency trainees). Ultimately, we balanced resident physician training objectives with patient safety. Experience improves tracheal intubation success, and lower-level residents gain experience with intubations during emergency code events. The institutional guideline permits lower-level residents one intubation attempt in patients

without cardiac arrest. After one failed attempt, intubation must be performed by the most experienced physician available. Lower-level residents are not permitted to attempt intubation in cardiac arrest patients if an anesthesia resident is available. Ongoing quality improvement efforts should also focus on other interventions known to improve safety. These measures include incorporating a pre-intubation checklist and improving the availability of equipment and experts familiar with multiple intubation techniques.

Conflicts of interest None.

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