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Volume 9, 2005 - [Issue 2](#)

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# Defining the Learning Curve for Paramedic Student Endotracheal Intubation

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Pages 156-162 | Received 03 Dec 2005, Accepted 15 Dec 2005, Published online: 02 Jul 2009

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## Abstract

**Background.** Proficiency in endotracheal intubation (ETI) is assumed to improve primarily with accumulated experience on live patients. While the National Standard Paramedic Curriculum recommends that paramedic students (PSs) perform at least five live ETIs, these training opportunities are limited. **Objective.** To evaluate the effects of cumulative live ETI experience, elapsed duration of training, and clinical setting on PS ETI proficiency. **Methods.** The authors used longitudinal, multicenter data from 60 paramedic training programs over a two-year period. The PSs reported outcomes (success/failure) for all live ETIs attempted in the operating room (OR), the emergency department (ED), the intensive care unit (ICU), and other hospital or prehospital settings. Fixed-effects logistic regression was used to model up to 30 consecutive ETI efforts by each PS, accounting for per-PS clustering. For each patient, the authors evaluated the association between ETI success and the PS's cumulative number of ETIs,

adjusted for clinical setting, elapsed number of days from the first ETI encounter, and the interaction (cumulative ETIs × elapsed days). Predicted probability plots were constructed depicting the “learning curve” overall and for each clinical setting. Results. Between one and 74 ETIs (median 7; IQR 4–12) were performed by each of 802 PSs. Of 7,635 ETIs, 6,464 (87.4%) were successful. Stratified by clinical setting, 6,311 (82.7%) ETIs were performed in the OR, 271 (3.6%) in the ED, 64 (0.8%) in the ICU, 86 (1.1%) in other in-hospital settings, and 903 (11.8%) in the prehospital setting. For the 7,398 ETIs included in the multivariate analysis, cumulative number of ETI was associated with increased adjusted odds of ETI success (odds ratio 1.067 per ETI; 95% CI: 1.044–1.091). ETI learning curves were steepest for the ICU and prehospital settings but lower than for other clinical settings. Conclusions. Paramedic student ETI success improves with accumulated live experience but appears to vary across different clinical settings. Strategies for PS airway education must consider the volume of live ETIs as well as the clinical settings used for ETI training. Key words: intubation; intratracheal; emergency medical services; learning; allied health personnel.

Keywords:

- intubation
- intratracheal
- emergency medical services
- learning
- allied health

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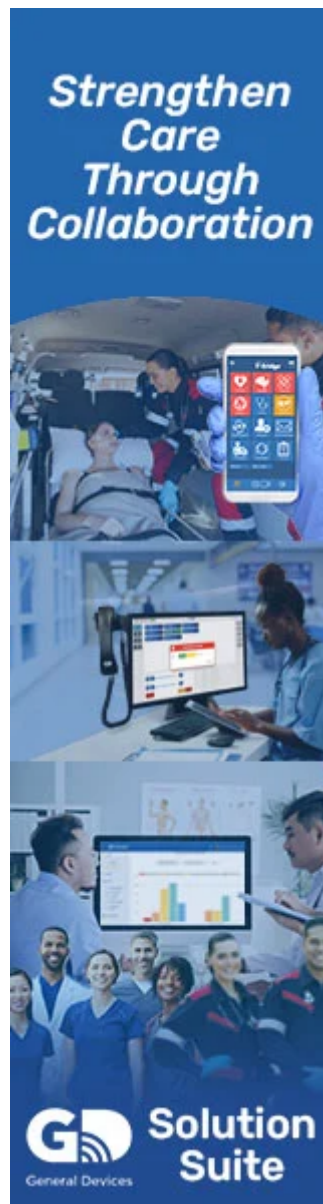
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