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REPORTS OF ORIGINAL INVESTIGATIONS

Emergency airway management in a tertiary trauma centre (AIRMAN): a one-year prospective longitudinal study

Prise en charge d'urgence des voies aériennes dans un centre tertiaire de traumatologie (AIRMAN) : une étude prospective longitudinale sur un an

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Abstract

Purpose *Emergency airway management can be associated with a range of complications including long-term neurologic injury and death. We studied the first-pass success rate with emergency airway management in a tertiary care trauma centre. Secondary outcomes were to identify factors associated with first-pass success and factors associated with adverse events peri-intubation.*

Methods *We performed a single-centre, prospective, observational study of patients ≥ 17 yr old who were intubated in the emergency department (ED), surgical intensive care unit (SICU), medical intensive care unit (MICU), and inpatient wards at our institution. Ethics approval was obtained from the local research ethics board.*

Results *In a seven-month period, there were 416 emergency intubations and a first-pass success rate of 73.1%. The first-pass success rates were 57.5% on the ward, 66.1% in the intensive care units (ICUs) and 84.3% in the ED. Equipment also varied by location; videolaryngoscopy use was 65.1% in the ED and only 10.6% on wards. A multivariate regression model using the least absolute shrinkage and selection algorithm (LASSO) showed that the odds ratios for factors associated with two or more intubation attempts were location (wards, 1.23; MICU, 1.24; SICU, 1.19; reference group, ED), physiologic instability (1.19), an anatomically difficult airway (1.05), hypoxemia (1.98), lack of neuromuscular blocker use (2.28), and intubator inexperience (1.41).*

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Conclusions *First-pass success rates varied widely between locations within the hospital and were less than those published from similar institutions, except for the ED. We are revamping ICU protocols to improve the first-pass success rate.*

Résumé

Objectif *La prise en charge d'urgence des voies aériennes peut être associée à une multitude de complications, y compris des lésions neurologiques à long terme et la mort. Nous avons étudié le taux de réussite à la première tentative lors de la prise en charge d'urgence des voies aériennes dans un centre de traumatologie tertiaire. Les critères d'évaluation secondaires étaient l'identification des facteurs associés à la réussite de la première tentative et des facteurs associés aux événements indésirables péri-intubation.*

Méthode *Nous avons réalisé une étude observationnelle prospective monocentrique sur des patients âgés de 17 ans ou plus qui avaient été intubés à l'urgence, à l'unité de soins intensifs chirurgicaux (USIC), à l'unité de soins intensifs médicaux (USIM) et aux étages dans notre établissement. L'approbation a été obtenue du comité d'éthique de la recherche local.*

Résultats *Au cours d'une période de sept mois, il y a eu 416 intubations d'urgence et un taux de réussite à la première tentative de 73,1 %. Les taux de réussite à la première tentative étaient de 57,5 % aux étages, de 66,1 % dans les unités de soins intensifs (USI) et de 84,3 % à l'urgence. Le matériel variait également selon l'emplacement; l'utilisation de la vidéolaryngoscopie était de 65,1 % à l'urgence et de seulement 10,6 % aux étages. Un modèle de régression multivariée utilisant l'algorithme LASSO (Least Absolute Shrinkage and Selection Algorithm) a montré que les rapports de cotes pour les facteurs associés à deux tentatives d'intubation ou plus étaient l'emplacement (étages, 1,23; USIM, 1,24; USIC, 1,19; groupe de référence, urgence), l'instabilité physiologique (1,19), des voies aériennes présentant des complications anatomiques (1,05), l'hypoxémie (1,98), la non-utilisation de bloqueurs neuromusculaires (2,28) et l'inexpérience de la personne pratiquant l'intubation (1,41).*

Conclusion *Les taux de réussite à la première tentative variaient considérablement d'un emplacement à l'autre au sein de l'hôpital et étaient inférieurs à ceux publiés par des établissements comparables, à l'exception du service des urgences. Nous retravaillons les protocoles des soins intensifs afin d'améliorer le taux de réussite à la première tentative.*

Keywords critical care · emergency · intubation · laryngoscopy

Emergency orotracheal intubation is a life-saving procedure commonly performed in the intensive care unit (ICU) and emergency department (ED) as a part of the resuscitation of critically ill or injured patients. Orotracheal intubation is typically accomplished easily and without incident;[1–5] however, complications can be devastating, including permanent neurologic disability and death.[6–9] In a one-year survey of airway complications, the fourth National Audit Project of the Royal College of Anesthetists in Britain (NAP 4) found that intubations occurring outside of the operating room, specifically in the ED and ICU, were associated with a higher rate of complications.[1,7] It is clear that, with difficult airway management, both anticipated and unanticipated, the risks to patients are compounded and consequences of adverse events can be severe. In response to these adverse events, various authors and medical societies have published algorithms for approaching a difficult intubation.[2,5,6,8,10]

Complications and adverse events in emergency airway management encompass a spectrum, including transient hypoxemia, hypotension, death, brain damage, need for emergency surgical airway, unanticipated ICU admissions, and extended ICU stays.[7] A series of Canadian multicentre studies showed that adverse events are common in emergent airway management and that they are associated with increased mortality.[4,9,11–13] Physiologic and environmental factors often associated with critically ill patients such as aspiration risk, cervical spine immobility, intoxication, altered level of consciousness, and trauma are felt to contribute significantly to the high incidence of adverse events in ED and critical care settings.[14–16] Additionally, physician experience and training in emergency airway management varies widely, with many intubations on hospital wards being performed by junior trainees or those who otherwise have not received adequate training or experience to be considered airway management experts.[5,10,11,16]

The objectives of this study were to enumerate the number of emergent intubations occurring annually at our tertiary care trauma centre and determine the rate of first-pass success. Furthermore, our goals were to identify predictors of first-pass intubation success and to identify incidence and predictors of adverse events.

Methods

Ethics

Ethics approval for this study was obtained from the University of Manitoba Health Research Ethics Board (Winnipeg, MB, Canada; Ethics #, HS22799 [H2019:164]).

Study design

We performed a single-centre, prospective, observational study, including all adult patients (≥ 17 yr old) that were intubated by emergency medicine or critical care medicine teams. We collected data on all consecutive emergent orotracheal intubations over a seven-month period at the Health Sciences Centre, a tertiary care trauma centre.

Data collection

The respiratory therapy department assists at all intubations that occur outside of the operating room. As such, the respiratory therapist liaised with the physician responsible for the intubation to complete a case report form after the patient had been intubated and stabilized. We collected additional data via chart review retrospectively.

Power and sample size

Several previous studies reported first-pass success rates of 80–85% for intubations performed in the ICU and ED setting.[1–4] Based on these reported values, using an alpha of 0.05 and a power of 80%, 113 patients were needed to accurately report incidence of first-pass success in 75% of studied patients. The estimated 75% rate of first-pass success was based on the assumption that there would be a high prevalence of trainees performing the initial intubation attempts.

Outcome measures and definitions

The primary outcome was the incidence of first-pass success. A first-pass success was defined as the successful intubation of the trachea with the first insertion of a laryngoscope blade. If a laryngoscope blade is inserted and then withdrawn, with no attempt at intubation, this was defined as a failed intubation attempt.[3,17]

Factors previously identified to affect first-pass success rate such as anatomically difficult airway (defined as two or more anatomic features known to contribute to difficult intubations)[9,14,18] and physiologically difficult airways (defined as patient instability leading to time pressure characterized by oxygen saturation $< 90\%$ despite intervention or systolic blood pressure < 90 mm Hg prior to the intubation attempt)[11,12] were collected.

Secondary outcomes were postintubation hypoxia (defined as an oxygen saturation that begins above and subsequently drops below 90% during intubation) and postintubation hypotension (defined as a systolic blood pressure that begins above 90 mm Hg and subsequently drops below 90 mm Hg or a decrease in mean arterial pressure [MAP] to less than 60 mm Hg).

Both the medical and surgical ICUs are staffed with residents from internal medicine, surgical specialties, anesthesia, and emergency medicine from years R1 to R7, as well as in-house medical officers. Night-time coverage is provided by two in-house physicians in each unit, with critical care attending back-up. At least one of the two physicians has previous experience with intubation. The ED has at least two attending emergency physicians on a 24-hr basis in-house along with resident staff. An experienced intubator was defined as any attending staff person in critical care or emergency medicine or any third-, fourth- or fifth-year anesthesia or emergency medicine resident or critical care fellow.

Statistical analysis

Descriptive statistics are reported as mean and standard deviation for normally distributed data. Categorical variables are reported as frequencies and percent values. We used univariate logistic regression models to explore the unadjusted relationships between each predictor and the odds of a failed intubation attempt, hypoxemia, and hypotension. Results are presented as odds ratios and their 95% confidence intervals (CIs) and P values. A P value less than 0.05 was considered significant.

For our primary outcome, we created a parsimonious multivariate logistic regression model identifying predictors of first-pass success. We used the group least absolute shrinkage and selection operator (LASSO) estimation method, which penalizes the model for complexity according to the sum of the absolute value of the regression coefficients. This in turn shrinks the coefficients, some of them to exactly zero, thereby enabling variable selection that occurs alongside the optimization of the model likelihood. Group LASSO is a particular variation in which the levels of categorical variables are selected or excluded together as a group, which aids interpretation. The LASSO method has been shown to have superior properties to certain ad hoc methods, univariable screening in particular.[19] We analyzed the secondary outcomes hypoxia and hypotension using univariate analyses only because of insufficient events and problems with multiple comparisons between the adverse events. We feel that the multivariate analyses predicting adverse events would be underpowered and would therefore not help in drawing conclusions.

Multiple LASSO models were fit, each with differing penalty weights for model complexity, and the model with the best Akaike Information Criterion (AIC) was selected. PROC LOGISTIC of SAS version 9.4 (SAS Institute, Cary,

NC, USA) was used to estimate the univariate logistic regression models. PROC HPGENSELECT was used to estimate the Group LASSO variable subset for first-pass intubation. Participants with missing information were omitted from the models. We excluded body mass index from multivariate modelling because of excessive missing information. Data from this multivariate model are presented as odds ratios without CIs as these are not possible with LASSO. A receiver operating characteristic (ROC) curve was established to estimate the area under the curve (AUC) of the model.

Results

Data were collected over a seven-month period from September 2019 to the end of March 2020. The data collection period was cut short from the intended one-year period because of institutional changes in airway management practices in response to the COVID-19 pandemic. A total of 416 patients were intubated during the study period with an overall first-pass success rate of 73.1% (95% CI, 68.5 to 77.3). Characteristics are summarized in Table 1.

Descriptive statistics for where the intubations occurred, the techniques used (direct laryngoscopy [DL] *vs* videolaryngoscopy [VL]), drugs given, and major complications are listed in Table 2. Further details on equipment choices and techniques are summarized in Electronic Supplementary Material (ESM) eTable 1.

There was considerable variation in key characteristics of intubation and in the first-pass success rate depending on where the intubation occurred (Table 3). Location of intubation was a significant factor in both univariate and multivariable models for predicting first-pass success rate (Tables 4 and 5). Notably, when controlling for other factors, the use of VL was not significantly associated with first-pass success (Table 5). The ROC AUC for the LASSO model was 0.75.

In the univariate analyses of secondary outcomes, the odds of postintubation hypoxemia were lower when the first attempt at intubation was successful *vs* when multiple attempts were required. Neither operator experience nor use of neuromuscular blockers were associated with postintubation hypoxemia or hypotension. Results are summarized in ESM eTables 2 and 3.

Table 1 Characteristics of study participants and their intensive care unit admissions

Male, *n*/total *N* (%)	253/416 (62.0%)
Age (yr), mean (SD)	56 (18)
BMI ($kg \cdot m^{-2}$), mean (SD)	28.5 (7.3)
BMI > 30, *n*/total *N* (%)	97/313 (30.9%)
Missing data, *n*/total *N* (%)	103/416 (24.8%)
APACHE II at ICU admission, mean (SD)	23.5 (8.6)
ICU length of stay (days), mean (SD)	8.8 (10.1)
ICU Mortality, *n*/total *N* (%)	72/416 (17.3%)
Reason for ICU admission, *n*/total *N* (%)	
Sepsis/shock	83/358 (23.2%)
Cardiac	60/358 (16.8%)
Respiratory failure	59/358 (16.5%)
Intracranial hemorrhage/stroke	36/358 (10.1%)
Pneumonia	23/358 (6.4%)
Seizure	22/358 (6.2%)
Hemorrhage	17/358 (4.8%)
Toxidrome	11/358 (3.1%)
Trauma	10/358 (2.8%)
Other	28/358 (7.8%)

APACHE II = Acute Physiology and Chronic Health Evaluation II score; BMI = body mass index; ICU = intensive care unit (medical or surgical); SD = standard deviation

Discussion

Our results show that first-pass success for intubations of critically ill patients outside of the operating room was 73.1% (95% CI, 68.5 to 77.3). First-pass success rates varied widely between locations within our hospital and were less than those published from similar institutions of 80–85% for intubations performed in the ICU and ED setting.[1,3,10,14] The main predictors for first-pass successful intubation were the use of a neuromuscular blocking agent and the experience of the intubator.

The use of neuromuscular blocking agents has been explored previously.[20] A 2017 meta-analysis by Tran *et al.*[20] compared rocuronium with succinylcholine used for emergency rapid sequence intubations and found similar conditions were achieved between groups. There was no association between use of neuromuscular blockers and rates of hypoxemia or hypotension, but the omission of a neuromuscular blocking agent was significantly associated with an increased number of attempts at intubation. Lundstrøm *et al.* completed a Cochrane review of neuromuscular blockade in tracheal intubations and found that omission of neuromuscular blocking agents increased the risk ratio to 13.27 for difficult intubation and to 2.54 for difficult laryngoscopy.[21] Several previously cited studies—with higher rates of first-pass success than in our institution—reported using neuromuscular blocking agents more than 95% of the time.[1,22] The lower rate of neuromuscular blocking agent use at our institution may in part account for the lower rates of first-pass success in this study.

Table 2 Characteristics of patients' airway management

Characteristic	*n*/total *N* (%)
Number of attempts	
1	304/416 (73.1%)
2+	112/416 (26.9%)
Location	
Medical ICU	105/416 (25.3%)
Surgical ICU	87/416 (21.0%)
Ward (ICU team)	47/416 (11.3%)
Emergency department	172/416 (41.5%)
Other	4/416 (0.9%)
Technique	
DL	199/416 (47.8%)
VL	200/416 (48.1%)
C-MAC®[†]	169/416 (40.6%)
GlideScope®[‡]	31/416 (7.5%)
Difficult airway	
Physiologic difficulty[§]	115/416 (27.6%)
Anatomic difficulty*	103/416 (24.8%)
Neuromuscular blocker used	
Rocuronium	242/416 (58.2%)
Succinylcholine	18/416 (4.3%)
None	156/416 (27.5%)
Adverse outcomes	
Hypotension	57/416 (13.7%)
Hypoxemia	48/416 (11.5%)
Esophageal intubation	25/416 (6.0%)
Aspiration	3/416 (0.7%)
Vasopressors initiated[††]	49/416 (11.8%)
CPR initiated	13/416 (3.1%)
Preoxygenation	
Bag-mask ventilation	362/416 (87.0%)
Nasal prongs	153/416 (36.8%)
Facemask	34/416 (8.2%)
Bilevel positive airway pressure	26/416 (6.3%)
High-flow nasal canulae	13/416 (3.1%)
Apneic oxygenation	
Nasal prongs	153/416 (36.8%)
High-flow nasal canulae	9/416 (2.2%)
Airway adjuncts	
Oral airway	90/416 (21.6%)
Bougie	43/416 (10.3%)
Laryngeal mask airway	1/416 (0.002%)

Data are presented as absolute numbers and percent values in brackets

[†]KARL STORZ SE & Co. KG, Tuttlingen, Germany

[‡]Verathon Inc., Bothell, WA, USA

[††]Vasopressors initiated post intubation

[§]Physiologic difficulty = oxygen saturation < 90% prior to intubation despite interventions and/or systolic blood pressure < 90 mm Hg prior to intubation.

*Anatomic difficulty = 2 or more factors associated with difficult intubation, including retrognathia, short thick neck, presence of cervical collar, limited mouth opening, Mallampatti score of 3 or 4 (if previously documented).

CPR = cardiopulmonary resuscitation; DL = direct laryngoscopy; ICU = intensive care unit; VL = videolaryngoscopy

At our centre, there was significant heterogeneity in the rates of success between locations within the hospital and this can be partly explained by differences in intubator experience, equipment used, and choice of medications. The association between intubator experience and first-pass success has been well documented previously and highlights the importance of clinical education and exposure to training opportunities.[23,24] Equipment availability is similar in all hospital settings. In the ED, there is a culture of using VL as the first choice, whereas on the wards, it is not always immediately available as it was not routinely brought to acute resuscitations by the ICU team. Unless the use of VL was anticipated in advance, there was often a delay or use of alternative equipment for the first attempt. The results of our multivariate model reveal the importance of an overall "team" approach to intubation. It is clearly important to have experienced intubators, appropriate medication choices, and proper equipment; however, success cannot be attributed to one single factor.

Physical equipment may also play a role in first-pass success. In 2018, Driver *et al*. reported a first-pass success rate of 98% when using a bougie in the ED compared with an 82% first-pass success rate using an endotracheal tube with stylet.[22] At our institution, endotracheal tubes are provided by the respiratory therapist with a stylet *in situ* unless specifically requested for an alternative plan by the intubating physician. Videolaryngoscopy has been studied as a primary method of intubation in the ED and ICU settings, with conflicting results.[3,5,17] Lascarrou *et al*.[17] performed a randomized controlled trial of 371 adult patients undergoing orotracheal intubation. They found no difference in rates of first-pass success with VL *vs* DL or by experience level of primary intubator. They discussed the notion that VL can lead to a false sense of security for nonexperts. In 2016, Hypes *et al*. reported propensity matched results from a prospective analysis of 809 intubations, mostly performed by trainees at various stages.[25] They found that VL was associated with significantly improved odds of first-pass success. Cabrini *et al*. performed a systematic review of nine studies on VL and found no improvement on rates of first-pass success and a trend towards increased number of adverse events.[26] In our study, the univariate analysis showed a significant association between use of VL and first-pass success; however, this association became nonsignificant when accounting for other predictors in our multivariate selection model.[25] Our data suggest that skill of the intubator rather than the equipment used best predicts first-pass success.

Using a prospective design, we were able to capture consecutive events of all emergency orotracheal intubations with a level of detail not typically available

Table 3 Select characteristics of intubation stratified by location of intubation

	MICU	SICU	Ward	ED
Number of attempts, *n*/total *N* (%)				
1	66/105 (62.9%)	61/87 (70.1%)	27/47 (57.5%)	145/172 (84.3%)
2+	39/105 (37.1%)	26/87 (29.9%)	20/47 (42.5%)	27/172 (15.7%)
Equipment used, *n*/total *N* (%)				
DL	60/101 (59.4%)	39/85 (45.9%)	42/47 (89.4%)	58/164 (35.0%)
VL	41/101 (40.6%)	46/85 (54.1%)	5/47 (10.6%)	108/164 (65.0%
Intubator experience, *n*/total *N* (%)				
Experienced*	29/102 (28.4%)	28/87 (32.2%)	18/47 (38.3%)	106/169 (62.7%)
Inexperienced	73/102 (71.6%)	59/87 (67.8%)	29/47 (61.7%)	63/169 (37.3%)
Neuromuscular blocker used, *n*/total *N* (%)				
Yes	42/105 (40.0%)	54/87 (62.0%)	16/47 (34.0%)	144/172 (83.7%)
No	63/105 (60.0%)	33/87 (38.0%)	31/47 (66.0%)	28/172 (16.3%)

Data are presented as absolute numbers and percent values in brackets.

*An experienced intubator was defined as any attending staff person or any third-, fourth- or fifth-year anesthesia or emergency medicine resident, or a critical care fellow

DL = direct laryngoscopy; ED = emergency department; MICU = medical intensive care unit, SICU = surgical intensive care unit; VL = videolaryngoscopy

Table 4 Factors associated with two or more attempts at intubation—univariate analyses

Variable	Odds ratio (95% CI)	*P* value
BMI ($kg \cdot m^{-2}$), (> 30 *vs* < 30)	1.59 (0.94 to 2.67)	0.08
Sex (female *vs* male)	1.09 (0.69 to 1.71)	0.71
Location (ward *vs* ED)	3.98 (1.96 to 8.1)	< 0.001
Location (SICU *vs* ED)	2.29 (1.24 to 4.24)	< 0.001
Location (MICU *vs* ED)	3.17 (1.79 to 5.6)	< 0.001
Physiologic difficulty* (yes *vs* no)	2.04 (1.25 to 3.32)	0.004
Anatomic difficulty† (yes *vs* no)	1.64 (1.01 to 2.66)	0.05
Hypoxemia on first attempt‡ (yes *vs* no)	5.44 (2.79 to 10.6)	< 0.001
Equipment (DL *vs* VL)	1.74 (1.12 to 2.70)	0.01
Neuromuscular blocker used (no *vs* yes)	2.77 (1.78 to 4.32)	< 0.001
Experienced intubator†† (no *vs* yes)	2.25 (1.42 to 3.57)	< 0.001

Data are presented as odds ratios with 95% confidence intervals (CI)

*Physiologic difficulty: oxygen saturation < 90% prior to intubation despite interventions and/or systolic blood pressure < 90 mm Hg prior to intubation

†Anatomic difficulty: two or more factors associated with difficult intubation, including retrognathia, short thick neck, presence of cervical collar, limited mouth opening, Mallampatti score of 3 or 4 (if previously documented)

‡Hypoxemia on first attempt: patients who were normoxic and subseqeuently developed hypoxemia during the first attempt at intubation

††Experienced intubator: An experienced intubator was defined as any attending staff person or any third-, fourth- or fifth-year anesthesia or emergency medicine resident, or a critical care fellow

BMI = body mass index; DL = direct laryngoscopy; ED = emergency department; MICU = medical intensive care unit; SICU = surgical intensive care unit; VL = videolaryngoscopy

via retrospective review. This enabled us to more accurately report key measures such as first-pass success and rates of adverse events. The design is further strengthened by the fact that data were collected by an unbiased neutral party. The respiratory therapists were instrumental in completing data forms accurately and reliably. A limitation to this approach is that the intubating physician was still required to contribute to specific

Table 5 Multivariable logistic regression model predicting two or more intubation attempts, with Least Absolute Shrinkage and Selection Algorithm (LASSO) variable selection

Variable	Odds ratio
Location	
MICU	1.24
SICU	1.18
Ward	1.23
ED	-reference-
Physiologic difficulty[§]	
Yes	1.19
No	-reference-
Anatomic difficulty*	
Yes	1.05
No	-reference-
Hypoxemia on first attempt†	
Yes	1.98
No	-reference-
Neurmuscular blocker used	
No	2.28
Yes	-reference-
Experienced intubator[‡]	
No	1.41
Yes	-reference-
Patient age (per 5 years)	0.99

The LASSO model has the advantage of telling us which variables were most predictive of the outcome although it does not provide individual *P* values or 95% CIs for each estimate

[§]Physiologic difficulty: oxygen saturation < 90% prior to intubation despite interventions and/or systolic blood pressure < 90 mm Hg prior to intubation

*Anatomic difficulty: two or more factors associated with difficult intubation, including retrognathia, short thick neck, presence of cervical collar, limited mouth opening, Mallampatti score of 3 or 4 (if previously documented)

[†]Hypoxemia on first attempt: patients who were normoxic and subseqeuently developed hypoxemia during the first attempt at intubation

[‡]Experienced intubator: an experienced intubator was defined as any attending staff person or any third-, fourth- or fifth-year anesthesia or emergency medicine resident, or a critical care fellow.

ED = emergency department; LASSO = Least Absolute Shrinkage and Selection Algorithm; MICU = medical intensive care unit; SICU = surgical intensive care unit

sections of form completion and may have introduced bias towards under reporting number of attempts or adverse events. Addressing the other limitations, the observational design limits our ability to establish causal associations between predictors of first-pass success; however, our total sample size allowed us to develop rigorous multivariable regression models to identify predictors of first-pass success. Furthermore, our study is a single-centre study, which may limit the generalizability of our findings to other institutions or healthcare contexts. Nevertheless, one could speculate whether similar results would be found in other comparable institutions. In spite of these limitations, the present study contributes important information for clinicians and administrators at our institution and will lead to changes aimed at improving patient care. Through a broad lens, this study provides a snapshot of contemporary practice in a tertiary Canadian trauma centre.

Conclusion

First-pass success is associated with both unmodifiable patient factors and modifiable situational factors. The rate of first-pass success varied significantly between locations at the study hospital. Operator experience and choice of medications are modifiable factors associated with first-pass success. We are in the process of modifying our hospital protocols, training, and education modules to improve first-pass success rates in the ICU.

Author contributions *Thomas Hall* contributed to the study design, data collection, data analysis, and writing of the manuscript. *Murdoch Leeies*, *Duane Funk*, *Carmen Hrymak*, *Faisal Siddiqui*, *Holly Black*, and *Stephen Kowalski* contributed to the study design, data analysis, and writing of the manuscript. *Kim Webster*, *Jennifer Tkach*, and *Matthew Waskin* contributed to the study design and data collection. *Brendan Dufault* contributed to the data analysis and writing of the manuscript.

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