Appendix E: Brief abstract review of ED airway registries in the 21st century

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<th>Author</th>
<th>Abstract</th>
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<td>Bushra et al</td>
<td>A comparison of trauma intubations managed by anesthesiologists and emergency physicians. Acad Emerg Med. 2004 Jan;11(1):66-70. Bushra JS, McNeil B, Wald DA, Schwell A, Karras DJ. Department of Emergency Medicine, Temple University Hospital and School of Medicine, Philadelphia, PA 19140, USA. Abstract Although airway management by emergency physicians has become standard for general emergency department (ED) patients, many believe that anesthesiologists should manage the airways of trauma victims. OBJECTIVES: To compare the success and failure rates of trauma intubations performed under the supervision of anesthesiologists and emergency physicians. METHODS: This was a prospective, observational study of consecutive endotracheal intubations (ETIs) of adult trauma patients in a single ED over a 46-month period. All ETIs before November 26, 2000, were supervised by anesthesiologists (34 months), and all ETIs from November 26, 2000, onward were supervised by emergency physicians (12 months). Data regarding clinical presentation, personnel involved, medications used, number of attempts required, and need for cricothyrotomy were collected. Study outcomes were: 1) successful intubation within two attempts, and 2) failure of intubation. Failure was defined as inability to intubate, resulting in successful intubation by another specialist, or cricothyrotomy. Odds ratios (ORs) with 95% confidence intervals (95% CIs) were used to compare results between groups. RESULTS: There were 673 intubations during the study period. Intubation within two attempts was accomplished in 442 of 467 patients (94.6%) managed by anesthesiologists, and in 196 of 206 patients (95.2%) managed by emergency physicians (OR = 1.109, 95% CI = 0.498 to 2.522). Failure of intubation occurred in 16 of 467 (3.4%) patients managed by anesthesiologists, and in 4 of 206 (1.9%) patients managed by emergency physicians (OR = 0.558, 95% CI = 0.156 to 1.806). CONCLUSIONS: Emergency physicians can safely manage the airways of trauma patients. Success and failure rates are similar to those of anesthesiologists.</td>
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<td>Casey ZC et al</td>
<td>Trauma intubations: can a protocol-driven approach be successful? J Trauma. 2007 Oct;63(4):955-60. Casey ZC, Smally AJ, Grant RJ, McQuay J. Emergency Department, Connecticut Children's Medical Center, Hartford Hospital, Hartford, Connecticut, USA. <a href="mailto:zcasey@ccmckids.org">zcasey@ccmckids.org</a> Abstract OBJECTIVE: To determine the success rate of a trauma airway protocol. METHODS: This was a prospective cohort study of trauma patients requiring intubation conducted for 24 months. The study facility is a Level I trauma center serving an urban population. The protocol suggests that the first two attempts at intubation be by the third-year emergency medicine resident, a hospital-wide stat overhead page for anesthesia occurs, which results in anesthesia (occasionally a resident only, but usually an attending) presenting in the trauma room in 5 to 10 minutes. After each intubation, the emergency medicine resident or the attending physician completed a data collection form indicating the number of intubation attempts and result of each one, who performed each attempt, complications related to each attempt, and airway adjuncts used. RESULTS: Two hundred seventy-four patients were intubated during the study period by either emergency medicine physician or anesthesiologist with a success rate of 91.6% after the third attempt. The complication and cricothyrotomy rates were 9.8% and 2.6%, respectively. CONCLUSION: Our trauma airway protocol allows for the safe and effective management of the trauma airway.</td>
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<td>Choi HJ et al</td>
<td>The factors associated with successful paediatric endotracheal intubation on the first attempt in emergency departments: a 13-emergency-department registry study. Resuscitation. 2012 Nov;83(11):1363-8. Choi HJ, Je SM, Kim JH, Kim E. Korean Emergency Airway Registry Investigators. Department of Emergency Medicine, College of Medicine, Hanyang University, Seoul, Republic of Korea. Abstract BACKGROUND: We investigated which factors are associated with successful paediatric endotracheal intubation (ETI) on the first attempt in emergency department (EDs) from multicentre emergency airway registry data. METHODS: We created a multicentre registry of intubations at 13 EDs and performed surveillance over 5 years. Each intubator filled out a data form after an intubation. We defined &quot;paediatric patients&quot; as patients younger than 10 years of age. We assessed the specialty and level of training of intubator, the method, the equipment, and the associated adverse events. We analysed the intubation success rates on the first attempt (first-pass success, FPS) based on these variables. RESULTS: A total of 430 ETIs were performed on 281 children seen in the ED. The overall FPS rate was 67.6%, but emergency medicine (EM) physicians showed a significantly greater success rate of 74.4%. In the logistic regression analysis, the intubator's specialty was the only independent predictive factor for paediatric FPS. In the subgroup analysis, the EM physicians used the rapid sequence intubation/intubation(RSI) method and Macintosh laryngoscope more frequently than physicians of other specialties. ETI-related adverse events occurred in 21 (7.2%) out of the 281 cases. The most common adverse event in the FPS group was mainstem bronchus intubation, and vomiting was the most common event in the non-FPS group. The incidence of adverse events was lower in the FPS group than in the non-FPS group, but this difference was not statistically significant. CONCLUSIONS: The intubator's specialty was the major factor associated with FPS in emergency department paediatric ETI, The overall ETI FPS rate</td>
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among paediatric patients was 67.6%, but the EM physicians had a FPS rate of 74.4%. A well structured airway skill training program, and more actively using the RSI method are important and this could explain this differences.

**Prospective observational study of the practice of endotracheal intubation in the emergency department of a tertiary hospital in Sydney, Australia.**
Fogg T, Annesley N, Hitos K, Vassiliadis J.

**Abstract**
OBJECTIVE: To describe the practice of endotracheal intubation in the ED of a tertiary hospital in Australia, with particular emphasis on the indication, staff seniority, technique, number of attempts required and the rate of complications.

**METHODS:**
A prospective observational study.

**RESULTS:**
Two hundred and ninety-five intubations occurred in 18 months. Trauma was the indication for intubation in 30.5% (95% CI 25.3-36.0) and medical conditions in 69.5% (95% CI 64.0-74.5). Emergency physicians were team leaders in 69.5% (95% CI 64.0-74.5), whereas ED registrars or senior Resident Medical Officers made the first attempt at intubation in 88.1% (95% CI 83.9-91.3). Difficult laryngoscopy occurred in 24.0% (95% CI 19.5-29.3) of first attempts, whereas first pass success occurred in 83.4% (95% CI 78.7-87.2). A difficult intubation occurred in 3.4% (95% CI 1.9-6.1) and all patients were intubated orally in five or less attempts. A bougie was used in 30.9% (95% CI 25.8-36.5) of first attempts, whereas a stylet in 37.5% (95% CI 32.1-43.3). Complications occurred in 29.0% (95% CI 23.5-34.1) of the patients, with desaturation the commonest in 15.7% (95% CI 11.9-20.5%). Cardiac arrest occurred in 12.2% (95% CI 9.9-4.1) after intubation. No surgical airways were undertaken.

**CONCLUSION:**
Although the majority of results are comparable with overseas data, the rates of difficult laryngoscopy and desaturation are higher than previously reported. We feel that this data has highlighted the need for practice improvement within our department and we would encourage all those who undertake emergent airway management to audit their own practice of this high-risk procedure.

**Rapid sequence intubation in Scottish urban emergency departments.**
Graham CA, Beard D, Oglesby AJ, Thakore SB, Beale JP, Brittliff J, Johnston MA, McKewon DW, Parke TR.
Department of Accident and Emergency Medicine, Southern General Hospital, Glasgow, UK. colingrahamlt@ukonline.co.uk

**Abstract**
OBJECTIVE: Airway care is the cornerstone of resuscitation. In UK emergency department practice, this care is provided by anaesthetists and emergency physicians. The aim of this study was to determine current practice for rapid sequence intubation (RSI) in a sample of emergency departments in Scotland.

**METHODS:**
Two year, multicentre, prospective observational study of endotracheal intubation in the emergency departments of seven Scottish urban teaching hospitals.

**RESULTS:**
1631 patients underwent an intubation attempt in the emergency department and 735 patients satisfied the criteria for RSI. Emergency physicians intubated 377 patients and anaesthetists intubated 355 patients. There was no difference in median age between the groups but there was a significantly greater proportion of men (73.2% versus 65.3%, p=0.024) and trauma patients (48.5% versus 37.4%, p=0.003) in the anaesthetic group. A well structured airway skill training program, and more actively using the RSI method are important and this could explain this differences.

**CONCLUSION:**
Anaesthetists achieve more good views at laryngoscopy with higher initial success rates during RSI. Emergency physicians perform RSI on a higher proportion of critically ill patients and a higher proportion of patients within 15 minutes of arrival. Complications may be fewer in the anaesthetists’ group, but this could be related to differences in patient populations. Training issues for RSI and emergency airway care are discussed. Complication rates for both groups are in keeping with previous studies.

**Emergency airway management in Japan: Interim analysis of a multi-center prospective observational study.**
Department of Emergency Medicine, Brigham and Women's Hospital, 75 Francis Street, Boston, MA 02115, USA. khassegawa1@partners.org

**Abstract**
OBJECTIVE: Emergency medicine is increasingly recognized as a medical specialty in Japan. However, comprehensive studies evaluating emergency airway management practice are lacking. We describe emergency department (ED) airway management using a large multi-center registry.

**METHODS:** We formed the Japanese Emergency Airway Network, a consortium of 10 academic and community medical centers in Japan, and prospectively collected data on ED intubations from April 2010 to February 2011. All patients undergoing emergency intubation were eligible for inclusion. Data were entered in real time by the intubator using a standardized data form. Variables included patient's age, sex, weight, indication for intubation, methods of intubation, drugs, level of training and specialty of the intubator, number of attempts, success or failure, and adverse events. We present descriptive data as proportions with 95% confidence intervals.

**RESULTS:**
We recorded 1486 intubations (compliance rate 99%). Intubation was ultimately successful in 99.7%. The initial method of intubation varied substantially among the hospitals, including rapid sequence intubation (0-79%), sedation without paralysis (4-88%), paralysis without sedation (0-18%), and oral without medication (12-67%), in non-cardiac arrest encounters. Success rates in first and ≤3 attempts ranged from 40 to 83% and from 74 to 100%, respectively. The overall adverse event rate was 11%, without significant difference by the method used.

**CONCLUSIONS:**
## Impact of emergency medicine faculty and an airway protocol on airway management.


Jones JH, Weaver CS, Rusyniak DE, Brziedline EJ, McGrath RB.

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### Abstract

**OBJECTIVE:**
To determine the impact of emergency medicine (EM) faculty presence and an airway management protocol on success rates of tracheal intubation in the emergency department (ED).

**METHODS:**
A retrospective observational study of prospectively collected data on rates of successful intubations between June 1997 and December 2001 in the ED of a large urban teaching hospital. The authors compared success rates of the first attempt at intubation and times to intubation prior to and after EM faculty presence and the institution of an airway management protocol.

**RESULTS:**
Prior to EM faculty presence and the airway management protocol, tracheal intubation was achieved on the first attempt 46% of the time; more than six attempts were required 2.9% of the time. The mean time to intubation was 9.2 minutes (+/-13.2 SD). Following EM faculty presence and the airway protocol, the success rate on the first attempt was 62%, more than six attempts were required 1.1% of the time, and the mean time to intubation was 4.6 minutes (+/-6.2 SD).

**CONCLUSIONS:**
First-attempt intubation success rates and decreased mean time to successful intubation improved following EM faculty presence and the introduction of an airway management protocol.

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## Rapid sequence intubation for pediatric emergency patients: higher frequency of failed attempts and adverse effects found by video review.


Kerrey BT, Rinderknecht AS, Geis GL, Nigrovic LE, Mittiga MR.

Division of Emergency Medicine, Cincinnati Children's Hospital Medical Center, OH, USA. benjamin.kerrey@cchmc.org

### Abstract

**STUDY OBJECTIVE:**
Using video review, we seek to determine the frequencies of first-attempt success and adverse effects during rapid sequence intubation (RSI) in a large, tertiary care, pediatric emergency department (ED).

**METHODS:**
We conducted a retrospective study of children undergoing RSI in the ED of a pediatric institution. Data were collected from preexisting video and written records of care provided. The primary outcome was successful tracheal intubation on the first attempt at laryngoscopy. The secondary outcome was the occurrence of any adverse effect during RSI, including episodes of physiologic deterioration. We collected time data from the RSI process by using video review. We explored the association between physician type and first-attempt success.

**RESULTS:**
We obtained complete records for 114 of 123 (93%) children who underwent RSI in the ED during 12 months. Median age was 2.4 years, and 89 (78%) were medical resuscitations. Of the 114 subjects, 59 (52%) were tracheally intubated on the first attempt. Seventy subjects (61%) had 1 or more adverse effects during RSI; 38 (33%) experienced oxyhemoglobin desaturation and 2 required cardiopulmonary resuscitation after physiologic deterioration. Fewer adverse effects were documented in the written records than were observed on video review. The median time from induction through final endotracheal tube placement was 3 minutes. After adjusting for patient characteristics and illness severity, attending-level providers were 10 times more likely to be successful on the first attempt than trainees combined.

**CONCLUSION:**
Video review of RSI revealed that first-attempt failure and adverse effects were much more common than previously reported for children in an ED.

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## Intubation in emergency department of a tertiary care hospital in a low-income country.


Khan NU, Khan UR, Ejaz K, Ahmad H, Zia N, Razzak JA.

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### Abstract

**OBJECTIVE:**
To study the indications, method, success rate and complications of intubation at the Emergency Department of a private, tertiary care hospital in Karachi, Pakistan.

**METHODS:**
The case series involved 278 patients above 14 years of age who underwent emergency intubation at the Emergency Department of Aga Khan University Hospital, Karachi between 1998 and 2003. Descriptive statistics were used to compare rapid sequence intubation with crash intubation. The level of significance was p<0.05.

**RESULTS:**
Of the total 278 intubations performed, 37 (13.3%) had to be left out for incomplete information. The study population remaining for inferential analysis comprised of 241 patients. Of the total 278 patients, 174 (63%) were males. Rapid sequence intubation was the commonest type (n=185, 67%) of intubation and was performed mostly by anaesthetists (n=236, 85%). Cardiogenic pulmonary oedema and head injury were commonly seen in these patients. The success on first attempt of intubation was 98% (n=181) in rapid sequence intubation, and 85% (n=48) in crash intubation. Overall, 15 (5.3%) complications were seen in these intubations.

**CONCLUSION:**
Study showed a satisfactory success rate in both rapid sequence and crash intubations.
Factors associated with successful second and third intubation attempts in the ED.
Department of Emergency Medicine, School of Medicine, The Catholic University of Korea, Seoul, South Korea.

Abstract

PURPOSE:
The aim of this study was to identify the factors associated with successful second and third attempts in adults following a failed first intubation attempt in the emergency department (ED).

METHODS:
This was a retrospective analysis of the data from a multicenter, prospective, observational airway registry in South Korea. We obtained demographic and clinical data of intubated adult patients in 6 academic EDs from January 2007 to December 2010. The primary outcome was successful rescue attempt, which was defined as the successful placement of an endotracheal tube following a failed first intubation attempt. Logistic regression analyses were conducted to develop a multivariate model identifying factors associated with successful second and third attempts.

RESULTS:
Of 5905 adult patients, 1122 (19.0%) failed a first intubation attempt. The success rates of the second and third attempts were 79.2% and 78.5%, respectively. In the multivariate logistic regression model, factors associated with a successful second attempt were emergency physicians, senior physicians, nondifficult airway, and the use of a rapid sequence intubation (RSI) (odds ratio = 2.81 [95% confidence interval, 1.80-4.37], 1.50 [1.10-2.07], 2.15 [1.53-3.01], and 1.53 [1.01-2.33], respectively). Nondifficult airway and the use of RSI were associated with successful third attempts (5.48 [2.69-11.18] and 2.63 [1.08-6.40], respectively).

CONCLUSIONS:
Nondifficult airway and the use of RSI were associated with successful second and third intubation attempts. The use of RSI, backup by experienced senior physicians, and preparation for management of a difficult airway could be strategies for successful rescue intubation attempts in the ED.

Alternating day emergency medicine and anesthesia resident responsibility for management of the trauma airway: a study of laryngoscopy performance and intubation success.
Levitan RM, Rosenblatt B, Meiner EM, Reilly PM, Holland J.
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Abstract

STUDY OBJECTIVE:
We compare laryngoscopy performance and overall intubation success in trauma airways when primary airway management alternated between emergency medicine and anesthesia residents on an every-other-day basis.

METHODS:
Data on all trauma intubations during approximately 3 years were prospectively collected. Primary airway management was assigned to emergency department (ED) residents on even days and anesthesia residents on odd days. Emergency medicine residents intubated patients who arrived without notification or who needed immediate intubation before anesthesia arrived. The study was conducted in an inner-city, Level I trauma center with approximately 50,000 ED patients and 1,800 major trauma cases a year. Main outcomes were success or failure at laryngoscopy and the number of laryngoscopy attempts needed for intubation.

RESULTS:
Six hundred fifty-eight trauma patients were intubated during the study period. Laryngoscopy was successful in 654 of 656 cases. Two (0.3%) patients underwent cricothyrotomy after failed laryngoscopy, and 2 (0.3%) patients had awake nasal intubation without laryngoscopy. The specific number of laryngoscopy attempts was unknown in 6 cases (3 from each service), resulting in 650 cases for laryngoscopy performance analysis. Overall, 87% of patients were intubated on first attempt, and 3 or more attempts occurred in 2.9% of patients. Laryngoscopy performance by service (broken down by 1, 2, and >or=3 attempts) was as follows: emergency medicine 86.4%, 11%, and 2.6% versus anesthesia 89.7%, 6.7%, and 3.6%. Analysis of patients were intubated on first attempt, and 3 or more attempts were 79.2% and 78.5%, respectively. In the multivariate logistic regression model, factors associated with a successful second attempt were emergency physicians, senior physicians, nondifficult airway, and the use of a rapid sequence intubation (RSI) (odds ratio = 2.81 [95% confidence interval, 1.80-4.37], 1.50 [1.10-2.07], 2.15 [1.53-3.01], and 1.53 [1.01-2.33], respectively). Nondifficult airway and the use of RSI were associated with successful third attempts (5.48 [2.69-11.18] and 2.63 [1.08-6.40], respectively).

CONCLUSIONS:
There were no differences in laryngoscopy performance and intubation success in trauma airways managed on an every-other-day basis by emergency medicine versus anesthesia residents.

Airway management of adult patients without trauma in an ED led by internists.
Roth D, Schreiber W, Stratil P, Pichler K, Havel C, Haugk M.
Department of Emergency Medicine, Medical University of Vienna, Vienna, Austria.

Abstract

BACKGROUND:
Airway management is a key competence in emergency medicine. Patients heavily differ from those in the operating room. They are acutely ill by definition and usually not fasting. Evaluation of risk factors is often impossible. Current literature primarily originates from countries where emergency medicine is an independent specialty. We evaluated intubations in a high-volume emergency department run by internists and comprising its own distinct intensive care unit.

METHODS:
In this prospective, noncontrolled, observational study, we continuously documented all intubations performed at the emergency department. We analyzed demographic, medical, and staff-related factors predicting difficulties during intubation using logistic regression models.

RESULTS:
For 73 months, 660 cases were included, 69 (10.5%) of them were without any induction therapy. Two hundred fifty-two (38.2%) patients were female, and their mean age was 59 ± 17 years. Three hundred four (49.9%) had an initial Glasgow Coma Scale of 3. Leading indications were respiratory insufficiency (n = 246; 37.3%), resuscitation (n = 172; 26.1%), and intracranial hemorrhage (n = 75; 11.4%). First attempt was successful in 465 cases (75.1%); alternative airway devices were used in 22 cases (3.3%). Time from the first intubation attempt to a validated airway was 1 minute (interquartile range, 0-2 minutes). Physicians’ experience and anatomical risk factors were associated with failure at the first attempt, prolonged intubation, and the need for alternative devices.

CONCLUSIONS:
Airway management at the emergency department possesses a high potential of failure. Experience seems to be the key to success.
Airway management by US and Canadian emergency medicine residents: a multicenter analysis of more than 6,000 endotracheal intubation attempts.
Sagarin MJ, Barton ED, Chng YM, Walls RM; National Emergency Airway Registry Investigators.
University of New Mexico Health Sciences Center, Albuquerque, NM, USA.

Abstract
STUDY OBJECTIVE:
We determine success rates of endotracheal intubation performed in emergency departments (EDs) by North American emergency medicine residents.
METHODS:
During 58 months, physicians performing intubations at 31 university-affiliated EDs in 3 nations completed a data form that was entered into the National Emergency Airway Registry 2 database. Included were all patients undergoing endotracheal intubation in the ED. The data form included patients' age, sex, weight, indication for intubation, technique of airway management, names and dosages of all medications used to facilitate intubation, level of training and specialty of the intubator, number of attempts, success or failure, and adverse events. We queried this prospectively gathered, observational data to analyze intubations done by US and Canadian emergency medicine residents.
RESULTS:
Enrollment was incomplete (eg, 85% at the main study center), so the study sample did not include all consecutive patients. Emergency medicine residents performed 77% (5768/7498; 95% confidence interval [CI] 76% to 78%) of all initial intubation attempts in the United States and Canada. The first intubator was successful in 90% (5,193/5,757; 95% CI 89% to 91%) of cases, including 83% (4,775/5,757; 95% CI 82% to 84%) on the first attempt. Success rates on the first attempt were as follows: postgraduate year 1 = 72% (498/692; 95% CI 68% to 75%), postgraduate year 2 = 82% (2,081/2,544; 95% CI 80% to 83%), postgraduate year 3 = 88% (1,963/2,238; 95% CI 86% to 89%), postgraduate year 4+ = 82% (233/283; 95% CI 77% to 87%), and attending physician = 89% (689/772; 95% CI 87% to 91%). Success rates by the first intubator were as follows: postgraduate year 1 = 80% (553/692; 95% CI 77% to 83%), postgraduate year 2 = 89% (2,272/2,544; 95% CI 88% to 90%), postgraduate year 3 = 94% (2,105/2,386; 95% CI 93% to 95%), postgraduate year 4+ = 93% (263/283; 95% CI 89% to 96%), and attending physician = 98% (755/772; 95% CI 96% to 99%). Rapid sequence intubation technique was used in 78% (4,513/5,676; 95% CI 77% to 79%) of initial attempts: it resulted in 85% (3,843/4,513; 95% CI 84% to 86%) success on the first attempt and 91% (4,117/4,513; 95% CI 90% to 92%) success by the first intubator. The overall rate of cricothyrotomy for all emergency resident intubations was 0.9% (50/5,757; 95% CI 0.6% to 1.1%). When an initial intubator failed, 40% (385/954; 95% CI 37% to 44%) of rescue attempts were performed by emergency medicine residents. Among emergency medicine residents, success on the first rescue attempt was 80% (297/371; 95% CI 76% to 84%), and success by the first rescue intubator was 88% (328/371; 95% CI 85% to 91%).
CONCLUSION:
Success of initial intubation attempts increased over the first 3 years of residency. This large multicenter study demonstrates the success of airway management by emergency medicine residents in North America. Using rapid-sequence intubation predominantly, emergency medicine residents achieved high levels of success.

Rapid sequence intubation for pediatric emergency airway management.
Source
Mount Auburn Hospital, Department of Emergency, Cambridge, MA 02138, USA. mark_sagarin@hms.harvard.edu

Abstract
OBJECTIVES:
To characterize current practice with respect to pediatric emergency airway management using a multicenter data set.
METHODS:
A multicenter collaboration was undertaken to gather data prospectively regarding emergency intubation. Analysis of data on adult emergency department (ED) intubations clearly demonstrated that rapid sequence intubation (RSI) was the method used most often. We then conducted an observational study of the prospectively collected database of pediatric ED intubations (EDIs) using the National Emergency Airway Registry Phase One data, gathered in 11 participating EDs over a 16-month time period. A data form completed at the time of EDI enabled analysis of patients' ages, weights, and indications for EDI; personnel; methods employed to facilitate EDI; success rates; and adverse events. Data forms were analyzed regarding the methods of intubation employed, and frequencies, success rates, and adverse event rates among various intubation modalities were compared.
RESULTS:
Of 1288 EDIs, there were 156 documented pediatric patients. Initial intubation attempts were all oral, including rapid sequence intubation in 81%, without medications (NOM) in 13%, and sedation without neuromuscular blockade (SED) in 6%. Older children and trauma patients were more likely to be intubated with RSI compared to younger children and patients presenting with medical illnesses. Intubation using RSI was more successful on the first attempt (78%) compared with either NOM (47%, <0.01) or SED (44%, <0.05), though this finding is likely explainable by the age differences among groups. Intubation was successfully performed by the initial intubator in 85% of RSI, 75% of NOM, and 89% of SED attempts ( = NS for both comparisons vs RSI). Overall, successful intubation occurred in 99% of RSI and 97% of non-RSI intubation attempts ( = NS). Only one of 156 patients required surgical airway management. True complications occurred in 1%, 5%, and 0% of RSI, NOM, and SED attempts, respectively ( = NS for both comparisons vs RSI). The majority of initial intubation attempts were performed by emergency medicine residents (59%), pediatric emergency medicine fellows (17%), and pediatric residents (10%). These groups were 77%, 77%, and 50% successful, respectively, on the first laryngoscopy attempt, and 89%, 89%, and 69% successful overall.
CONCLUSIONS:
A large, prospective, multicenter observational study of pediatric EDIs was conducted at university-affiliated EDs. RSI is the method of choice for the majority of pediatric emergency intubations; it is associated with a high success rate and a low rate of serious adverse events. Pediatric intubation as practiced in academic EDs, with most initial attempts by emergency and pediatrics residents and fellows under attending physician supervision, is safe and highly successful.

The importance of first pass success when performing orotracheal intubation in the emergency department.
Sakles JC, Chiu S, Monsier J, Wolfe RE, C, Stolz U.
Department of Emergency Medicine, University of Arizona, Tucson, AZ, USA. sakles@aemrc.arizona.edu

Abstract

OBJECTIVES: The goal of this study was to determine the association of first pass success with the incidence of adverse events (AEs) during emergency department (ED) intubations.

METHODS: This was a retrospective analysis of prospectively collected continuous quality improvement data based on orotracheal intubations performed in an academic ED over a 4-year period. Following each intubation, the operator completed a data form regarding multiple aspects of the intubation, including patient and operator characteristics, method of intubation, device used, the number of attempts required, and AEs. Numerous AEs were tracked and included events such as witnessed aspiration, oxygen desaturation, esophageal intubation, hypotension, dysrhythmia, and cardiac arrest. Multivariable logistic regression was used to assess the relationship between the primary predictor variable of interest, first pass success, and the outcome variable, the presence of one or more AEs, after controlling for various other potential risk factors and confounders.

RESULTS: Over the 4-year study period, there were 1,828 orotracheal intubations. If the intubation was successful on the first attempt, the incidence of one or more AEs was 14.2% (95% confidence interval [CI] = 12.4% to 16.2%). In cases requiring two attempts, the incidence of one or more AEs was 47.2% (95% CI = 41.8% to 52.7%); in cases requiring three attempts, the incidence of one or more AEs was 63.6% (95% CI = 53.7% to 72.6%); and in cases requiring four or more attempts, the incidence of one or more AEs was 70.6% (95% CI = 56.2% to 82.5%). Multivariable logistic regression showed that more than one attempt at tracheal intubation was a significant predictor of one or more AEs (adjusted odds ratio [aOR] = 7.52, 95% CI = 5.86 to 9.63).

CONCLUSIONS: When performing orotracheal intubation in the ED, first pass success is associated with a relatively small incidence of AEs. As the number of attempts increases, the incidence of AEs increases substantially.

Tracheal intubation in the emergency department: the Scottish district hospital perspective

A G M Stevenson, C A Graham, R Hall, P Korsah, A C McGuffie

Abstract

Background: Tracheal intubation is the accepted gold standard for emergency department (ED) airway management. It may be performed by both anaesthetists and emergency physicians (EPs), with or without drugs.

OBJECTIVE: To characterise intubation practice in a busy district general hospital ED in Scotland over 40 months between 2003 and 2006.

SETTING: Crosshouse Hospital, a 450-bed district general hospital serving a mixed urban and rural population; annual ED census 58 000 patients.

Methods: Prospective observational study using data collection sheets prepared by the Scottish Trauma Audit Group. Pro formas were completed at the time of intubation and checked by investigators. Rapid-sequence induction (RSI) was defined as the co-administration of an induction agent and suxamethonium.

RESULTS: 234 intubations over 40 months, with a mean of 6 per month. EPs attempted 108 intubations (46%). Six patients in cardiac arrest on arrival were intubated without drugs. 29 patients were intubated after a gas induction or non-RSI drug administration. RSI was performed on 199 patients. Patients with trauma constituted 75 (38%) of the RSI group. 29 RSIs (15%) were immediate (required on arrival at the ED) and 154 (77%) were urgent (required within 30 min of arrival at the ED). EPs attempted RSI in 88 (44%) patients and successfully intubated 85 (97%). Anaesthetists attempted RSI in 111 (56%) patients and successfully intubated 108 (97%). Anaesthetists had a higher proportion of good views at first laryngoscopy and there was a trend to a higher rate of successful intubation at the first attempt for anaesthetists. Complication rates were comparable for the two specialties.

CONCLUSIONS: Tracheal intubations using RSI in the ED are performed by EPs almost as often as by anaesthetists in this district hospital. Overall success and complication rates are comparable for the two specialties. Laryngoscopy training and the need to achieve intubation at the first (optimum) attempt needs to be emphasised in EP airway training.

Trauma airway management: transition from anesthesia to emergency medicine.

Varga S, Shupp JW, Maher D, Tuznik I, Sava JA.

Division of Trauma and Surgical Critical Care, USC Department of Surgery, University of Southern California, LAC + USC Medical Center, Los Angeles, CA 90033, USA.

Abstract

BACKGROUND: Trauma airway management is commonly performed by either anesthesiologists or Emergency Physicians (EPs).

OBJECTIVE: Our aim was to evaluate the impact of switching from one group of providers to the other, focusing on outcomes and complications.

METHODS: Medical records were used to identify all patients during a 3-year period who were intubated emergently after traumatic injury. Before November 1, 2007, airway management was supervised by anesthesiologists, after that date airways were needed in 3.2% of patients. The complication rate was 18.3% for the anesthesia group and 18% for the EP group. There were no statistically significant differences between the EP and anesthesia groups with regard to complication rates, although the EP patients had a higher Injury Severity Score on average.

CONCLUSIONS:
EPs can safely manage the airways of trauma patients with rates of complication and failure comparable with those of anesthesiologists.

**Emergency airway management: a multi-center report of 8937 emergency department intubations.**
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**Abstract**

**OBJECTIVE:**
Emergency department (ED) intubation personnel and practices have changed dramatically in recent decades, but have been described only in single-center studies. We sought to better describe ED intubations by using a multi-center registry.

**METHODS:**
We established a multi-center registry and initiated surveillance of a longitudinal, prospective convenience sample of intubations at 31 EDs. Clinicians filled out a data form after each intubation. Our main outcome measures were descriptive. We characterized indications, methods, medications, success rates, intubator characteristics, and associated event rates. We report proportions with 95% confidence intervals and chi-squared testing; p-values < 0.05 were considered significant.

**RESULTS:**
There were 8937 encounters recorded from September 1997 to June 2002. The intubation was performed for medical emergencies in 5951 encounters (67%) and for trauma in 2337 (26%); 649 (7%) did not have a recorded mechanism or indication. Rapid sequence intubation was the initial method chosen in 6138 of 8937 intubations (69%) and in 84% of encounters that involved any intubation medication. The first method chosen was successful in 95%, and intubation was ultimately successful in 99%. Emergency physicians performed 87% of intubations and anesthesiologists 3%. Several other specialties comprised the remaining 10%. One or more associated events were reported in 779 (9%) encounters, with an average of 12 per 100 encounters. No medication errors were reported in 6138 rapid sequence intubations. Surgical airways were performed in 0.84% of all cases and 1.7% of trauma cases.

**CONCLUSION:**
Emergency physicians perform the vast majority of ED intubations. ED intubation is performed more commonly for medical than traumatic indications. Rapid sequence intubation is the most common method of ED intubation.

**Emergency airway management—experience of a tertiary hospital in South-East Asia.**
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**Abstract**

**OBJECTIVE:**
To study the indications and diagnoses of patients requiring emergency airway management and to evaluate the adequacy of airway management skills of emergency physicians.

**METHODS:**
Prospective observational study of all patients requiring advanced airway management from 1 November 1998 to 31 October 2002.

**RESULTS:**
There were 1068 cases, 710 (66.5%) were men. The median age was 63 years. The most common diagnoses requiring tracheal intubation were cardiopulmonary arrest (37.7%), congestive heart failure (20.8%) and head injury (8.3%). The main indications were apnoea (42.5%), hypoxia (21.3%) and prophylactic airway protection (17.6%). Orotracheal intubation with no medication was most common (51.5%) followed by rapid sequence induction (RSI) (29.4%) and orotracheal intubation with sedation only (19.6%). The overall success rate for orotracheal intubation was 99.6%. The cricothyrotomy rate was 0.2%. Hypotension (4.2%), multiple intubation attempts (1.9%) and oesophageal intubation (1.5%) were the three most common problems. There was no statistical difference in the occurrence of hypotension between the use of midazolam and etomidate for sedation or induction prior to intubation. Six hundred and forty-six (60.5%) patients survived the immediate post-resuscitation period. No patient died from failure to secure the airway.

**CONCLUSION:**
Airway management and rapid sequence induction for intubation can be safely performed by emergency physicians.

**A prospective observational study of tracheal intubation in an emergency department in a 2300-bed hospital of a developing country in a one-year period.**
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**Abstract**

**OBJECTIVE:**
To assess the competency of physicians in the non-traumatic emergency department (ED) in intubating critically ill patients, to describe the methods, success rates and immediate complications after intubation in Siriraj Hospital.

**METHOD:**
A one-year prospective observational study of endotracheal intubation in the ED of Siriraj Hospital, which has an annual census of 150 518 patients. Data were collected by each intubator at the time of each intubation for indications, success rates, use of drugs to facilitate intubation and immediate complications of tracheal intubation and the outcomes of patients.

**RESULT:**
A total of 757 patients underwent endotracheal attempts in the ED, including 176 (23.2%) patients in cardiopulmonary arrest; 754 (99.6%) of these were successfully intubated and 602 (79.5%) patients were successfully intubated at the first attempt. Three patients could not be intubated and underwent surgical airway management. In non-cardiac arrest patients, intubation by neuromuscular blocking agent was performed in 16 (2.75%) patients only, and all the intubators were anaesthesiologists. 396 (68.1%) patients were successfully intubated without using any drug. 285 (37.6%) patients were found to have a total of 341 complications.

**CONCLUSION:**
At this institution, the majority of ED intubations were performed by residents and no drug was used. In this ED patients were intubated with a high success rate for orotracheal intubation.
Effect of video laryngoscopy on trauma patient survival: A randomized controlled trial.

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Abstract

BACKGROUND:

Many resuscitation scenarios include the use of emergency intubation to support injured patients. New video-guided airway management technology is available, which may minimize the risk to patients from this procedure.

METHODS:

This was a controlled clinical trial conducted in the trauma receiving unit in a university-affiliated urban hospital in which 623 consecutive adult patients requiring emergency airway management were prospectively randomized to intubation with either the direct laryngoscope (DL) or the GlideScope video laryngoscope (GVL) device.

RESULTS:

The primary outcome was survival to hospital discharge. There was no significant difference in mortality between the GVL group (28 [9%] of 303) and the DL group (24 [8%] of 320) (p = 0.43) for all patients. Within a smaller cohort identified retrospectively, there was a higher mortality rate seen in the subgroup of patients with severe head injuries (head Abbreviated Injury Scale [AIS] score > 3) who were randomized to intubation with GVL (22 [30%] of 73) versus DL (16 [14%] of 112) (p = 0.047). Among all patients, median intubation duration in seconds was significantly higher for the GVL group (median, 56; interquartile range, 40-81) than for the DL group (median, 40; interquartile range, 24-68) (p < 0.001). Among those with severe head injuries, median intubation duration in seconds was also significantly higher for the GVL group (median, 74) than for the DL group (median, 65) (p < 0.003). Correspondingly, this group also experienced a greater incidence of low oxygen saturations of 80% or less (27 [50%] of 54 for the GVL group and 15 [24%] of 63 for the DL group; p = 0.004). There were no significant differences between the two groups in first-pass success (80% for GVL and 81% for DL, p = 0.46).

CONCLUSION:

Use of the GlideScope did not influence survival to hospital discharge among all patients and was associated with longer intubation times than direct laryngoscopy. Among the video laryngoscope cohort, a smaller subgroup of severe head injury trauma patients identified retrospectively seemed to be associated with a greater incidence of hypoxia of 80% or less and mortality.

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