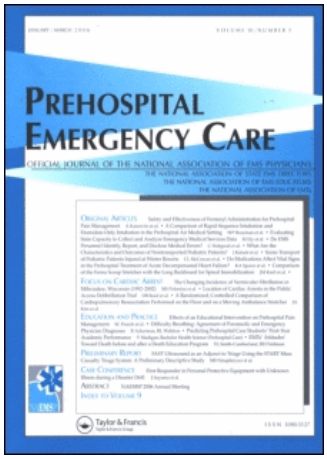

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THE PREDICTIVE VALUE OF PARAMEDIC ASSESSMENT OF ASPIRATION IN PATIENTS UNDERGOING RSI

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with intubation. **Conclusions:** In this study intubation success rate and dose of RSI medications were consistent with established guidelines for intubation. Neither $EtCO_2$ nor syringe aspiration was utilized in 6 patients. Atropine pretreatment in children age 10 or less was underutilized. Failed intubations occurred only in patients receiving no medications. Oxygen saturation improved significantly with intubation. Limitations include retrospective data collection.

22 COMPARISON OF VENTILATORY EFFICACY OF THE STANDARD BAG–VALVE–MASK AND THE SMART BAG© **Jonnathan M. Busko, Michael Dailey, Fred Goodwin,** *Carolinas Medical Center*

Objective: Bag–valve–mask ventilation is often poorly performed in the prehospital environment. The American Heart Association guidelines specify 10 breaths per minute, tidal volumes of 6–7 mL/kg, an I:E ratio of 1:2, and low peak airway pressures to minimize gastric inflation. This study compared EMS provider ventilation with a standard bag–valve–mask (BVM) to ventilation with a new bag–valve–mask device, the SMART Bag© (O-Two Systems Inc., Ontario, Canada). This device uses a pressure responsive flow-limiting valve to limit peak pressures and gas flow rate. **Methods:** This study was conducted at a regional EMS conference. Participants were randomized to order of device utilization. Providers were told to ventilate a Mini-Ventilation Analyzer© (O-Two Systems Inc.) with each device for 1 minute as they would ventilate an 85 kg patient. Mask leak variability was controlled for by directly connecting the devices to the Mini-Ventilation Analyzer©. Esophageal opening pressure was set at 18 cm H_2O, lung compliance at 0.03 L/cm H_2O, and airway resistance per Michigan Instruments healthy adult parameters. Breaths per minute, mean tidal volume, minute ventilation, peak airway pressure, mean gastric inflation volume, and mean I:E ratio were measured. **Results:** Mean breaths per minute were 17.10 (SD: 0.74) with the BVM and 14.45 (SD: 0.68) for the SMART Bag© ($p < 0.0001$). The mean tidal volume was 479.03 mL (SD: 12.98 mL) with the BVM and 536.78 mL (SD: 18.95 mL) with the SMART Bag© ($p = 0.0007$). The mean minute ventilation was 8,034.83 mL (SD: 338.55 mL) with the BVM and 7,484.63 mL (SD: 253.73 mL) with the SMART Bag© ($p = 0.0324$). Mean gastric inflation volume with the BVM was 1,725.36 mL (SD: 374.52 mL) versus 0 mL for the SMART Bag© ($p = 0.0006$). Peak airway pressures were 16.30 cm H_2O (SD: 0.89 cm H_2O) with the BVM and 12.23 cm H_2O, (SD: 0.29 cm H_2O) with the SMART Bag© ($p < 0.0001$). The I:E ratio for the BVM was 1:1.21 (SD: 0.10) versus 1:1.40 (SD: 0.09) with the SMART Bag© ($p = 0.0117$). **Conclusion:** Using the SMART Bag© increased participants' ability to perform BVM ventilation to AHA standards. For all parameters, the SMART Bag© performed significantly better than the standard bag–valve device.

23 RELIABILITY OF PARAMEDIC RATINGS OF LARYNGOSCOPIC VIEWS DURING ENDOTRACHEAL INTUBATION **Jeremiah K. OShea, Henry E. Wang,** *University of Pittsburgh Affiliated Residency in Emergency Medicine*

Objective: Prior studies have related prehospital endotracheal intubation (ETI) difficulty to paramedic visualization of the vocal cords as described by the Cormack-Lehane (C-L) grading scale. However, the reliability of paramedic C-L ratings has not been formally studied. We evaluated the reliabilities of C-L and a recently described scale, percentage of glottic opening (POGO), when used by paramedics to rate laryngoscopic views during ETI. **Methods:** We used 25 standard slide images of laryngoscopic views obtained during ETI. We duplicated the 25 images to facilitate evaluation of intra-rater agreement (total 50 slides). Seven paramedics rated the degree of vocal cord visualization in each image using C-L (1-4, ordinal scale; 1 = full visualization of vocal cords, 2 = vocal cords partially obstructed by epiglottis, 3 = vocal cords mostly obstructed by epiglottis, 4 = only epiglottis seen) and POGO (0–100% continuous scale describing percentage of vocal cords visualized; 0% = vocal cords completely obstructed, 100% = vocal cords fully visualized). We assessed intra- and inter-rater reliabilities using Cohen's multi-rater kappa for C-L and intraclass correlation coefficients (ICC) for POGO. **Results:** C-L showed variable intra-rater reliabilities (kappa range = 0.37–0.90) and poor inter-rater reliability (multi-rater kappa = 0.22). POGO demonstrated good intra-rater reliabilities (one-way random-effects ICC range = 0.57–0.87) and good inter-rater reliability (two-way random-effects ICC = 0.59, 95% CI: 0.48–0.71). **Conclusions:** Paramedic C-L ratings exhibit poor intra- and inter-rater reliabilities and thus may have only limited clinical or scientific utility. Paramedic POGO ratings exhibit good intra- and inter-rater reliabilities and may be more appropriate for prehospital clinical and scientific application.

24 THE PREDICTIVE VALUE OF PARAMEDIC ASSESSMENT OF ASPIRATION IN PATIENTS UNDERGOING RSI **Gary M. Vilke, Tyler Vadeboncoeur, Daniel P. Davis, Jennifer C. Poste, Mel Ochs, David B. Hoyt,** *University of California San Diego Medical Center*

Objective: The San Diego Paramedic RSI Trial revealed an increase in mortality associated with paramedic RSI. Paramedics reported a high incidence of aspiration in trial patients. Here we investigate the validity and clinical consequences of paramedic determination of aspiration. **Methods:** Severely head-injured (GCS 3–8) adults were prospectively enrolled. Paramedics made prospective determinations of aspiration for all trial patients; aspiration was defined by visualization of blood/vomitus distal to vocal cords or the presence of rhonchi in a patient with oropharyngeal blood/vomitus. RSI factors and clinical data were abstracted from a telephone debriefing, and hospital data were obtained from the county trauma registry. Patients with and without paramedic determination of aspiration were compared with regard to the rate of aspiration pneumonia, defined by discharge diagnosis or autopsy data, as well as for various RSI factors, vital signs, and clinical data. **Results:** Aspiration was noted by paramedics in 72/269 patients in whom complete data were available. A formal diagnosis of aspiration pneumonia was given to 11.1% of the aspiration group vs. only 3.6% of the non-aspiration group (p + 0.017). Field aspiration patients had lower SaO_2 and arrival pO_2

values, required more intubation attempts, and had a higher incidence of Combitube insertion. Field aspiration patients also had higher head/neck AIS and ISS scores, longer ICU and total hospital stays, but no difference in mortality. **Conclusions:** Paramedics accurately assess aspiration in patients undergoing RSI. Aspiration was associated with more severe injuries, prolonged hospitalization, and prehospital and arrival hypoxia.

25 First Year's Experience with Rapid-sequence Intubation (RSI) in a Rural City of 85,000 **Brian P. McGlinch, Eric Weller,** *Mayo Clinic*

Objective: We report our first 12 months' experience with rapid-sequence intubation (RSI) in a rural city (population 85,000) from a single advanced life support ground ambulance service employing 45 paramedics. **Methods:** We conducted a retrospective, observational review of an RSI database following our first year's experience with RSI. Glasgow Coma Scores <8 and/or deteriorating hemodynamic or respiratory stability were indications for RSI. Etomidate (0.2 mg/kg) and succinylcholine (2 mg/kg) were the only agents used for initial sedation and paralysis. Laryngoscopy is limited to 30 seconds in duration per intubation attempt. **Results:** In the 12-month period, approximately 3,700 emergency calls were answered. 23 of these patients met RSI criteria. 17 of 23 patients received the intervention: 1 trauma, 16 with medical emergencies (7 neurologic, 5 respiratory, 3 drug overdoses, 1 carbon monoxide poisoning). Hospital records were available for all patients. 15 of 17 (88%) were intubated on the first or second laryngoscopy. Duration of laryngoscopy (8 patients), not oxygen desaturation (1 patient), was the usual reason for interrupting intubation attempts. No esophageal intubations occurred. Patients weighing 120 kg or more were more difficult to intubate. Two patients required Combitube placement due to failed intubation: a 170 kg unresponsive patient and a 130 kg patient with copious pulmonary edema fluid. Two cardiac arrests occurred immediately after RSI: a patient with severe emphysema developed pulseless electrical activity and the 130 kg patient with pulmonary edema developed ventricular fibrillation. Neither patient survived. Of the 15 patients surviving to hospital admission, 6 patients (4 neurologic and 2 respiratory) died from processes unrelated to RSI. **Conclusions:** In a city this size, RSI is infrequently indicated. Infrequent oxygen desaturation during RSI suggests adequate paramedic airway management skills and the benefit of limiting duration of intubaiton attempts. The high mortality in patients receiving RSI (related and unrelated to the intervention) suggests RSI may not improve patient outcome in critically ill patients. Justifying training in and maintaining RSI skills in non-metropolitan ambulance services is difficult given its infrequent use and lack of compelling evidence the intervention improves patient outcomes.

26 Comparison of Intubation Times in Emergency Residents Wearing Personal Protective Equipment **Rachel I. Burke, Linda Spillane, John Benitez,** *Strong Memorial Hospital*

Objective: Disaster preparedness requires personnel to maintain proficiency at lifesaving procedures while donning protective equipment. Hypothesis: There will be no clinically significant difference in intubation time with and without full level C personal protective equipment (PPE). **Methods:** Case–control study. Volunteer EM residents were timed intubating a computerized human patient simulator (HPS) once with and without PPE—order randomized by coin toss. All participants intubated the same HPS. The HPS was programmed to start with an oxygen saturation (O_2 saturation) 90% and have a set rise in O_2 saturation when ventilated (and fall in O_2 saturation at a set rate with cessation of active ventilation). Residents were instructed to ventilate the patient until the O_2 saturation was 98%, intubate the patient, and confirm tube placement using the end tidal CO_2 detector. Time to ventilate the HPS to an O_2 saturation of 98% and the times to intubate the patient and confirm tube placement as determined by end-tidal CO_2 detector color change were recorded. After a rest period, each resident repeated the procedure wearing the other set of gear (either PPE or UP). Data Analysis: A priori, a time difference of >60 seconds and time to intubate/confirm tube placement >5 minutes were determined to be clinically significant. Mean times to intubate with and without PPE were compared between groups and for individuals using a t-test with equal variance. **Results:** 14 residents participated in the study with 7 intubating first in PPE. The mean time to intubate with PPE was 37.1 seconds (95% CI 27.1–47.0). The mean time to intubate in UP was 29.8 seconds (95% CI 24.2–35.4). Individual variance was 19.0 seconds, and did not correlate with the type of gear being worn first. No difference in time to intubate based on order of PPE versus UP was found. No intubation took $>$ 90 seconds once an O_2 saturation of 98% was achieved. The patient's O_2 saturation was never below 98% during any of the intubations. There were no esophageal intubations. **Conclusion:** There was no clinically significant difference in time to intubate with and without PPE.

27 What Are the Emergency Department Outcomes of Failed Prehospital Intubations? **Meredith D. Chiasson, David A. Petrie, Ed Cain,** *Dalhousie University*

Objective: Despite the importance of prehospital airway management, little is known about the outcomes of failed prehospital intubations. Our primary objective is to determine the emergency department (ED) outcome of failed prehospital intubations in a large emergency medical services (EMS) system. The secondary objective is to describe the epidemiology of all patients with an attempted field intubation. **Methods:** Design: Retrospective review of the provincial prehospital intubation registry for the period of January 1, 2002, to June 1, 2003. Data for the registry were extracted from the patient care record using a standardized data extraction form. Setting: The EMS system in Nova Scotia is a single system covering a population of 940,000 in urban, suburban, and rural settings. Subjects: All intubated patients (ground and air). No patients were excluded. Observations: Intubations were verified by clinical signs, and either end tidal CO_2 capnometry or esophageal detector devices; emergency physicians verified tube placement when possible.