

# Selected References

## General

Hagberg CA (Editor). *Benumof's Airway Management, 2nd Edition*. Mosby, Philadelphia, PA 2007.

Hung O, Murphy MF. *Management of the Difficult and Failed Airway*. McGraw-Hill Medical, New York, NY 2008.

Kovacs G, Law JA. *Airway Management in Emergencies*. McGraw-Hill Medical, New York, NY 2008.

Levitan RM. *The AirwayCam Guide to Intubation and Practical Emergency Airway Management*. AirwayCam Technologies, Inc., Wayne, PA 2004.

Margolis, G. *Paramedic: Airway Management*. Jones and Bartlett Publishers, Inc. Sudbury, MA 2004.

Rich JM. *SLAM: Street Level Airway Management*. Pearson Education, Inc., Upper Saddle River, NJ 2008.

Walls RM, Murphy MF. *Manual of Emergency Airway Management, 3rd Edition*. Wolters Kluwer, Philadelphia, PA 2008.

## Chapter 1

Bozeman WP, Kleiner DM, Huggett V. A comparison of rapid-sequence intubation and etomidate-only intubation in the prehospital air medical setting. *Prehosp Emerg Care* 2006;10(1):8-13.

Jacoby J et al. Etomidate versus midazolam for out-of-hospital intubation: a prospective, randomized trial. *Ann Emerg Med* 2006;47(6):525-30.

Kociszewski C, Thomas SH, Harrison T, Wedel SK. Etomidate versus succinylcholine for intubation in an air medical setting. *Am J Emerg Med* 2000;18(7):757-63.

Kovacs G et al. Acute airway management in the emergency department by non-anesthesiologists. *Can J Anesth* 2004;51(2):174-80.

Reed DB, Snyder G, Hogue TD. Regional EMS experience with etomidate for facilitated-intubation. *Prehosp Emerg Care* 2002;6(1):50-3.

Sackles JC et al. Airway management in the emergency department: a one year study of 610 tracheal intubations. *Ann Emerg Med* 1998;31:325-32.

Sagarin MJ et al. Airway management by US and Canadian emergency medicine residents: a multicenter analysis of more than 6,000 intubation attempts. *Ann Emerg Med* 2005;46(4):328-36.

Sagarin MJ et al. Rapid sequence intubation for pediatric emergency airway management. *Pediatr Emerg Care* 2002;18(6):417-23.

Wang HE, Yealy DM. How many attempts are required to accomplish out-of-hospital endotracheal intubation. *Acad Emerg Med* 2006;13(4):372-7.

## Chapter 2

Altermatt FR et al. Pre-oxygenation in the obese patient: the effects of position on tolerance to apnoea. *Br J Anaesth* 2005. Nov;95(5):706-9. Epub 2005 Sep 2.

Baillard C et al. Noninvasive ventilation improves preoxygenation before intubation of hypoxic patients. *Am J Resp Crit Care Med* 2006;174:171-77.

Bair AE et al. An assessment of the tracheal tube introducer as an endotracheal tube placement confirmation device. *Am J Emerg Med* 2005;23:754-758.

Benumof J, Dagg R, Benumof R. Critical hemoglobin desaturation will occur before return to an unparalyzed state following 1 mg/kg succinylcholine. *Anesthesiol* 1997;87(4):979-982.

Bozeman WP et al. Esophageal detector device versus detection of end-tidal carbon dioxide in emergency intubation. *Ann Emerg Med* 1996;27(5):595-9.

Brimacombe JR and Berry AM. Cricoid Pressure. *Can J Anaesth* 1997;44(4):414-425.

Butler PJ, Munro HM and Kenny MB. Preoxygenation in children using expired oxygraphy. *Br J Anaesth*. 1996. Sep;77(3):333-4

Carlson J et al. Extubation force: tape versus endotracheal tube holders. *Ann Emerg Med* 2007;50(6):686-691.

Clark RK and Trethewy CE. Assessment of cricoid pressure application by emergency department staff. *Emerg Med Australas* 2005;17(4):376-81.

Delay JM et al. The effectiveness of noninvasive positive pressure ventilation to enhance preoxygenation in morbidly obese patients: a randomized controlled study. *Anesth Analg* 2008;107:1707-13.

Ellis DY, Harris T, Zideman D. Cricoid pressure in emergency department rapid sequence intubations: a risk-benefit analysis. *Ann Emerg Med* 2007;50:653-665.

Flucker CJ et al. The 50-millilitre syringe as an inexpensive training aid in the application of cricoid pressure. *Eur J Anaesthesiol*. 2000;17(7):443-7.

Garrard A et al. The effect of mechanically-induced cricoid force on lower oesophageal sphincter pressure in anaesthetized patients. *Anaesthesia* 2004;59(5):435-9.

Grmec S. Comparison of three different methods to confirm tracheal tube placement in emergency intubation. *Intensive Care Med* 2002;28(6):701-4.

Hardman JG, Wills JS. The development of hypoxaemia during apnoea in children: a computational modelling investigation. *Br J Anaesth* 2006;97(4):564-70.

Hartsilver EL, Vanner RG. Airway obstruction with cricoid pressure. *Anaesthesia* 2000;55(6):208-11.

Haslam N, Parker L, Duggan JE. Effect of cricoid pressure on the view at laryngoscopy. *Anaesthesia* 2005;60:41-47.

Heidegger T, Heim C. Esophageal detector device: not always reliable. *Ann Emerg Med* 1996;28(5):582.

Hendey et al. Esophageal detector bulb in the aeromedical setting. *J Emerg Med* 2002;23(1):51-5.

Herman NL, Carter B, Van Decar TK. Cricoid pressure: teaching the recommended level. *Anesth Analg* 1996;83(4):859-63.

Ho AM et al. Airway difficulties caused by improperly applied cricoid pressure. *J Emerg Med* 2001;20(1):29-31.

Katz SH, Falk JL. Misplaced endotracheal tubes by paramedics in an urban emergency medical services system. *Ann Emerg Med* 2001;37:32-37.

Kelly JJ et al. Use of tube condensation as an indicator of endotracheal tube placement. *Ann Emerg Med* 1998;31:575-578.



Kung MC et al. Arterial desaturation during induction in healthy adults: should preoxygenation be a routine? *Anaesth Intensive Care* 1991. May;19(2):192-6.

Lane S et al. A prospective, randomised controlled trial comparing the efficacy of pre-oxygenation in the 20 degrees head-up vs. supine position. *Anaesthesia* 2005. Nov;60(11):1064-7.

Lawes EG, Campbell I, Mercer D. Inflation pressure, gastric insufflation and rapid sequence induction. *Br J Anaesth* 1987;59(3):315-18.

Levitan RM et al. Laryngeal view during laryngoscopy: a randomized trial comparing cricoid pressure, backward-upward-rightward pressure, and bimanual laryngoscopy. *Ann Emerg Med* 2006;47(6):548-555.

Li J. Capnography alone is imperfect for endotracheal tube placement confirmation during emergency intubation. *J Emerg Med* 2001;20(3):223-29.

McCrory JW and Matthews JN. Comparison of four methods of preoxygenation. *Br J Anaesth* 1990. May;64(5):517-6.

McGowan P and Skinner A. Preoxygenation – the importance of a good face mask seal. *Br J Anaesth* 1995. Dec;75(6):777-8.

Morrison JE Jr., Collier E, Friesen RH and Logan L. Preoxygenation before laryngoscopy in children: how long is enough? *Paediatr Anaesth*. 1998.8(4):292-8.

Mort TC. Emergency Tracheal Intubation: Complications associated with repeated laryngoscope attempts. *Anesth Analg* 2004;99:607-13.

Moynihan et al. The effect of cricoid pressure on preventing gastric insufflation in infants and children. *Anesthesiology* 1993;78(4):652-6.

Murdoch E, Holdgate A. A comparison of tape-tying versus a tube-holding device for securing endotracheal tubes in adults. *Anaesth Intensive Care* 2007;35(5):730-5.

Nimmagadda U et al. Preoxygenation with tidal volume and deep breathing techniques: the impact of duration of breathing and fresh gas flow. *Anesth Analg* 2001. May;92(5):1337-41.

Palmer JHM and Ball DR. The effect of cricoid pressure on the cricoid cartilage and vocal cords: an endoscopic study in anaesthetized patients. *Anaesthesia* 2000;55:260-87.

Petito SP and Russell WJ. The prevention of gastric insufflation – a neglected benefit of cricoid pressure. *Anaesth Intensive Care* 1988;16(2):139-43.

Ralph SJ, Wareham CA. Rupture of the oesophagus during cricoid pressure. *Anaesthesia* 1991;46(1):40-1.

Ramesh P et al. Age and the onset of desaturation in apnoeic children. *Can J Anaesth* 1994;41(9):771-4.

Rooney MJ. Pre-oxygenation: a comparison of two methods using a Bain system. *Anaesthesia* 1994;49(7):629-32.

Saghaei M, Masoodifar M. The pressor response and airway effects of cricoid pressure during induction of general anesthesia.

Salem MR, Sellick BA, Elam JO. The historical background of cricoid pressure in anaesthesia and resuscitation. *Anesth Analg*. 1974;53(2):230-2.

Schaller RJ, Huff JS, Zahn A. Comparison of a colorimetric end-tidal CO<sub>2</sub> detector and an esophageal aspiration device for verifying endotracheal tube placement in the prehospital setting: a six-month experience. *Prehosp Disaster Med* 1997;12(1):57-63.

Sellick BA. Cricoid pressure to control regurgitation of stomach contents during induction of anaesthesia. *Lancet* 1961;2:404-6.

Sharieff GQ et al. The self-inflating bulb as an esophageal detector device in children weighing more than twenty kilograms: a comparison of two techniques. *Ann Emerg Med* 41(5):623-9.

Sharieff GQ et al. The self-inflating bulb as an airway adjunct: is it reliable in children weighing less than 20 kilograms? *Acad Emerg Med* 2003;10(4):303-8.

Smith KJ, Ladak S, Choi PT, Dobranowski J. The cricoid cartilage and the esophagus are not aligned in close to half of adult patients. *Can J Anaesth* 2002. 49(5):503-7.

Smith KJ et al. Cricoid pressure displaces the esophagus: an observational study using magnetic resonance imaging. *Anesthesiol* 2003;99:60-4.

Takeda et al. Assessment of three methods to verify tracheal tube placement in the emergency setting. *Resuscitation* 2003;56(2):153-7.

Tournadre JP et al. Cricoid pressure reduces lower esophageal sphincter tone. *Anesthesiology* 1997;86(1):7-9.

Wang HE, Yealy DM. How many attempts are required to accomplish out-of-hospital endotracheal intubation. *Acad Emerg Med* 2006;13(4):372-7.

Xue FS et al. Study of the optimal duration of preoxygenation in children. *J Clin Anesth.* 1995. Mar;7(2):93-6.

Zaleski L, Abello D, Gold MI. The esophageal detector device. Does it work? *Anesthesiol* 1993;79(2):244-7.

## Chapter 3

Adamzik M et al. Intravenous lidocaine after tracheal intubation mitigates bronchoconstriction in patients with asthma. *Anesth Analg* 2007;104(1):168-72.

Adembri C, Venturi L, Pellegrini-Giampietro DE. Neuroprotective effects of propofol in acute cerebral injury. *CNS Drug Rev* 2007;3(3):333-51.

Allen JY, Macias CG. The efficacy of ketamine in pediatric emergency department patients who present with acute severe asthma. *Ann Emerg Med* 2005;46(1):43-50.

Bauer SJ, Orio K, Adams BD. Succinylcholine induced masseter spasm during rapid sequence intubation may require a surgical airway: case report. *Emerg Med J* 2005;22(6):456-8.

Black TE, Kay B, Healy TE. Reducing the haemodynamic responses to laryngoscopy and intubation: a comparison of alfentanil with fentanyl.

Bramwell JK et al. The effect of etomidate on intracranial pressure and systemic blood pressure in pediatric patients with severe traumatic brain injury. *Pediatr Emerg Care* 2006;22(2):90-3.

Chang HS, Togias A, Brown RH. The effects of systemic lidocaine on airway tone and pulmonary function in asthmatic subjects. *Anesth Analg* 2007;104(5):1109-1115.

Craven R. Ketamine. *Anaesthesia* 2007;62 Suppl 1:48-53.

Dalhlgren N, Messeter K. Treatment of stress response to laryngoscopy and intubation with fentanyl. *Anaesthesia* 1981;36(11):1022-6.

Dean P. Should etomidate be used for rapid-sequence intubation induction in critically ill septic patients? Probably not. *Am J Emerg med* 2008;26(6):728-9.

Denmark TK, Crane HA, Brown L. Ketamine to avoid mechanical ventilation in severe pre-diabetic asthma. *J Emerg Med* 2006;30(2):163-6.



- Dhungana Y et al. Prevention of hypotension during propofol induction: a comparison of preloading with 3.5% polymers of degraded gelatin (Haemaccel) and intravenous ephedrine. *Nepal Med Coll J* 2008;10(1):16-9.
- Fastle RK, Roback MG. Pediatric rapid sequence intubation: incidence of reflex bradycardia and effects of pretreatment with atropine. *Pediatr Emerg Care* 2004;20(10):651-5.
- Feng CK et al. A comparison of lidocaine, fentanyl, and esmolol for attenuation of cardiovascular response to laryngoscopy and tracheal intubation. *Acta Anaesthesiol Sin.* 1996;34(2):61-7.
- Fusciardi et al. Roles of fentanyl and nitroglycerin in prevention of myocardial ischemia associated with laryngoscopy and tracheal intubation in patients undergoing operations of short duration. *Anesth Analg.* 1986;65(6):617-24.
- Howton JC et al. Randomized, double-blind, placebo-controlled trial of intravenous ketamine in acute asthma. *Ann Emerg Med* 1996;27(2):170-5.
- Gamlin F et al. The haemodynamic effects of propofol in combination with ephedrine. *Anaesthesia* 1996;51(5):488-91.
- Gill M, Graeme K, Guenterberg K. Masseter spasm after succinylcholine administration. *J Emerg Med* 2005;29(2):167-71.
- Gopalakrishna MD, Krishna HM, Shenoy UK. The effect of ephedrine on intubating conditions and haemodynamics during rapid tracheal intubation using propofol and rocuronium. *Br J Anaesth* 2007;99(2):191-4.
- Guldner G et al. Etomidate for rapid-sequence intubation in young children: hemodynamic effects and adverse events. *Acad Emerg Med* 2003;10(2):134-9.
- Hussain AM, Sultan ST. Efficacy of fentanyl and esmolol in the prevention of haemodynamic response to laryngoscopy and endotracheal intubation. *J Coll Physicians Surg Pak.* 2005;15(8):454-7.
- Kautto UM. Attenuation of the circulatory response to laryngoscopy and intubation by fentanyl. *Acta Anaesthesiol Scand.* 1982;26(3):217-21.
- Kindler CH, Schumacher PG, Schneider MC, Urwyler A. Effects of intravenous lidocaine and/or esmolol on hemodynamic responses to laryngoscopy and intubation: a double-blind, controlled clinical trial. *J Clin Anesth* 1996;8(6):491-6.

- Koerner IP, Brambrink AM. Brain protection by anesthetic agents. *Curr Opin Anaesthesiol* 2006;19(5):481-6.
- Kotani Y et al. The experimental and clinical pharmacology of propofol, an anesthetic agent with neuroprotective properties. *CNS Neurosci Ther* 2008;14(2):95-106.
- Krieger W, Copperman J, Laxer KD. Seizures with etomidate anesthesia. *Anesth Analg* 1985;64(12):1226-7.
- Martin R et al. Rocuronium is the best non-depolarizing relaxant to prevent succinylcholine fasciculations and myalgia. *Can J Anaesth* 1998;45(6):521-5.
- Murray H, Marik PE. Etomidate for endotracheal intubation in sepsis: acknowledging the good while accepting the bad. *Chest* 2005;127(3):707-9.
- Pathak D et al. Effects of alfentanil and lidocaine on the hemodynamic responses to laryngoscopy and tracheal intubation. *J Clin Anesth* 1990;2(2):81-5.
- Perry JJ et al. Rocuronium versus succinylcholine for rapid sequence induction intubation. *Cochrane Database Syst Rev*. 2008;16(2):CD002788.
- Puhringer FK et al. Reversal of profound, high-dose rocuronium-induced neuromuscular blockade by sugammadex at two different time points. *Anesthesiol* 2008;109:188-97.
- Ray DC, McKeown DW. Effect of induction agent on vasopressor and steroid use, and outcome, in patients with septic shock. *Crit Care* 2007;11(3):R56.
- Roman CS, Rosin A. Succinylcholine-induced masseter muscle rigidity associated with rapid sequence intubation. *Am J Emerg Med* 2007;25(1):102-4.
- Rothrock SG, Pagane J. Pediatric rapid sequence intubation incidence of reflex bradycardia and effects of pretreatment with atropine. *Pediatr Emerg Care* 2005;21(9):637-8.
- Sacchetti A. Etomidate: not worth the risk in septic patients. *Ann Emerg Med* 2008;52(1):14-6.
- Sagarin MJ et al. Underdosing of midazolam in emergency department endotracheal intubation. *Acad Emerg Med* 2003;10(4):329-38.
- Salhi B, Stettner E. In defense of the use of lidocaine in rapid sequence intubation. *Ann Emerg Med* 2007;49(1):84-6.



Sarkar M. Hemodynamic responses to etomidate on induction of anesthesia in pediatric patients. *Anesth Analg* 2005;101(3):645-50.

Singh H et al. Comparative effects of lidocaine, esmolol, and nitroglycerin in modifying hemodynamic response to laryngoscopy and intubation. *J Clin Anesth* 1995;7(1):5-8.

Sokolove PE, Price DD, Okada P. The safety of etomidate for emergency rapid sequence intubation of pediatric patients. *Pediatr Emerg Care* 2000;16(1):18-21.

Splinter WM, Cervenka F. Haemodynamic responses to laryngoscopy and tracheal intubation in geriatric patients: effects of fentanyl, lidocaine and thiopentone. *Can J Anaesth* 1989;36(4):370-6.

Tekwani KL et al. A prospective observational study of the effect of etomidate on septic patient mortality and length of stay. *Acad Emerg Med* 2009;16:11-14.

Turner BK et al. Neuroprotective effects of thiopental, propofol, and etomidate. *AANA J* 2005;73(4):297-302.

Tsui BC et al. A precurarization technique using rocuronium. *Can J Anaesth* 1998;45(5):397-401.

Ugur et al. Effects of esmolol, lidocaine and fentanyl on haemodynamic responses to endotracheal intubation: a comparative study. *Clin Drug Investig* 2007;27(4):269-77.

Vaillancourt C, Kapur AK. Opposition to the use of lidocaine in rapid sequence intubation. *Ann Emerg Med* 2007;49(1):86-7.

Vinclair M et al. Duration of adrenal inhibition following a single dose of etomidate in critically ill patients. *Intensive Care Med* 2008;34(4):714-9.

Walls RM, Murphy MF. Clinical controversies: etomidate as an induction agent for endotracheal intubation in patients with sepsis: continue to use etomidate for intubation of patients with septic shock. *Ann Emerg Med* 2008;52(1):13-4.

Zed PJ, Abu-Laban RB, Harrison DW. Intubating conditions and hemodynamic effects of etomidate for rapid-sequence intubation in the emergency department: an observational cohort study. *Acad Emerg Med* 2006;13(4):378-83.

## Chapter 4

Adnet F et al. Study of the "sniffing position" by magnetic resonance imaging. *Anesthesiol* 2001;94(1):83-6.

Adnet F et al. Randomized study comparing the “sniffing position” with simple head extension for laryngoscopic view in elective surgery patients. *Anesthesiol* 2001;95(4):836-41.

Agro F et al. Use of a lighted stylet for intubation via the laryngeal mask airway. *Can J Anaesth* 1998;45(6):556-60.

Ahmed AB, Nathanson MH, Gajraj NM. Tracheal intubation through the laryngeal mask airway using a gum elastic bougie: the effect of head position. *J Clin Anesthesia* 2001;13:427-429.

Allison A, McCrory J. Tracheal placement of a gum elastic bougie using the laryngeal mask airway. *Anaesthesia* 1990;45:419-20.

American Society of Anesthesiologists Task Force on Management of the Difficult Airway. Practice guidelines for management of the difficult airway. *Anesthesiology* 2003;98(5):1269-77.

Bagberi SC et al. Esophageal rupture with the use of the Combitube: report of a case and review of the literature. *J Oral Maxillofac Surg* 2008;66(5):1041-4.

Baillard C et al. Noninvasive ventilation improves preoxygenation before intubation of hypoxic patients. *Am J Resp Crit Care Med* 2006;174:171-77.

Bair AE et al. The failed intubation attempt in the emergency department: analysis of prevalence, rescue techniques, and personnel. *J Emerg Med* 2002;23(2):131-140.

Bourke DL, Katz J, Tonneson A. Nebulized anesthesia for awake endotracheal intubation. *Anesthesiology* 1985;63:690-92.

Braude D and McLaughlin SM. Difficult airways are ‘LEMONS’ – updating the LEMON mnemonic to account for time and oxygen reserve. *Ann Emerg Med* 2006;47(6):581.

Brodsky JB et al. Morbid obesity and tracheal intubation. *Anesth Analg* 2002;94:732-6.

Chan TC et al. Comparison of wire-guided cricothyrotomy versus standard surgical cricothyrotomy technique. *J Emerg Med* 1999;17(6):957-62.

Collins JS et al. Laryngoscopy and morbid obesity: a comparison of the “sniff” and “ramped” positions. *Obesity Surgery* 2004;14:1171-75.

Delay JM et al. The effectiveness of noninvasive positive pressure ventilation to enhance preoxygenation in morbidly obese patients: a randomized controlled study. *Anesth Analg* 2008;107:1707-13.

Eisenburger P et al. Comparison of conventional surgical versus Seldinger technique emergency cricothyrotomy performed by inexperienced clinicians. *Anesthesiology* 2000;92(3):687-90.

Esses BA and Jafek BW. Cricothyroidotomy: a decade of experience in Denver. *Ann Otolaryngology Rhinology Laryngology* 1987;96(5):519-524.

Ezri T et al. The incidence of class "zero" airway and the impact of Mallampati score, age, sex, and body mass index on prediction of laryngoscopy grade. *Anesth Analg* 2001;93(4):1073-75.

Fan KH, Hung OR, Agro F. A comparative study of tracheal intubation using an intubating laryngeal mask (Fastrach) along or together with a lightwand (Trachlight). *J Clin Anesth* 2000;12(8):581-5.

Ferson DZ et al. Use of the intubating LMA-Fastrach in 254 patients with difficult-to-manage airways. *Anesthesiology* 2001;95(5):1175-81.

Fikkers BG et al. Emergency cricothyrotomy: a randomized crossover trial comparing the wire-guided and catheter-over-needle techniques. *Anaesthesia* 2004;59(10):1008-11.

Gabbott DA, Sasada MP. Tracheal intubation through the laryngeal mask using a gum elastic bougie in the presence of cricoid pressure and manual in line stabilization of the neck. *Anaesthesia* 1996;51(4):389-90.

Gonzalez H et al. The importance of increased neck circumference to intubation difficulties in obese patients. *Anesth Analg* 2008;106(4):1132-6.

Grover VK, Mahajan R, Tomar M. Class zero airway and laryngoscopy. *Anesth Analg* 2003;96(3):911.

Henderson J.J. The use of the paraglossal straight blade laryngoscopy in difficult tracheal intubation. *Anaesthesia* 1997;52:552-560.

Hochman II, Zeitels SM, Heaton JT. Analysis of forces and position required for direct laryngoscopic exposure of the anterior vocal folds. *Ann Otolaryngology Rhinology Laryngology* 1999;108(8):715-24.

Hung OR et al. Lightwand intubation: II – Clinical trial of a new lightwand for tracheal intubation in patients with difficult airways. *Can J Anaesth* 1995;42(9):826-30.



Hung OR et al. Clinical trial of a new lightwand device (Trachlight) to intubate the trachea. *Anesthesiology* 1995;83(3):509-14.

Iohom G, Ronayne M and Cunningham AJ. Prediction of difficult tracheal intubation. *Eur J Anaesthesiol* 2003;20(1):31-6

Juvin P et al. Difficult tracheal intubation is more common in obese than in lean patients. *Anesth Analg*. 2003;97(2):595-600.

Karkouti K, Rose DK, Wigglesworth D, Cohen MM. Predicting difficult intubation: a multivariable analysis. *Can J Anesth* 2000;47(8):730-39.

Kheterpal S et al. Incidence and prediction of difficult and impossible mask ventilation. *Anesthesiology* 2006;105:885-91.

Kundra P, Kuttralam S, Ravishankar M. Local anesthesia for awake fiberoptic nasotracheal intubation. *Acta Anaesthesiol Scand* 2000;44(5):511-6.

Langeron O et al. Prediction of difficult mask ventilation. *Anesthesiology* 2000;92:1229-36.

Langeron O et al. Comparison of the intubating laryngeal mask airway with the fiberoptic intubation in anticipated difficult airway management. *Anesthesiology* 2001;94(6):968-72.

Lee L, Weightman WM. Laryngoscopy force in the sniffing position compared to the extension-extension position. *Anaesthesia* 2008;63:375-8.

Levitan RM, Everett WW, Ochroch EA. Limitations of difficult airway prediction in patients intubated in the Emergency Department. *Ann Emerg Med* 2004;44:307-313.

Levitan RM et al. Head-elevated laryngoscopy position: improving laryngeal exposure during laryngoscopy by increasing head elevation. *Ann Emerg Med* 2003;41:322-330.

Levitan RM, Kinkle WC, Levin WJ, Everett WW. Laryngeal view during laryngoscopy: a randomized trial comparing cricoid pressure, backward-upward-rightward pressure, and bimanual laryngoscopy. *Ann Emerg Med* 2006;47(6):548-555.

Levitan RM et al. Stylet bend angles and tracheal tube passage using a straight-to-cuff shape. *Acad Emerg Med* 2006;13(12):1255-8.

Manoach S, Paladino L. Manual in-line stabilization for acute airway management of suspected cervical spine injury: historical review and current questions. *Ann Emerg Med* 2007;50:236-245.

Maharaj CH, Costello JF, Harte BH, Laffey JG. Evaluation of the Airtraq and Macintosh laryngoscopes in patients at increased risk for difficult tracheal intubation. *Anaesthesia* 2008;63(2):182-8.

Maharaj CH et al. Endotracheal intubation in patients with cervical spine immobilization: a comparison of macintosh and airtraq laryngoscopes. *Anesthesiology* 2007;107():53-9.

Mashour GA, Sandberg WS. Craniocervical extension improves the specificity and predictive value of the Mallampati airway evaluation. *Anesth Analg* 2006;103(5):1256-9.

Mashour GA et al. The extended Mallampati score and a diagnosis of diabetes mellitus are predictors of difficult laryngoscopy in the morbidly obese. *Anesth Analg* 2008;107(6):1919-23.

McCall MJ et al. Paramedic tracheal intubation using intubating laryngeal mask airway. *Prehosp Emerg Care* 2008;12(1):30-4.

Meggs et al. Sustained oxygenation in without ventilation in paralyzed pigs with high-flow tracheal oxygen. *Am J Emerg Med* 2005;23(7):864-867,

Mort TC. Emergency tracheal intubation: Complications associated with repeated laryngoscope attempts. *Anesth Analg* 2004;99:607-13.

Naguib M et al. Predictive performance of three multivariate difficult intubation models: a double-blind, case-controlled study. *Anesth Analg* 2006;102:818-24.

Ndoko SK et al. Tracheal intubation of morbidly obese patients: a randomized trial comparing performance of Macintosh and Airtraq laryngoscopes. *Br J Anaesth* 2008;100(2):263-8.

Norwick TA et al. Comparison of use of the Airtraq with direct laryngoscopy by paramedics in the simulated airways. *Prehosp Emerg Care* 2009;13(1):75-80.

Parment JL et al. The laryngeal mask airway reliably provides rescue ventilation in case of unanticipated difficult tracheal intubation along with difficult mask ventilation. *Anesth Analg* 1998;87(3):661-5.

Reed MK, Dunn MJG, McKeown DW. Can an airway assessment score predict difficulty at intubation in the emergency department? *Emerg Med J* 2005;22:99-102.

Robinson KJ, Katz R, Jacobs LM. A 12-year experience with prehospital cricothyrotomies. *Air Med J* 2001;20(6):27-30.

Rose DK, Cohen MM. The airway: problems and predictions in 18,500 patients. *Can J Anaesth* 1994;41(5 Pt 1):372-83.

Rose DK, Cohen MM. The incidence of airway problems depends on the definition used. *Can J Anaesth* 1996;43(1):30-4.

Sakles JC, Laurin EG, Rantapaa AA, Panacek EA. Airway management in the emergency department: a one year study of 610 intubations. *Ann Emerg Med* 1998;31(3):325-32.

Salvino CK, Dries D, Gamelli R, Murphy M and Marshall W. Emergency cricothyroidotomy in trauma victims. *J Trauma* 1993;34(4):503-505.

Savoldelli GL et al. Comparison of the Glidescope, the McGrath, the Airtraq and the Macintosh laryngoscope in simulated difficult airways. *Anaesthesia* 2008;63(12):1358-64.

Schaumann N et al. Evaluation of Seldinger technique emergency cricothyroidotomy versus standard surgical cricothyroidotomy in 200 cadavers. *Anesthesiology* 2005;102(1):7-11.

Schmitt HJ, Mang H. Head and neck elevation beyond the sniffing position improves laryngeal view in cases of difficult direct laryngoscopy. *J Clin Anesth* 2002;14:335-38.

Shiga T, Wajima Z, Inoue T, Sakamoto A. Predicting difficult intubation in apparently normal patients: a meta-analysis of bedside screening test performance. *Anesthesiology* 2005;103:429-37.

Soh CR et al. Tracheal intubation by novice staff: the direct vision laryngoscope or the lighted stylet (Trachlight)? *Emerg Med J* 2002;19(4):292-4.

Spaite DW, Joseph M. Prehospital cricothyrotomy an investigation of indications, technique, complications, and patient outcome. *Ann Emerg Med* 1990;19(3):279-85.

Stoppacher R, Teggatz JR, Jentzen JM. Esophageal and pharyngeal injuries associated with the esophageal-tracheal Combitube. *J Forensic Sci* 2004;49(3):586-91.

Sutherland AD, Sales JP. Fiberoptic awake intubation – a method of topical anaesthesia and orotracheal intubation. *Can Anaesth Soc J* 1986;33(4):502-4.

Suzuki A et al. The Pentax-AWS rigid indirect video laryngoscope: clinical assessment of performance in 320 cases. *Anaesthesia* 2008;63(6):641-7.

Takenaka I et al. The sniffing position provides greater occipito-atlanto-axial angulation than simple head extension: a radiological study. *Can J Anaesth* 2007;54(2):129-33.

Tamura M et al. Mandibular advancement improves the laryngeal view during direct laryngoscopy performed by inexperienced physicians. *Anesthesiology* 2004;100:598-601.



Tentillier E et al. Use of the intubating laryngeal mask airway in emergency pre-hospital difficult intubation. *Resuscitation* 2008;77(1):30-4.

Tremblay MH, Williams S, Robitaille A, Drolet P. Poor visualization during direct laryngoscopy and high upper lip bite test score are predictors of difficult intubation with the Glidescope videolaryngoscope. *Anesth Analg* 2008;106(5):1495-500.

Verghese C, Brimacombe JR. Survey of laryngeal mask airway usage in 11,910 patients: safety and efficacy for conventional and nonconventional usage. *Anesth Analg* 1996;82(1):129-33.

Vezina MC et al. Complications associated with the Esophageal-Tracheal Combitube in the pre-hospital setting. *Can J Anaesth* 2007;54(2):124-8.

Wang HE, Yealy DM. How many attempts are required to accomplish out-of-hospital endotracheal intubation? *Acad Emerg Med* 2006;13:372-77.

Wik L, Naess AC, Steen PA. Intubation with laryngoscope versus transillumination performed by paramedic students on manikins and cadavers. *Resuscitation* 1997;33(3):215-8.

Woollard M et al. Use of the Airtraq laryngoscope in a model of difficult intubation by pre-hospital providers not previously trained in laryngoscope. *Anaesthesia* 2007;62(10):1061-5.

## Chapter 5

Benumof J, Dagg R, Benumof R. Critical hemoglobin desaturation will occur before return to an unparalyzed state following 1 mg/kg succinylcholine. *Anesthesiol* 1997;87(4):979-982.

Black K, Barnett P, Wolfe R, Young S. Are methods used to estimate weight in children accurate? *Emerg Med* 2002;14(2):160-5.

Butler PJ, Munro HM and Kenny MB. Preoxygenation in children using expired oxygraphy. *Br J Anaesth*. 1996. Sep;77(3):333-4

Deakers TW, Reynolds G, Stretton M, Newth CJ. Cuffed endotracheal tubes in pediatric intensive care. *J Pediatr* 1994;125(1):57-62.

Essouri S et al. Noninvasive positive pressure ventilation: five years of experience in a pediatric intensive care unit. *Pediatr Crit Care Med* 2006;7(4):329-34.

Fastle RK, Roback MG. Pediatric rapid sequence intubation: incidence of reflex bradycardia and effects of pretreatment with atropine. *Pediatr Emerg Care* 2004;20(10):651-5.

Fortenberry JD et al. Management of pediatric acute hypoxemic respiratory insufficiency with bilevel positive pressure (BiPAP) nasal mask ventilation. *Chest* 1995;108(4):894-5.

Gaitini L et al. Comparison of the CobraPLA and the Laryngeal Mask Airway Unique in children under pressure controlled ventilation. *Pediatric Anest* 2008;18:313-319.

Garey DM et al. Tidal volume threshold for colorimetric carbon dioxide detectors available for use in neonates. *Pediatrics* 2008;121(6):e1524-7.

Garland JS et al. A rapid and accurate method of estimating body weight. *Am J Emerg Med* 1986;4(5):390-3.

Goldman RD, Buskin S, Augarten A. Parental estimates of their child's weight: accurate for resuscitation drug dosages. *Pediatr Emerg Care* 1999;15(1):19-21.

Greig A, Ryan J, Glucksman E. How good are doctors at estimating children's weight? *J Accid Emerg Med* 1997;14(2):101-3.

Hardman JG, Wills JS. The development of hypoxaemia during apnoea in children: a computational modeling investigation. *Br J Anaesth* 2006;97(4):564-70.

Hofer CK et al. How reliable is length-based determination of body weight and tracheal tube size in the paediatric age group? The Broselow tape reconsidered. *Br J Anaesth* 2002;88(2):283-5.

International Liaison Committee on Resuscitation. The International Liaison Committee on Resuscitation (ILCOR) consensus on science with treatment recommendations for pediatric and neonatal patients: pediatric basic and advanced life support. *Pediatrics* 2006;117(5):e955-e977.

Khine HH et al. Comparison of cuffed and uncuffed endotracheal tubes in young children during general anesthesia. *Anesthesiology* 1997;86(3):627-31.

Krieser D et al. Parental weight estimation of their child's weight is more accurate than other weight estimation methods for determining children's weight in an emergency department. *Emerg Med J* 2007;24(11):765-9.

Leffler S, Hayes M. Analysis of parental estimates of children's weights in the ED. *Ann Emerg Med* 1997;30(2):167-70.

Lubitz DS et al. A rapid method for estimating weight and resuscitation drug dosages from length in the pediatric age group. *Ann Emerg Med* 1988;17(6):576-81.

Morrison JE Jr., Collier E, Friesen RH and Logan L. Preoxygenation before laryngoscopy in children: how long is enough? *Paediatr Anaesth*. 1998.8(4):292-8.

Nieman CT et al. Use of the Broselow tape may result in the under-resuscitation of children. *Acad Emerg Med* 2006;13(10):1011-9.

Pancera CF et al. Noninvasive ventilation in immunocompromised pediatric patients: eight years of experience in a pediatric oncology intensive care unit. *J Pediatr Hematol Oncol* 2008;30:533-538.

Patel R, Hannallah RS, McGill WA. Age and the onset of desaturation in apneic children. *Can J Anaesth* 1994;41(9):771-4.

Rothrock SG, Pagane J. Pediatric rapid sequence intubation incidence of reflex bradycardia and effects of pretreatment with atropine. *Pediatr Emerg Care* 2005;21(9):637-8.

Sharieff GQ et al. The self-inflating bulb as an esophageal detector device in children weighing more than twenty kilograms: a comparison of two techniques. *Ann Emerg Med* 41(5):623-9.

Sharieff GQ et al. The self-inflating bulb as an airway adjunct: is it reliable in children weighing less than 20 kilograms? *Acad Emerg Med* 2003;10(4):303-8.

Szmuk P et al. A prospective, randomized comparison of Cobra perilaryngeal airway and laryngeal mask airway unique in pediatric patients. *Anesth Analg* 2008;107(5):1523-30.

Vialet R, Nau A, Chaumoitre K, Martin C. Effects of head posture on the oral, pharyngeal and laryngeal axis alignment in infants and young children by magnetic resonance imaging. *Pediatr Anesth* 2008;18:525-31.

Xue FS et al. Study of the optimal duration of preoxygenation in children. *J Clin Anesth*. 1995. Mar;7(2):93-6.

## Chapter 7

Braude D and Richards M. Rapid Sequence Airway (RSA) – a novel approach to prehospital airway management. *Prehosp Emerg Care* 2007;11:1-3.



## Chapter 8

Bochicchio GV et al. Endotracheal intubation in the field does not improve outcome in trauma patients who present without an acutely lethal traumatic brain injury. *J Trauma* 2003;54(2):307-11.

Cudnik MT, Newgard CD, Daya M, Jui J. The impact of rapid sequence intubation on trauma patient mortality in attempted prehospital intubation. *J Emerg Med* 2008.

Davis DP. Should invasive airway management be done in the field? *CMAJ* 2008;178(9):1171-3.

Davis DP et al. Paramedic rapid sequence intubation for severe traumatic brain injury: perspectives from an expert panel. *Prehosp Emerg Care* 2007;11(1):1-8.

Davis DP et al. The impact of prehospital endotracheal intubation on outcome in moderate to severe traumatic brain injury. *J Trauma* 2005;58(5):933-9.

Dunford JV et al. Incidence of transient hypoxia and pulse rate reactivity during paramedic rapid sequence intubation. *Ann Emerg Med* 2003;42:721-728.

Gauche M et al. Effect of out-of-hospital pediatric endotracheal intubation on survival and neurological outcome: a controlled clinical trial. *JAMA* 2000;282:783-790.

Murray JA et al. Prehospital intubation in patients with severe head injury. *J Trauma* 2000;49(6):1065-70.

National Association of EMS Physicians. Drug-assisted intubation in the prehospital setting: position statement of the National Association of EMS Physicians. *Prehosp Emerg Care* 2006;10(2):260.

Stiell IG et al. The OPALS Major Trauma Study: impact of advanced life-support on survival and morbidity. *CMAJ* 2008;178:1141-52.


Stiell IG et al. Advanced life support for out-of-hospital respiratory distress. *N Engl J Med* 2007;356:2156-64.

Wang HE, Yealy DM. Out-of-hospital endotracheal intubation-it's time to stop pretending that problems don't exist. *Acad Emerg Med* 2005;12(12):1245.

Wang HE et al. Out-of-hospital endotracheal intubation and outcome after traumatic brain injury. *Ann Emerg Med* 2004;44(5):439-50.

## Acronyms and Abbreviations

**ASA** – American Society of Anesthesiologists  
**BiPAP** – Bilevel Positive Airways Pressure  
**BMX** – Bicycle Motorcross  
**BNTI** – Blind Nasotracheal Intubation  
**BURP** – Backwards, upwards, rightwards pressure  
**BVM** – Bag-valve Mask  
**BVMV** – Bag-valve Mask Ventilation  
**CABG** – Coronary Artery Bypass Graft  
**CAD** – Coronary Artery Disease  
**CHF** – Congestive Heart Failure  
**CPAP** – Continuous Positive Airways Pressure  
**CT** – Cat Scan  
**EAD** – Extraglottic Airway Device  
**EBM** – Evidence-based Medicine  
**ED** – Emergency Department  
**EDD** – Esophageal Detector Device  
**ELM** – External Laryngeal Manipulation  
**EMS** – Emergency Medical Services  
**EMT** – Emergency Medicine Technician  
**EMT-P** – Emergency Medicine Technician – Paramedic  
**ETA** – Estimated Time of Arrival  
**ETCO<sub>2</sub>** – End-tidal Carbon Dioxide  
**ETI** – Endotracheal Intubation  
**FDA** – Federal Drug Administration



## Acronyms and Abbreviations

**GCS** – Glasgow Coma Scale

**GI** – Gastrointestinal

**HTN** - Hypertension

**ICP** – Intracranial Pressure

**ICU** – Intensive Care Unit

**IM** - Intramuscular

**IOP** – Intraocular Pressure

**IV** - Intravenous

**JCAHO** – The Joint Commission on Accreditation of Healthcare Organizations

**LOC** – Level of Consciousness

**MICU** – Medical Intensive Care Unit

**NIPPV** – Non-invasive Positive Pressure Ventilation

**OR** – Operating Room

**PEEP** – Positive End-expiratory Pressure

**PICU** – Pediatric Intensive Care Unit

**PISA** – Paralyze, induce, sedate and analgesia

**PPV** – Positive-pressure Ventilation

**QA** – Quality Assurance

**RSA** – Rapid Sequence Airway

**RSI** – Rapid Sequence Intubation

**SFI** – Sedation-facilitated Intubation

**TTJI** – Transtracheal Jet Insufflation

**UK** – United Kingdom





## About the Author

Dr. Braude began messing with airways as an EMT in 1985. He worked as a rural volunteer EMT and Advanced EMT-Intermediate for Southern Madison County EMS in Central New York from 1986 to 1990, while a student at Colgate University. Here he learned what it was like to be the only intubation trained provider on scene and gained nothing but respect for long transport times, volunteer EMS providers and EMT-intermediates. Following graduation he attended paramedic school at Daniel Freeman Paramedic School in Southern California, interned with the Los Angeles City Fire Department and then honed his prehospital airway skills while working in Ventura, California before starting medical school at New York Medical College. Upon graduation from medical school in 1996 he spent 4 years tackling bloody airways at UCSF-Fresno while being molded into an emergency physician and EMS medical director by the best-of-the-best. Finally he was fortunate enough to land among amazing airway colleagues at the University of New Mexico where he spent 5 years as the Medical Director of the EMS Academy and Lifeguard Air Emergency Services. He currently tortures the crews about each and every airway as Medical Director of PHI Air Medical of New Mexico and co-directs the *Airway911* program, which strives everyday to put an end to airway death.



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