

Noninvasive Airway Management and Supraglottic Airways

Jestin N. Carlson
Henry E. Wang

REFERENCES

- Kallet RH, Diaz JV: The physiologic effects of noninvasive ventilation. *Respir Care* 54: 102, 2009. [PMID: 19111110]
- Walls RM, Murphy MF: *Manual of Emergency Airway Management*, 3rd ed. Philadelphia: Lippincott, Williams & Wilkins; 2008.
- Nandi PR, Charlesworth CH, Taylor SJ, Nunn JF, Dore CJ: Effect of general anaesthesia on the pharynx. *Br J Anaesth* 66: 157, 1991. [PMID: 1817614]
- Ramachandran SK, Cosnowski A, Shanks A, Turner CR: Apneic oxygenation during prolonged laryngoscopy in obese patients: a randomized, controlled trial of nasal oxygen administration. *J Clin Anesth* 22: 164, 2010. [PMID: 20400000]
- Roca O, Riera J, Torres F, Masclans JR: High-flow oxygen therapy in acute respiratory failure. *Respir Care* 55: 408, 2010. [PMID: 20406507]
- Parke R, McGuinness S, Eccleston M: Nasal high-flow therapy delivers low level positive airway pressure. *Br J Anaesth* 103: 886, 2009. [PMID: 19846404]
- Parke RL, McGuinness SP: Pressures delivered by nasal high flow oxygen during all phases of the respiratory cycle. *Respir Care* 58: 1621, 2013. [PMID: 19846404]
- Jones PG, Kamona S, Doran O, Sawtell F, Wilsher M: Randomized controlled trial of humidified high-flow nasal oxygen for acute respiratory distress in the emergency department: the HOT-ER study. *Respir Care* 61: 291, 2016. [PMID: 26577199]
- Driver BE, Prekker ME, Kornas RL, Cales EK, Reardon RF: Flush rate oxygen for emergency airway preoxygenation. *Ann Emerg Med* 69: 1, 2017. [PMID: 27522310]
- Driver BE, Klein LR, Carlson K, Harrington J, Reardon RF, Prekker ME: Preoxygenation with flush rate oxygen: comparing the nonbreather mask with the bag-valve mask. *Ann Emerg Med* 71: 381, 2018. [PMID: 29089172]
- Frat JP, Thille AW, Mercat A, et al: High-flow oxygen through nasal cannula in acute hypoxemic respiratory failure. *N Engl J Med* 372: 2185, 2015. [PMID: 25981908]
- Campbell TP, Stewart RD, Kaplan RM, DeMichieci RV, Morton R: Oxygen enrichment of bag-valve-mask units during positive-pressure ventilation: a comparison of various techniques. *Ann Emerg Med* 17: 232, 1988. [PMID: 3278659]
- Otten D, Liao MM, Wolken R, et al: Comparison of bag-valve-mask hand-sealing techniques in a simulated model. *Ann Emerg Med* 63: 6, 2014. [PMID: 23937957]
- Hillberg RE, Johnson DC: Noninvasive ventilation. *N Engl J Med* 337: 1746, 1997. [PMID: 9392701]
- Yeow ME, Santanilla JI: Noninvasive positive pressure ventilation in the emergency department. *Emerg Med Clin North Am* 26: 835, 2008. [PMID: 18655947]
- Waldhorn RE: Nocturnal nasal intermittent positive pressure ventilation with bi-level positive airway pressure (BiPAP) in respiratory failure. *Chest* 101: 516, 1992. [PMID: 1735282]
- Kramer N, Meyer TJ, Meharg J, Cece RD, Hill NS: Randomized, prospective trial of noninvasive positive pressure ventilation in acute respiratory failure. *Am J Respir Crit Care Med* 151: 1799, 1995. [PMID: 7767523]
- Perrin C, El Far Y, Vandenbos F, et al: Domiciliary nasal intermittent positive pressure ventilation in severe COPD: effects on lung function and quality of life. *Eur Respir J* 10: 2835, 1997. [PMID: 9493670]
- Wysocki M, Richard JC, Meshaka P: Noninvasive proportional assist ventilation compared with noninvasive pressure support ventilation in hypercapnic acute respiratory failure. *Crit Care Med* 30: 323, 2002. [PMID: 11889302]
- Keenan SP, Kernerman PD, Cook DJ, Martin CM, McCormack D, Sibbald WJ: Effect of noninvasive positive pressure ventilation on mortality in patients admitted with acute respiratory failure: a meta-analysis. *Crit Care Med* 25: 1685, 1997. [PMID: 9377883]
- Masip J, Roque M, Sanchez B, Fernandez R, Subirana M, Exposito JA: Noninvasive ventilation in acute cardiogenic pulmonary edema: systematic review and meta-analysis. *JAMA* 294: 3124, 2005. [PMID: 16380593]
- Moritz F, Brousse B, Gellee B, et al: Continuous positive airway pressure versus bilevel noninvasive ventilation in acute cardiogenic pulmonary edema: a randomized multicenter trial. *Ann Emerg Med* 50: 666, 2007. [PMID: 17764785]
- Ho KM, Wong K: A comparison of continuous and bi-level positive airway pressure non-invasive ventilation in patients with acute cardiogenic pulmonary oedema: a meta-analysis. *Crit Care* 10: R49, 2006. [PMID: 16569254]
- Tallman TA, Peacock WF, Emerman CL, et al: Noninvasive ventilation outcomes in 2,430 acute decompensated heart failure patients: an ADHERE Registry Analysis. *Acad Emerg Med* 15: 355, 2008. [PMID: 18370990]
- Park M, Sangean MC, Volpe Mde S, et al: Randomized, prospective trial of oxygen, continuous positive airway pressure, and bilevel positive airway pressure by face mask in acute cardiogenic pulmonary edema. *Crit Care Med* 32: 2407, 2004. [PMID: 15599144]
- Peter JV, Moran JL, Phillips-Hughes J, Graham P, Bersten AD: Effect of non-invasive positive pressure ventilation (NIPPV) on mortality in patients with acute cardiogenic pulmonary oedema: a meta-analysis. *Lancet* 367: 1155, 2006. [PMID: 16616558]
- Gray A, Goodacre S, Newby DE, et al: Noninvasive ventilation in acute cardiogenic pulmonary edema. *N Engl J Med* 359: 142, 2008. [PMID: 18614781]
- Quon BS, Gan WQ, Sin DD: Contemporary management of acute exacerbations of COPD: a systematic review and metaanalysis. *Chest* 133: 756, 2008. [PMID: 18321904]
- Lim WJ, Mohammed Akram R, Carson KV, et al: Non-invasive positive pressure ventilation for treatment of respiratory failure due to severe acute exacerbations of asthma. *Cochrane Database Syst Rev* 12: CD004360, 2012. [PMID: 23235608]
- Confalonieri M, Potena A, Carbone G, Porta RD, Tolley EA, Umberto Meduri G: Acute respiratory failure in patients with severe community-acquired pneumonia. A prospective randomized evaluation of noninvasive ventilation. *Am J Respir Crit Care Med* 160 (5 Pt 1): 1585, 1999. [PMID: 10556125]
- Hilbert G, Gruson D, Vargas F, et al: Noninvasive ventilation in immunosuppressed patients with pulmonary infiltrates, fever, and acute respiratory failure. *N Engl J Med* 344: 481, 2001. [PMID: 11172189]
- Hill NS: Noninvasive ventilation for immunocompromised patients. *N Engl J Med* 344: 522, 2001. [PMID: 11172197]
- Xirouchaki N, Kondoudaki E, Anastasaki M, Alexopoulou C, Koumiotaki S, Georgopoulos D: Noninvasive bilevel positive pressure ventilation in patients with blunt thoracic trauma. *Respiration* 72: 517, 2005. [PMID: 16210892]
- Hurst JM, DeHaven CB, Branson RD: Use of CPAP mask as the sole mode of ventilatory support in trauma patients with mild to moderate respiratory insufficiency. *J Trauma* 25: 1065, 1985. [PMID: 3903175]
- Chiumello D, Coppola S, Froio S, Gregoretti C, Consonni D: Noninvasive ventilation in chest trauma: systematic review and meta-analysis. *Intensive Care Med* 39: 1171, 2013. [PMID: 23571872]
- Smailes ST: Noninvasive positive pressure ventilation in burns. *Burns* 28: 795, 2002. [PMID: 12464481]
- Endorf FW, Dries DJ: Noninvasive ventilation in the burned patient. *J Burn Care Res* 31: 217, 2010. [PMID: 20182360]
- Hubble MW, Richards ME, Jarvis R, Millikan T, Young D: Effectiveness of prehospital continuous positive airway pressure in the management of acute pulmonary edema. *Prehosp Emerg Care* 10: 430, 2006. [PMID: 16997770]
- Kosowsky JM, Stephanides SL, Branson RD, Sayre MR: Prehospital use of continuous positive airway pressure (CPAP) for presumed pulmonary edema: a preliminary case series. *Prehosp Emerg Care* 5: 190, 2001. [PMID: 11339731]
- Templier F, Dolveck F, Baer M, Chauvin M, Fletcher D: 'Boussignac' continuous positive airway pressure system: practical use in a prehospital medical care unit. *Eur J Emerg Med* 10: 87, 2003. [PMID: 12789061]
- Kallio T, Kuisma M, Alaspaa A, Rosenberg PH: The use of prehospital continuous positive airway pressure treatment in presumed acute severe pulmonary edema. *Prehosp Emerg Care* 7: 209, 2003. [PMID: 12710780]
- Gay PC: Complications of noninvasive ventilation in acute care. *Respir Care* 54: 246, 2009. [PMID: 19173756]
- De Keulenaer BL, De Backer A, Schepens DR, Daelemans R, Wilmer A, Malbrain ML: Abdominal compartment syndrome related to noninvasive ventilation. *Intensive Care Med* 29: 1177, 2003. [PMID: 12761616]
- Devlin JW, Nava S, Fong JJ, Bahhady I, Hill NS: Survey of sedation practices during noninvasive positive-pressure ventilation to treat acute respiratory failure. *Crit Care Med* 35: 2298, 2007. [PMID: 17717491]
- Senoglu N, Oksuz H, Dogan Z, Yildiz H, Demirkiran H, Ekerbicer H: Sedation during noninvasive mechanical ventilation with dexmedetomidine or midazolam: a randomized, double-blind, prospective study. *Curr Ther Res Clin Exp* 71: 141, 2010. [PMID: 24683260]
- Longrois D, Conti G, Mantz J, Faltlhauser A, Aantaa R, Tonner P: Sedation in non-invasive ventilation: do we know what to do (and why)? *Multidiscip Respir Med* 9: 56, 2014. [PMID: 25699177]
- Maltby JR, Loken RG, Watson NC: The laryngeal mask airway: clinical appraisal in 250 patients. *Can J Anaesth* 37: 509, 1990. [PMID: 2372856]
- Wang HE, Schmicker R, Daya MR, et al: Laryngeal tube vs. endotracheal intubation in adult out-of-hospital cardiac arrest. *JAMA* 320: 769, 2018. [PMID: 30167699]
- Frascone RJ, Wewerka SS, Burnett AM, Griffith KR, Salzman JG: Supraglottic airway device use as a primary airway during rapid sequence intubation. *Air Med J* 32: 93, 2013. [PMID: 23452368]
- Carlson J, Mayrose J, Krause R, Jehle D: Extubation force: tape versus endotracheal tube holders. *Ann Emerg Med* 50: 686, 2007. [PMID: 17599694]
- Carlson JN, Mayrose J, Wang HE: How much force is required to dislodge an alternate airway? *Prehosp Emerg Care* 14: 31, 2010. [PMID: 19947865]
- Davenport C, Martin-Gill C, Wang HE, Mayrose J, Carlson JN: Comparison of the force required for dislodgement between secured and unsecured airways. *Prehosp Emerg Care* 2018: 1, 2018. [PMID: 29714527]
- Theiler L, Gutzmann M, Kleine-Brueggeny M, Urwyler N, Kaempfen B, Greif R: i-gel supraglottic airway in clinical practice: a prospective observational multicentre study. *Br J Anaesth* 109: 990, 2012. [PMID: 22956643]
- Beauchamp G, Phrampus P, Guyette FX: Simulated rescue airway use by laypersons with scripted telephonic instruction. *Resuscitation* 80: 925, 2009. [PMID: 19481853]

2 SECTION 4: Resuscitative Procedures

55. Gaither JB, Matheson J, Eberhardt A, Colwell CB: Tongue engorgement associated with prolonged use of the King-LT laryngeal tube device. *Ann Emerg Med* 55: 367, 2010. [PMID: 19695741]
56. Reinhart DJ, Simmons G: Comparison of placement of the laryngeal mask airway with endotracheal tube by paramedics and respiratory therapists. *Ann Emerg Med* 24: 260, 1994. [PMID: 8037393]
57. Deakin CD, Peters R, Tomlinson P, Cassidy M: Securing the prehospital airway: a comparison of laryngeal mask insertion and endotracheal intubation by UK paramedics. *Emerg Med J* 22: 64, 2005. [PMID: 15611551]
58. Carlson JN, Suffoletto BP, Salcido DD, Logue ES, Menegazzi JJ: Chest compressions do not disrupt the seal created by the laryngeal mask airway during positive pressure ventilation: a preliminary porcine study. *CJEM* 16: 1, 2014. [PMID: 24742633]
59. Stancil S, Miller J, Riddle M: Laryngeal mask airway exchange using a gum elastic bougie with a rotational twist technique. *J Spec Oper Med* 14: 74, 2014. [PMID: 25344710]