

Paramedic CAT

The importance of non-invasive ventilation in Acute Respiratory Distress for Pediatrics

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Scenario:

It's a beautiful fall day, in your small rural community when your radio goes off and the ambulance is dispatched to the local playground for a 7-year-old girl having difficulty breathing, with no relief from her inhalers. You start running through what ifs on route, knowing that any time a child is in respiratory distress it can be very serious. Upon arrival, you find out that not only is your patient young and asthmatic, but she's been previously intubated and had extended hospital stays prior to this episode. This routine call is now challenging based on your patients age, history, and presentation. How do you ensure the best outcome for this critically ill little girl?

PICO Question:

Population: Pediatrics in respiratory distress or failure

Intervention: PEEP &/or CPAP; non-invasive ventilation

Comparison: Standard Care

Outcome: Need for (re)intubation, adverse outcomes

Search Strategy:

((("continuous positive airway pressure" or "CPAP" or "PEEP" or "positive end expiratory pressure")) OR "ped*" "respiratory distress"

((("continuous positive airway pressure" OR "CPAP" OR "PEEP" OR "positive end expiratory pressure")) AND (pediatric* OR Child*)) AND (asthma OR respiratory OR "shortness of breath")

Search Outcome:

3019, 2020

Relevant Papers:

AUTHOR, DATE	POPULATION: SAMPLE CHARACTERISTICS	DESIGN (LOE)	OUTCOMES	RESULTS	STRENGTHS/ WEAKNESSES
Yaman, Ayhan Journal of Critical Care 32 (2016) 175–181	160 NIV episodes in 137 patients	A prospective observational study in a multidisciplinary 10-bed PICU of a hospital. Level II	To determine the efficiency of non-invasive mechanical ventilation (NIV) both in protection from intubation and in preventing reintubation of patients in the pediatric intensive care unit (PICU).	Non-invasive mechanical ventilation was successful in 70% (112 episodes) of all patients. In 48 (30%) episodes, NIV failed due to the progression of ARF, requiring tracheal intubation and CMV. Baseline characteristics of successful and failed episodes are shown in Table 2.	This was a study, that could be applied to a prehospital setting for EMS to use in standardizing airway management for pediatric patients in respiratory distress. Smaller sample group, with diverse respiratory issues and complications, with low variances in the population age being evaluated, infant to toddler vs pediatric.
Wolfer, Andrea	Seven thousand one-hundred eleven admissions of children with 0–16 years old	National, multicentre, retrospective, observational cohort Level II	Cause of respiratory failure, length and mode of non-invasive ventilation, type of interfaces, incidence of treatment failure, and outcome were recorded.	Noninvasive ventilation is increasingly and successfully used as first respiratory approach in several, but not all, Italian PICUs. The current study shows that noninvasive ventilation represents a feasible and safe technique of ventilatory assistance for the treatment of mild acute respiratory failure. Noninvasive ventilation was used as primary mode of ventilation in children with low respiratory tract infection (mainly in bronchiolitis and pneumonia), in acute on chronic respiratory failure or to prevent reintubation.	This study could also be applied to a prehospital setting for EMS to use in standardizing airway management for pediatric patients in respiratory distress. This was a large sample group, over multiple years, with a variety of illnesses showing that non-invasive ventilation is a great preventative measure and should be used.

Consider:

While non-invasive ventilation is a great for prevention of poor outcomes for pediatric patients, in a prehospital setting there is an element of human error and issues with quality control in the use of non-invasive ventilation while providing/assisting and maintaining airways in any patient.

Clinical Bottom Line:

The benefit of having non-invasive ventilation for pediatric patients in respiratory distress outweighs the negative outcomes. With adequate training and standardization across rural and urban settings, the use of non-invasive ventilation would greatly improve patient outcomes in a prehospital setting.

References:

Yaman, Ayhan, et al. "Efficacy of Non-invasive Mechanical Ventilation in Prevention of Intubation and Reintubation in the Pediatric Intensive Care Unit." *Journal of Critical Care*, vol. 32, Apr. 2016, pp. 175–181., doi:10.1016/j.jcrc.2015.12.013.

Wolfler, A., Calderini, E., Iannella, E., Conti, G., Biban, P., Dolcini, A., ... Salvo, I. (n.d.). Evolution of Non-invasive Mechanical Ventilation Use. *Pediatric Critical Care Medicine*, 16(5), 418–427. doi: 10.1097/pcc.0000000000000387