

Noninvasive ventilation in a tertiary pediatric intensive care unit in a middle-income country

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Objective: To determine the factors that predict outcome of noninvasive ventilation (NIV) in critically ill children.

Design: Prospective observational study.

Setting: Multidisciplinary pediatric intensive care unit of a university hospital in Malaysia.

Patients: Patients admitted to the pediatric intensive care unit from July 2004 to December 2006 for respiratory support due to acute respiratory failure and those extubated from invasive mechanical ventilation.

Interventions: NIV was used as an alternative means of respiratory support for all children. In patients who had prior invasive mechanical ventilation, NIV was used to facilitate extubation, or it was used after a failed extubation. The children were assigned to the nonresponders group (intubation was needed) or responders group (intubation was avoided totally or for at least 5 days). The physiologic variables were monitored before, at 6 hrs, and 24 hrs of NIV.

Measurements and Main Results: Of 278 patients, 129 were admissions for management of acute respiratory failure and

149 patients received NIV to facilitate extubation ($n = 98$) or for a failed extubation ($n = 48$). Their median age and weight were 8.7 months (interquartile range, 3.1–33.1 months) and 5.5 kg (interquartile range, 3.3–10.8 kg), respectively. Intubation was avoided for >5 days in 79.1% ($n = 220$). No significant difference in age or weight of responders and nonresponders was observed. The cardiorespiratory variables in all patients improved, but significant differences between the two groups were noted at 6 hrs and 24 hrs after NIV.

Conclusions: NIV was a feasible strategy of respiratory support to avoid intubation in $>75\%$ of children in this study. A higher Pediatric Risk of Mortality II score, sepsis at initiation of NIV, an abnormal respiratory rate, and a higher requirement of FiO_2 may be predictive factors of NIV failure. (*Pediatr Crit Care Med* 2011; 12:e7–e13)

KEY WORDS: noninvasive ventilation; pediatric; outcome; middle-income country

Respiratory failure is one of the commonest causes of admission to the pediatric intensive care unit (PICU). Invasive mechanical ventilation (IMV) is associated with ventilator-induced lung injury and ventilator-associated pneumonia. A tra-

cheal tube may cause subglottic and tracheal injury and ineffective clearance of secretions. Tracheostomy, which is used in patients requiring prolonged mechanical ventilation, is associated with morbidity and mortality, especially in small children (1–5).

Positive-pressure support in respiratory failure is critical in stabilizing the airways and the compliant chest wall of the young child. Alveolar ventilation and oxygenation improve, as the work of breathing is reduced. Noninvasive ventilation (NIV) can, to a certain extent, provide the benefits of positive-pressure ventilation without incurring the risks of IMV.

Randomized clinical trials have demonstrated the benefits of NIV in improving the mortality and morbidity in adults with acute exacerbation of chronic obstructive pulmonary disease through the reduction of complications associated with IMV (6–9). NIV has become first-line treatment for this condition (10) and is an alternative to immediate intubation in some acute hypoxemic respiratory disorders (11, 12).

The role of NIV in pediatric chronic respiratory insufficiency of neuromuscular diseases is well established (13). In recent years, a great deal of the interest in NIV has shifted to the management of acute respiratory failure (ARF) (14, 15), a condition represented by a relatively heterogeneous group of patients. It has been shown to be feasible in children with a variety of disorders (16, 17). However, NIV in critically ill children is not without risks, and with failure rates ranging from 8% (14) to 43% (18), it is essential to define those patients least likely to respond.

Acute respiratory distress syndrome and a high Pediatric Risk of Mortality (PRISM) score have been recognized as risk factors for failure of NIV in both retrospective (19) and prospective studies (18, 20). A smaller age and weight were predictive but not independent factors of NIV failure (18, 20).

Our center is a PICU in a middle income country (21). Equipment and human resources are limited, and demand for beds is high. Turnover in the PICU is, thus, necessarily high, and patients must be transferred to the general wards as quickly as

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The authors have not disclosed any potential conflicts of interest.

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