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Response to "High-flow nasal cannula failure in Pediatric Emergency Department: Remarks and questions to explore the predictive factors"

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Dear Editor,

This letter is a reply to the correspondence entitled "High-flow nasal cannula failure in Pediatric Emergency Department: *Remarks and questions to explore the predictive factors*". We would like to thank the authors for their interest in our article and for giving us the opportunity to further explain. In their letter, they comment on our original article entitled "Predictive factors of high-flow nasal cannula oxygen therapy failure in children with respiratory distress treated in a Pediatric Emergency Department".[1]

Their first comment is about the classification of past medical history and its diversity. In our study, an underlying disease was present in 65.8% of the patients, and a history of atopy including eczema, asthma, reactive airway disease, or allergic rhinitis was present in 31 patients.[1] We agree with the concern about the classification of medical history. However, because there is no generally accepted standard classification for the underlying diseases we preferred to classify the diseases that may affect the course of the lower respiratory tract infection of the patient.

In the literature, underlying diseases or past medical history as predictors of high-flow nasal cannula (HFNC) therapy failure are less described. In a study designed by D'Alessandro et al.[2], patient characteristics associated with HFNC failure in bronchiolitis were evaluated. The authors categorized the past medical history of the patients such as congenital cardiac disease, chronic lung disease, neuromuscular disease, genetic diagnosis, previous intubation, home oxygen, atopy, and others. Two hundred-eight patients were included in the study and fifty-eight patients (27.8%) had a significant past medical history. An underlying disorder was found in 31.2% and 19.6% of HFNC responder and nonresponder groups, respectively (p=0.089). However, they did not investigate separately whether each medical history affected the response to HFNC. Kelly et al.[3] reported no correlation between medical history and treatment outcome, which is similarly reflected in the results of our study. On the other hand, Betters et al.[4] showed that HFNC failure is more likely in children with a history of cardiac disease. However, their study included patients with only cardiac disease and respiratory chronic illnesses such as asthma and bronchiolitis. Although the correspondents highlighted the diversity of medical history and differences in response to HFNC in patients with atopic dermatitis or muscular dystrophy, HFNC can be used easily regardless of the underlying disease or the patient's diagnosis. With our current knowledge, it seems that HFNC failure is associated with multiple factors including patient age, HFNC duration, respiratory rate, initial venous pCO2, initial venous pH, history of intubation, and underlying cardiac disease.[2-4] To clear this question, studies including a larger number of patients who are evaluated according to the underlying disease in different study populations such as bronchiolitis, pneumonia, or other diagnoses should be conducted.

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The second comment raised concerned the complications during the HFNC therapy. Generally, HFNC therapy is well tolerated in children and complications are not common during the treatment.[5,6] In our study population, pneumothorax or any other adverse events were not observed. Kelly et al.[3] reported an immediate complication in an infant who had a superficial burn from the heated tubing connected to the apparatus. This complication was managed with burn wound care easily. However, subcutaneous scalp emphysema, pneumo-orbit, and pneumocephalus were rarely reported in neonates as complications of HFNC.[6]

In our study, patients who need an escalation of respiratory support were transferred to the pediatric intensive care unit (PICU) and patients who need follow-up for at least two hours in the Pediatric Emergency Department (PED) were included in the study. Patients aged 28 days or under were excluded from the study. Therefore, we conducted the study with patients followed in the PED. Contraindications of HFNC therapy are upper airway obstruction, central apnea, blocked nasal passages/choanal atresia, trauma/surgery to the nasopharynx, pneumothorax, and requiring an immediate higher level of respiratory support like noninvasive ventilation (NIV) or invasive ventilation. However, some of these contraindications may be accepted as relative contraindications. None of the patients in our study had any contraindications.

The third comment is the evaluation of the effectiveness of HFNC therapy in patients with diagnosed bronchiolitis or pneumonia in the same study. The role of HFNC therapy has been studied in selected populations such as acute bronchiolitis, pneumonia, or asthma.[2] There are a few studies investigating the failure of HFNC therapy in all causes of respiratory distress in children presenting with the PED.[3] Therefore, our study included not only patients with bronchiolitis (75.3% of patients) but also those with other causes of respiratory distress. Additionally, the effects of salbutamol and steroid therapies are controversial in patients with bronchiolitis and it was not possible to exclude these therapies.

Lastly, we investigated early predictors for HFNC therapy failure which was determined as escalation to another ventilation support treatment. Therefore, we did not determine mortality, the duration of non-invasive and invasive mechanical ventilation and hospital stay as potential predictors in the study. Similarly, oxygen concentration and oxygen flow rate were not evaluated, although vital signs were evaluated at the admission and the second hour of the follow-up period to follow the clinical improvement of patients.

We hope that this additional information helps to further clarify some aspects of our study and thank the authors again for their correspondence.

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