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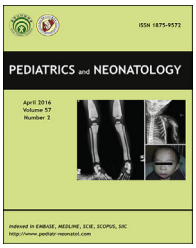

ORIGINAL ARTICLE

Duration of Hospitalization in Association with Type of Inhalation Therapy Used in the Management of Children with Nonsevere, Acute Bronchiolitis

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Key Words
bronchiolitis;
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length of stay

Background: Acute bronchiolitis is one of the main respiratory emergencies in young children. Although supportive therapy is recommended, substantial inconsistency in the clinical usage of inhaled treatments has been reported. In the present study, we evaluated the association between different types of nebulized therapies in clinical practice and the length of stay (LOS) of young children hospitalized with nonsevere bronchiolitis.
Methods: Medical records of 195 patients with bronchiolitis, without evidence of pneumonia or congenital/chronic respiratory conditions, were stratified with respect to the type of inhalation therapy received: nebulized albuterol (Group 1, $n = 53$), nebulized albuterol with 3% saline (Group 2, $n = 38$), nebulized 3% saline alone (Group 3, $n = 33$), or no inhaled treatment (Group 4, $n = 71$). Duration of hospital stay was reported with respect to the type of inhalation therapy received after controlling for variability in patient age (months), oxygen saturation, respiratory score, and use of other treatments (antibiotics, oxygen supplementation, and/or corticosteroids). LOS is presented in terms of mean and 95% confidence interval (95% CI).
Results: The groups were similar except for differences in the mean level of oxygen saturation, respiratory score, and corticosteroid use. Children in Group 4 had the lowest mean respiratory score due to a lesser prevalence of wheezing and/or retractions than in other groups. The LOS for children in Groups 1 and 4 was shorter (43.2 hours, 95% CI 34.9–51.3, and 44.1 hours, 95% CI 37.3–51.0, respectively) than in Groups 2 and 3 (72 hours, 95% CI 62.1–81.6, and 65.1 hours, 95% CI 54.7–75.6, respectively) ($p < 0.02$). The mean LOS in each group did not change significantly after adjustment for covariants.

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Conclusion: Prolonged hospitalization of children younger than 2 years with acute, nonsevere bronchiolitis is associated with administration of nebulized 3% saline, independent of age, clinical presentation of disease, or inclusion of other treatments in their management.

1. Introduction

Acute bronchiolitis is a viral respiratory infection that occurs in children younger than 2 years, associated with the development of edema, mucus plugging, and obstruction of the lower airways.[1–3] Although, in general, acute bronchiolitis is a self-limited condition, children with moderate-to-severe respiratory distress, deoxygenation, and dehydration require hospitalization for observation and supportive therapy.[4] Acute bronchiolitis has been recognized as the main respiratory emergency leading to hospitalization of up to 3% of young children diagnosed with the condition.[2,5] Of the total annual hospital charges in the USA, around 2 billion dollars are attributed to hospitalization of children with bronchiolitis.[6] Pharmacological therapies for bronchiolitis with corticosteroids, antibacterials, antivirals, and/or bronchodilators are not recommended by the American Academy of Pediatrics for the routine management of hospitalized children.[4] Although the evidence does not support routine administration of bronchodilators,[7] their use in the clinical management of bronchiolitis is relatively frequent and varies widely between clinical settings.[8–10] A number of studies have examined the effect of inhaled hypertonic saline (HS) on bronchiolitis outcomes and show an overall reduction in the length of stay (LOS) and good tolerability of inhaled HS treatments in children with mild-to-moderate bronchiolitis.[3] However, others have reported no benefit[11–13] or a negative impact[14] of nebulized 3% saline on the clinical course of bronchiolitis, including respiratory function and/or LOS. Inconsistency in the medical literature and variability in the usage of inhaled therapy highlight the need for further evaluation of bronchiolitis outcomes in relation to management in the inpatient setting. In the present report, we evaluated the duration of hospitalization of young children with nonsevere bronchiolitis in association with the type of nebulized therapy used (albuterol, albuterol with 3% HS, 3% HS, or no inhaled treatment with bronchodilators and/or HS) in the inpatient setting, after accounting for variability in patients' age, clinical presentation of disease, and inclusion of other medications in treatment.

2. Methods

We conducted a retrospective review of the medical records of children hospitalized with bronchiolitis between October 2009 and September 2012 at the Jersey Shore University Medical Center, Neptune, NJ, USA. We identified bronchiolitis cases from the hospital's administrative database, using the International Classification of Diseases, Ninth Revision codes for bronchiolitis (466.11 and 466.19). This study is a secondary analysis of collected bronchiolitis cases to determine the relationship between LOS of young children hospitalized with bronchiolitis and types of nebulized medications included in their treatment. Children aged $\leq$ 2 years, born at term gestation, without chronic conditions (lung disease, asthma, immunodeficiency, congenital heart disease, or cystic fibrosis), and without evidence of chest radiography-confirmed pneumonia[15] and/or admission to the pediatric intensive care were eligible for inclusion in this analysis. Demographics (age and gender), medical history (history of eczema or wheezing, and family history of asthma), clinical data at admission (oxygen saturation, respiratory rate, wheezing, air exchange, and retractions), laboratory data (white blood cell count), and treatments administered (supplemental oxygen, corticosteroids, antibiotics, inhaled bronchodilator, and/or 3% HS) were extracted from the medical records of selected patients using a standardized collection tool that was approved by the Meridian Health Institutional Review Board of Jersey Shore University Medical Center in Neptune, NJ, USA.

Respiratory symptoms at admission (respiratory rate, wheezing, air exchange, and retractions) listed in the medical records were used to calculate and categorize the respiratory scores, as <3 versus ≥ 3.[16] Hypoxia at admission was defined as oxygen saturation (SpO_2) of $<$ 90% because oxygen supplementation is recommended for patients whose SpO_2 is $<$ 90%.[4] LOS was defined as the difference in hours between admission and discharge. The time of discharge was identified by the attending pediatrician's order in each of the bronchiolitis cases. We defined the study population as patients with nonsevere bronchiolitis, because patients were from the general pediatric ward and did not require continuous positive airway pressure and/or intubation during the course of disease.

2.1. Data presentation and statistical analysis

LOS for children hospitalized with bronchiolitis was analyzed with respect to the types of solutions used for nebulized therapy: 1.25 mg/3 mL (isotonic standard solution) albuterol every 4 hours prior to discharge (Group 1), 1.25 mg of albuterol with 4 mL of 3% HS every 4–6 hours prior to discharge (Group 2), 4 mL of 3% HS alone every 6–8 hours prior to discharge (Group 3), and no inhaled treatments (Group 4).

We compared demographic and clinical data of the groups using Chi-square and analysis of variance for categorical and continuous variables, respectively. The LOS for children included in each group is presented before and