Why do we use steroids during asthma exacerbations?

Scarfone RJ et al. Controlled trial of oral prednisone in the emergency department treatment of children with acute asthma. Pediatrics 1993;92:513-518.

Take Home Message: Oral prednisone reduced the need for hospitalization in children presenting to an emergency room with moderate asthma exacerbations.

Highlights: Corticosteroids have long been used in the treatment of asthma, and prior to this trial, studies had begun to demonstrate that the use of parenteral steroids in the emergency department decreased hospitalization rates in patients having acute asthma exacerbations.[i][ii] This 1993 study by Scarfone et al.[iii] was the first to look at the benefit of orally administered corticosteroids combined with frequent B2-agonist therapy for children treated in the emergency department.

The researchers randomized 75 children with moderate asthma exacerbations (as defined by a pulmonary index score) to receive either oral prednisone or placebo along with structured frequent albuterol treatments. After 4 hours, the blinded physicians decided whether or not to admit the patients. Among all the patients, 31% of the prednisone group were admitted versus 49% of the placebo group, which was not statistically significant. However, among the 40 patients with the most severe exacerbations, 32% of the prednisone group were admitted versus 72% of the placebo group ($P<0.05$).

A 2001 Cochrane Review,[iv] that included this trial, concluded that the use of corticosteroids significantly reduces hospital admission in both children and adults with acute asthma, particularly in those with more severe exacerbations. It is now standard practice for children presenting to emergency departments with acute asthma exacerbations to receive oral corticosteroids.

The Nitty-Gritty:

- **Design:**
  - Randomized, double blind, placebo-controlled trial
  - N= 75
    - Prednisone group (n=36)
    - Placebo group (n=39)
  - Setting: Children's Hospital of Pittsburgh
  - Enrollment: 1991-1992
  - Primary outcome: Hospitalization rates
- **Population:**
  - **Inclusion Criteria:**
    - 1-17 years of age
    - Presenting to the ED with a moderate exacerbation of acute asthma (determined by a pulmonary index score of 8-13 based on respiratory rate, wheezing, inspiratory-expiratory ratio, accessory muscle use and oxygen saturation)
    - Previous episode of wheezing
  - **Exclusion Criteria**

§ Use of inhaled or systemic corticosteroids within the previous 72 hours

§ Concurrent stridor

§ Possible foreign body aspiration

§ History of bronchopulmonary dysplasia, cystic fibrosis, liver or renal disease, congenital heart disease, or sickle cell anemia

§ Pregnancy

§ Patients with bronchiolitis, pneumonia or repeated vomiting

o **Baseline Characteristics** – from the prednisone group; there were no significant differences between groups

§ Mean age: 59 months (standard deviation 47)

§ Male: 72%

§ White: 53%

§ Mean hours of wheezing: 15

§ Theophylline use in previous 24 hours: 8%

§ B2- Agonist use

· 1 hour prior: 25%

- 24 hours prior: 67%

§ Mean number of prior admissions: 1.5

§ Mean initial pulmonary index score: 11.0

§ Mean respiratory rate: 47

§ Mean oxygen saturation: 93.5%

- **Intervention**:

o Patients were randomized to receive 2 mg/kg of prednisone or placebo.

o All patients received albuterol nebulization prior to receiving the study drug

o Patients received subsequent albuterol treatments in an identical, structure protocol – the first three at 30-minute intervals and then at 45 minute intervals if more were needed

o Physicians made a preliminary admission or home decision 2 hours after treatment began. Final admission decisions were made at 4 hours. Criteria for admission included: an oxygen saturation ≤92% or continued significant retractions or continued poor aeration by auscultation

- **Outcomes:** comparisons are prednisone vs. placebo groups

o **Primary outcome: Hospitalization rates**

§ All patients: 31% vs. 49% (P=0.10)

- § Patients with initial pulmonary index >10: 32% vs. 72% (P<0.05)
- § Patients given a preliminary disposition of "Admit": 45% vs. 83% (P<0.05)

- o **Secondary outcomes: degree of improvement in pulmonary index:** 5 points vs. 3 points (P<0.001)

[i] Littenberg B, Gluck EH. A controlled trial of methylprednisolone in the emergency treatment of acute asthma. N Engl J Med 1986; 14:150-152.

[ii] Tal A et al. Methylprednisolone therapy for acute asthma in infants and toddlers: a controlled clinical trial. Pediatrics 1990; 86:350-356.

[iii] Scarfone RJ et al. Controlled trial of oral prednisone in the emergency department treatment of children with acute asthma. Pediatrics 1993;92:513-518.

[iv] Rowe BH et al. Early emergency department treatment of acute asthma with systemic corticosteroids. Cochrane Database Syst Rev. 2001:CD002178.