Artigo Original

Factors predictive of the development of acute asthma attacks in children*

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ABSTRACT

Objective: To use clinical and functional characteristics observed upon admission to an emergency room to identify factors predictive of the occurrence and course of acute asthma attacks in children. **Methods:** We prospectively studied 130 asthmatic children, from 1 to 13 years of age, who were treated for acute asthma attacks in an emergency room, evaluating status determined at admission and over the course of the crisis. Clinical scores were determined and arterial oxygen saturation by pulse oximetry was measured, as was peak expiratory flow. **Results:** The initial clinical score, arterial oxygen saturation by pulse oximetry and peak expiratory flow correlated with the number of inhalations performed, as well as with the need for corticosteroid treatment. Mean initial clinical score and mean arterial oxygen saturation by pulse oximetry of the hospitalized patients were statistically different from those of patients who were not hospitalized. Initial clinical score, arterial oxygen saturation and prior treatment for the same exacerbation were predictive of the need for hospitalization. **Conclusion:** The measurement of arterial oxygen saturation by pulse oximetry and the clinical score were useful in predicting the occurrence and course of acute asthma attacks in children. The measurement and interpretation of peak expiratory flow is difficult in children and, under these conditions, served no practical application.

Keywords: Asthma; Acute disease; Prospective studies; Predictive value of tests; Child

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INTRODUCTION

The greatest challenge in evaluating children with acute asthma is to determine whether, after appropriate treatment in an emergency room (ER), they may be safely referred for home treatment or need to be hospitalized. More than one-fourth of all asthmatic patients treated in an ER and discharged in order to be treated at home suffer recurrence of acute asthma some days after treatment.[1-2] Children who respond favorably to bronchodilators but suffer early recurrences pose a dilemma for the ER physician.

Several studies carried out in ERs and involving both adults and children analyzed various predictive indexes in search of a safe and efficient criterion for recommending hospitalization of patients with acute asthma.[2-11] The difficulty and subjectivity of the clinical evaluation, particularly in children, justifies its complementation with more objective measures of the severity of acute asthma.[3] The main methods used to evaluate the severity of acute asthma in the ER are clinical parameters, arterial oxygen saturation by pulse oximetry (SpO_2) and peak expiratory flow (PEF). Most of these studies have shown that there is a correlation between baseline SpO_2 values in the ER and the need for hospitalization.[5,7,10] However, the interpretation of the results and the SpO_2 values chosen as cutoff point for indicating hospitalization presented discrepancies in some studies.[5,6] In guidelines for the management of asthma, the measurement of PEF is recommended as a criterion to evaluate the severity of acute asthma. This recommendation is based on studies that have shown good correlations between PEF and forced expiratory volume in one second and between PEF and the need for hospitalization.[5-6] However, in other studies, no correlation was found between baseline PEF and the need for hospitalization.[8-9,11]

Although several studies on the theme have been published, there is no consensus regarding the relative importance of these parameters in making the decision to hospitalize patients, and this has motivated us to carry out the present study. Our objective was to identify, upon admission to an ER, clinical and laboratory factors predictive of the course of acute asthma in children.

METHODS

We prospectively studied 130 children with acute asthma admitted to the ER of the São José do Rio Preto School of Medicine Hospital de Base from September 1996 to May 1997. Inclusion criteria were having a family history of atopy and having experienced at least two wheezing episodes, with clinical improvement after the use of a bronchodilator. Exclusion criteria were having hemoglobinopathies, acute bronchiolitis, congenital or acquired heart disease, cystic fibrosis, bronchopulmonary dysplasia and being under one year of age. The research project was evaluated and approved by the Medical Ethics Committees of the São José do Rio Preto School of Medicine and of the Children's Institute of the University of São Paulo School of Medicine. Parents or legal guardians gave written informed consent for the child to be included in the study.

A clinical questionnaire containing data regarding the current attack and previous history of asthma was completed for each child. Anthropometric data as well as data from the physical examination were collected and the measurement of SpO_2 of all children was performed in room air. The measurement of PEF was performed in patients older than five years of age. The Wood-Downes[12] clinical score was used (Chart 1), and the respiratory rate values recommended by Waring[13] were considered normal. The score parameters were evaluated using a scale ranging from 0 to 2, with increasing severity. The score at each moment of the evaluation was obtained from the sum of these values.

A pulse oximeter (DX 2405 Oxypleth; Dixtal, São Paulo, Brazil) was used to measure SpO_2 in room air. The oximeter was connected to the index finger or big toe of the child, using a sensor of an age-appropriate size. The SpO_2 value was registered after the first minute of stabilization as the value that remained the most constant during the second minute.

Values of PEF were obtained using a portable device, the Wright Peak Flow Meter (Clement Clarke International Ltd., London, England). The children were asked to remain in the orthostatic position and, after making a maximum forced inspiration, make a strong and fast expiration. This maneuver was performed three times, and the highest value obtained was registered. This value was expressed as percentage

Chart 1 -Clinical scoring system for assessment of the intensity of asthma attacks in children treated in an emergency room

Clinical parameters	0	1	2
Color of the skin	normal	pale	cyanotic
Respiratory rate (breaths/min)*			
1-2 years	up to 30	31-60	over 60
2-5 years	up to 25	26-50	over 50
> 5 years	up to 20	21-40	over 40
Use of accessory muscles	none	mild or moderate	intense
Lung auscultation	wheezing at the end of the inspiration	inspiratory and expiratory wheezing	no sounds
Brain function	normal	depressed or agitated	comatose

*The values recommended by Waring were considered normal.[29]

of predicted value for the patient age and gender, using the Torres et al equation.[14]

Based on the baseline clinical score, initial SpO_2 and baseline PEF, the severity of acute asthma was classified using the criteria specified in Chart 2. The criteria for SpO_2 and PEF were based on the International Consensus Report on Diagnosis and Treatment of Asthma.[15-17]

After this initial evaluation, treatment was initiated, based on the recommendations of the above mentioned international consensus report.[16-17] Patients received intermittent nebulizations using a 0.15 mg/kg dose of a solution of salbutamol (0.5%), added to 5 ml of a solution of sodium chloride (0.9%), with a 6 L/min continuous flow of oxygen. After the evaluations, depending on the response, nebulizations were performed every twenty minutes for up to two hours after the beginning of the treatment. During their stay in the ER, all patients were evaluated by the same author five minutes after the first, third and sixth inhalations. At each of these moments, clinical score, SpO2 in room air and PEF were registered.

In accordance with the guidelines established by the International Consensus Report on Diagnosis and Treatment of Asthma,[16-17] the following procedures were adopted for the management of patients. Patients who presented no clinical improvement and presented SpO_2 < 91% after the first or third nebulization or who presented partial clinical improvement and SpO_2 between 91% and 94% after the third nebulizations received an intravenous dose of methylprednisolone (2 mg/kg). After a marked clinical improvement and SpO_2 = 95%, regardless of the number of nebulizations, discharge from the hospital was considered. Hospitalization was indicated when, after a maximum number of six consecutive nebulizations, there was no satisfactory clinical improvement, and SpO_2 remained under 95%. Hospitalization was indicated for patients who presented SpO_2 = 91% after the third nebulization. An inhaled beta-2 agonist was prescribed (every six hours for five days), or, when it was necessary to administer intravenous corticosteroid in the ER or when patients were already using a beta-2 agonist previously, an oral corticosteroid was prescribed. In the latter case, prednisone or prednisolone was used for five days in daily doses of 1 mg/kg administered in the morning.

The correlation between the different parameters for the classification of patients regarding the severity of acute asthma was evaluated using the Kappa index and the Landis and Koch classification.[18] In order to analyze the differences between the group of hospitalized patients and the group of nonhospitalized patients, the following statistical methods were used: analysis of variance, linear regression, the non-parametric Kruskal-Wallis test, Tukey multiple comparison test, the chi-square test and Fisher's exact test. The results of the numeric variables are expressed as mean values and 95% confidence intervals. In all statistical tests, the level of significance required to reject the null hypothesis was set at 0.05.

RESULTS

A total of 130 patients were studied. Mean age was 68.67 + 39 months, and the ratio of male to female children was 1.8:1.

Most of the patients (86.9%) began to present asthma symptoms before the age of three years,

41.5% presenting symptoms in the first year of life. Only 21.5% of the patients were under prophylactic therapy when the evaluation was carried out, and 43.1% had been previously hospitalized. Within the 24 hours preceding the treatment, 63% of the patients had used a bronchodilator, and 12.3% had taken corticosteroids. Regarding the current attack, 59 patients (45.4%) had begun to present symptoms 48 hours or more prior to treatment, and 30% had been previously treated for the same attack. In accordance with the classification established by the International Consensus Report on Diagnosis and Treatment of Asthma, the percentages of patients who presented mild intermittent, mild persistent, moderate persistent and severe persistent asthma were 61%, 21.5%, 9.3% and 7.7%, respectively.

Baseline PEF was obtained for 56 (87.5%) of the children over the age of five, and 8 children did not perform the maneuver due to uncooperativeness or to the severity of their acute asthma symptoms. There were differences in the distribution of patients regarding the severity of the current attack, taking into account the classifications based on clinical score, SpO_2 and PEF (Table 1). According to the criterion established for PEF, 32.1% of the crises were classified as mild, whereas according to the criteria established for clinical score and SpO2, mild crises represented 68.5% and 65.4%, respectively. Calculation of the Kappa index revealed, according to the Landis and Koch criterion, a slight degree of concordance between the classifications based on clinical score and SpO_2 and those based on SpO_2 and PEF, and a very slight concordance between the classifications based on clinical score and those based on PEF.

A total of 88 patients (67.7%) received one to three nebulizations, and 32.3% required six nebulizations. Linear regression was used to measure the degree of correlation between the number of nebulizations and the baseline values obtained for clinical score, SpO_2 and PEF. There was a correlation between the number of nebulizations needed to alleviate the symptoms of the attack and higher baseline clinical score values and lower baseline SpO_2 and PEF values ($p < 0.001$). The determination coefficients for clinical score, SpO_2 and PEF were 0.329, 0.207 and 0.260, respectively.

A total of 68 patients (52.3%) received corticosteroid therapy during their treatment in the ER. We observed that the mean baseline clinical score of the patients who received corticosteroid therapy was significantly higher than the mean of the patients who did not require such therapy ($p < 0.001$), and that mean baseline SpO_2 and mean baseline PEF were significantly lower in the patients who required corticosteroid therapy ($p < 0.001$ and $p = 0.004$, respectively). Table 2 shows the calculations regarding sensitivity, specificity, positive predictive value and negative predictive value for the use of corticosteroid therapy, using different cutoff levels for the clinical score, SpO_2 and PEF values obtained upon admission to the ER.

Of the 130 children studied, 22 (16.9%) met the criteria for hospitalization previously established by the consensus.(15-16) In 5 cases (3.8%), the parents refused hospitalization, and the child was discharged from the ER by decision of the legal guardian. Therefore, a total of 17 children (13.1%) were hospitalized. Of the children who were discharged, 7 (6.5%) suffered recurrence of acute asthma within seven days after the treatment and returned to the ER, and 2 were hospitalized. Of the 5 patients who were discharged by decision of the family, 4 returned to the ER and did not suffer recurrence. Only 1 child did not

TABLE 1

Distribution of sensitivity, specificity and positive and negative predictive values, using baseline clinical score, SpO2 and PEF values to predict corticosteroid use in the treatment of asthma attacks

	n of patients	SE (%)	SP (%)	PPV (%)	NPV (%)
Score					
≥ 7	8	11.8	100	100	50.8
≥ 6	18	22.1	95.2	83.3	52.7
≥ 4	45	50	82.2	75.6	60
SpO_2 (%)					
< 91	8	11.8	100	100	50.8
< 93	19	26.5	98.4	94.7	54.9
< 95	41	20	89.7	82.9	61.8
% PEF					
≤ 30	7	20	91.7	57.1	67.3
≤ 40	14	40	83.3	57.1	71.4
≤ 60	29	75	61.1	51.7	81.5

SE: sensitivity; SP: specificity; PPV: positive predictive value; NPV: negative predictive value; SpO2: arterial oxygen saturation by pulse oximetry; PEF: peak expiratory flow

TABLE 2

Distribution of the values obtained for different parameters studied upon admission to the emergency room, comparison between hospitalized patients and nonhospitalized patients

Parameter	Hospitalized (n = 17) Mean (95% CI)	Nonhospitalized (n = 108) Mean (95% CI)	p
Nº of previous treatments for the current attack	0.76 (0.27 - 1.25)	0.34 (0.15 - 0.53)	0.02
Clinical score	5.06(4.15 - 5.97)	3.09 (2.81 - 3.37)	< 0.001
SpO_2 (%)	92.53(90.8 - 94.26)	95.48 (95.2 - 95.76)	< 0.001
PEF (% of predicted)	41.53 (25.14 - 57.92)	60.87 (54.17 - 67.57)	0.05

95% CI: 95% confidence interval; SpO2: arterial oxygen saturation by pulse oximetry; PEF: peak expiratory flow

return, and it was not possible to re-establish contact after that child had left the ER.

Statistically significant differences were found between the patients who were hospitalized and those who were not hospitalized regarding the mean number of previous treatments for the current attack ($p = 0.02$), the mean baseline clinical score ($p < 0.001$) and mean baseline SpO_2 ($p < 0.001$). Mean baseline PEF among the patients who were hospitalized was lower than that of those who were not hospitalized. However, this difference was less than significant ($p = 0.05$). These data are shown in Table 3.

Sensitivity, specificity, positive predictive value and negative predictive value for the need for hospitalization were calculated using various cutoff levels for baseline clinical score, baseline SpO_2 and baseline PEF. These results are shown in Table 4.

The proportion of children who had presented acute asthma within the last 30 days was higher among the children who suffered recurrence than among those who did not ($p = 0.01$). In addition, there was a difference between the same two groups regarding the number of inhalations received in the ER. Most of the patients who suffered no recurrence received one to three inhalations, whereas, in the group of patients suffering recurrences, there was a higher proportion of patients who received 6 inhalations ($p = 0.02$).

Statistical analysis using the Tukey method showed that there were no significant differences between patients who were discharged and suffered recurrence and those who were discharged and suffered no recurrence in terms of age, age at the onset of the disease, clinical score, SpO_2 and PEF ($p > 0.05$) (Table 5).

Analysis using Fisher's exact test and the chi-square test showed that there were no significant differences between patients who were hospitalized and those who were not hospitalized, as well as between those who were discharged and suffered recurrence those who were discharged and suffered no recurrence, regarding age, gender, number of previous hospitalizations for asthma, previous admission to an intensive care unit, physical activity

TABLE 3

Distribution of sensitivity, specificity and positive and negative predictive values, using baseline clinical score, SpO_2 and PEF values to predict hospitalization in the 130 children presenting asthma attacks

	n of patientes	SB (%)	SP (%)	PPV (%)	NPV (%)
Score					
≥ 7	8	35,3	98,2	75	91
≥ 6	18	47,1	91,2	44,4	92
≥ 5	33	52,9	78,8	27,3	91,8
≥ 4	45	70,6	70,8	26,7	94,1
SpO_2 (%)					
< 91	8	29,4	97,3	62,5	90,2
< 92	10	35,3	96,5	60	90,8
< 93	19	64,7	92,9	57,9	94,6
< 94	25	70	88,5	48	95,2
< 95	41	70,6	74,3	29,3	94,4
PEF (% of predicted)					
≤ 30	7	42,9	91,6	42,9	91,6
≤ 40	14	57,1	79,2	28,6	92,7
≤ 50	22	57,1	62,5	18,2	90,9
≤ 60	29	71,4	50	17,2	92,3

SE: sensitivity; SP: specificity; PPV: positive predictive value; NPV: negative predictive value; SpO2: arterial oxygen saturation by pulse oximetry; PEF: peak expiratory flow

TABLE 4

Clinical and functional characteristics of the patients who were discharged after treatment in the emergency room

Characteristic	Discharged*	
	With recurrence (n = 07) Mean (95% CI)	With no recurrence (n = 101) Mean (95% CI)
Clinical score	3.43 (2.31 – 4.55)	3.07 (2.78 – 3.36)
Arterial oxygen saturation (%)	95.57 (94.73 – 96.41)	95.48 (95.19 – 95.77)
PEF (% of predicted)	3 72.59 (44.36 – 100.82)	45 60.09 (53.17 – 67.01)

95% CI: 95% confidence interval

limitation, use of prophylactic medication, asthma classification, onset of the symptoms of the current attack, time elapsed since the last attack, medication used within the last 24 hours and use of corticosteroid therapy after treatment in the ER.

DISCUSSION

A great number of children with acute asthma are treated in ERs. Guidelines regarding the therapeutic approach exist. However, there have been few studies defining criteria predictive of the evolution of acute asthma. Therefore, there is little data available that would guide professionals in making better initial decisions regarding the management of acute asthma, when hospitalization is indicated, prevention of recurrence, optimizing treatment, minimizing patient suffering and reducing costs to the health care system.[19-20]

We recognize the difficulty and subjectivity of the clinical evaluation of the severity of acute asthma, particularly in children, as well as the need for complementing that evaluation with more objective measures.[3,21-22] Pulse oximetry has been recommended for monitoring hypoxemia by measuring SpO_2 during asthma attacks, and its usefulness in the pediatric age bracket has been highlighted since it does not require the cooperation of the child.[1,6 7,23] Most of the studies conducted have shown that there is a strong correlation between baseline SpO_2 in the ER and the need for hospitalization.[5, 7,10] However, the interpretation of the results and the SpO_2 values chosen as cutoff point for indicating hospitalization have presented discrepancies in some studies.[5,6] In the guidelines on the management of asthma,[1,15-17] it is recommended that PEF be used as a criterion to evaluate the severity of the asthma attack and the response to treatment. This is based on some studies that demonstrated good correlations between PEF and forced expiratory volume in one second and between PEF and the need for hospitalization.[5- 6,23] However, other studies found no correlation between baseline PEF and the need for hospitalization.[5, 7,10]

Regarding the classification of the severity of acute asthma in the present study, using the criteria established by the International Consensus Report on Diagnosis and Treatment of Asthma,[15-16] there was a better concordance of classification when we contrasted SpO_2 with clinical score and SpO_2 with PEF. Half of the cases were considered as mild intensity attacks Based on baseline clinical score and baseline SpO_2, half of the attacks were classified as being of mild intensity. However, taking the Kappa indexes and the Landis and Koch criterion into consideration,[18] the degree of concordance between these two parameters was low. According to the criterion established for PEF, only 32.1% of the asthma attacks were classified as mild. This finding suggests that the classification criterion based on baseline PEF may be overestimate acute asthma severity. This occurs because, since PEF is effort-dependent, children have greater difficulty in executing the maneuver required for PEF measurement when they are experiencing an acute asthma attack than when they are in follow-up treatment, and this leads to a tendency for PEF values to be reduced.[24]

In the present study, considerable discordance was observed among the degrees of classification of acute asthma, according to the international criteria[15-17] established for the different parameters studied (clinical score, SpO_2 and PEF). Therefore, further studies investigating the relative importance of the various criteria used for the classification of acute asthma severity and identifying those that should be prioritized are warranted.

In a previous study, mean baseline SpO_2 and mean baseline PEF were found to correlate with the number of bronchodilator treatments in an ER

($p < 0.0001$).[11] In our study, baseline PEF was correlated with the number of inhalations needed to alleviate acute asthma symptoms and the need for corticosteroid use but was not correlated with the need for hospitalization. Baseline clinical score and baseline SpO_2 correlated significantly with the severity of acute asthma, measured by the number of inhalations needed to alleviate the symptoms of the attack, the need for corticosteroid use and the need for hospitalization.

Early use of systemic corticosteroids to treat acute asthma, orally or intravenously, is well established.[17,25-26] However, in the literature, there are no objective criteria based on baseline clinical score, baseline SpO_2 or baseline PEF for the indication of corticosteroid use to treat acute asthma. Some authors have found that, after nebulizations with salbutamol, an SpO_2 cutoff value of 91% had higher sensitivity, specificity and positive predictive value for the indication of intravenous treatment in children with acute asthma. In our study, we found that 100% of the children admitted to the ER with baseline clinical scores equal to or greater than 7 and SpO_2 lower than 91% (Table 2) received corticosteroid therapy according to the international norm previously established. Based on this observation, it is possible to establish criteria to hasten the introduction of corticosteroid use after admission of the asthmatic child to the ER, and this may contribute to faster clinical and functional improvement. Previous studies have shown that a delay in initiating corticosteroid use may result in a greater number of admissions and alter the prognosis of the course of acute asthma.[25-26]

Some studies have demonstrated that SpO_2 is a better predictor of the course of acute asthma than is PEF.[5-6,23] In addition, SpO_2 and PEF were found to be predictors, to some extent, of the need for hospitalization, but only SpO_2 was predictive of recurrence.[6] Data in the literature show that baseline SpO_2 lower than 91% indicates the need for hospitalization patients with acute asthma.[7-8,27] Studies examining the usefulness of clinical or objective evaluations of asthma severity in predicting the need for hospitalization generally measure the sensitivity and the specificity of the tests or parameters studied. However, some authors emphasize that, in this situation, the positive predictive value outweighs the specificity of the test. Positive predictive values may be low even when specificity is high.[10]

The analysis of the data in Table 4 reveals that SpO_2 lower than 91% presented high specificity (97.3%) and the highest positive predictive value (62.5%) for the need for hospitalization. Of the 10 children with baseline SpO_2 values lower than or equal to 91%, 6 (60%) were hospitalized. However, most of the children who were hospitalized according to the clinical criteria, previously established in the International Consensus Report on Diagnosis and Treatment of Asthma, presented SpO_2 values above 91% (64.7%). Of the remaining 11 children who were hospitalized, 7 presented baseline SpO_2 values between 92% and 95%, and 4 presented baseline SpO_2 values equal to or greater than 96%.

The analysis of these data suggests that SpO_2, although specific, may be a low-sensitivity parameter for the initial identification of patients who require hospitalization. However, the criteria for hospitalization established in the above mentioned international consensus report may be overly rigid, which may lead to overestimation of the need for hospitalization. The fact that the children who were not hospitalized due to the family decision presented favorable evolution, with no recurrence of the attack, strengthens this hypothesis. We observed that, despite improvement in their clinical condition, several children were hospitalized because their SpO_2 levels suffered an initial abrupt decrease and remained below 95% after several inhalations of a beta-2 agonist. The effect of beta-2 agonists may cause a transitory imbalance in the ventilation/perfusion ratio, thereby maintaining hypoxemia despite the reduced airflow obstruction.[28]

In our study, SpO_2 was not useful in predicting the possibility of recurrence of acute asthma. None of the children who suffered recurrence presented baseline SpO_2 values lower than or equal to 91%. However, the small number of patients who suffered recurrence ($n = 7$) prevented us from performing this analysis properly. This may be done in new studies involving greater numbers of subjects.

Two critical considerations regarding our study deserve to be mentioned. The fact that we used SpO_2 levels as a parameter for making the decision to hospitalize or discharge our patients may limit the use of this parameter as a predictor. Another

limitation was the fact that the researcher who decided whether patients should be hospitalized or discharged was not blinded as to the SpO_2 values (although the researcher did not take baseline SpO_2 into account in making the decision). However, the methodology used and the careful statistical analysis (even though limited by the use, in the prediction, of a parameter that also played a part in the decision to hospitalize patients) indicate that this parameter should be considered the best predictor of hospitalization.

Studies of adults have shown that the spirometric criterion is important in making the decision to discharge patients from ERs.[4,29] However, one study showed that baseline PEF, as well as baseline SpO_2, was not useful for identifying the children who would be hospitalized.[8] In another study, baseline PEF was found to be an accurate indicator of which children would be hospitalized but not of which would be discharged and later suffer recurrence of acute asthma symptoms.[6]

It is difficult to interpret the measurement of PEF in children treated in the ER.[24] This fact, in addition to the difficulties in obtaining the cooperation of the children being treated for acute asthma attacks to perform the PEF maneuver, makes us question the usefulness of the measurement of PEF in this situation. In addition to not being effort-dependent, SpO_2 is much more easily obtained than is PEF.[23-24]

There is little consensus in the literature regarding the relative importance of the various components of clinical history in predicting the evolution of patients with acute asthma. Some authors have found that data regarding clinical history may be predictive of the need for hospitalization,[9,30] but this was not found in other studies.[3,7-8] In our study, only one clinical history parameter significantly differentiated the group of hospitalized patients from the group of nonhospitalized patients: the number of previous treatments for the current exacerbation. This number was significantly greater among the patients who were hospitalized.

Comparison of the group of patients who were discharged and did not suffer recurrence with the group of those who were discharged and suffered recurrence revealed that only two characteristics significantly differentiated the two groups: an interval of less than 30 days since the previous attack; and the number of inhalations received in the ER. This finding may suggest that, when the number of bronchodilator doses is greater than three, improvement may be only transitory, indicating that the airway obstruction is more severe. The number of previous treatments for the current attack, clinical score, SpO_2 and PEF were not predictive of recurrence of acute asthma. In addition, no differences regarding the prescription of corticosteroid therapy after discharge were observed between the groups, and, of the 7 patients who suffered recurrence, only 2 were discharged with no prescription for corticosteroids.

We concluded that, although baseline clinical score, in isolation, proved to accurately discriminate the patients who were hospitalized, there are valid justifications for including objective measures of the severity of acute asthma. Based on our results, we believe that evaluation of SpO_2 in the ER is essential. Since the measurement and interpretation of PEF is difficult in children with acute asthma, we consider its practical application in the ER questionable.

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