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Treatment of the Asthmatic Child[1]

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At the end of 1983 the outpatient clinic at the National Children's Hospital in San José, Costa Rica, adopted a new program for treating children with asthmatic crises. Use of adrenaline was discontinued, and administration of salbutamol in aerosol and short courses of corticosteroids was introduced; also, a special outpatient room was set aside for treating pediatric asthma cases. Between 1984 and 1986 this program's marked superiority was demonstrated by many developments—including reduction of both initial hospitalizations and readmissions for pediatric asthma by nearly 70%.

The asthma syndrome is a serious problem for children, who in general are not well treated for it in most Latin American health services.

Among other things, asthma preoccupies the afflicted child's parents and greatly limits the child's activities. Hence, a good therapeutic program should strive to give asthmatic children and their families as normal a lifestyle as possible while virtually eliminating hospitalizations.

Worldwide, asthma prevalence is both changeable and varied. For example, estimated asthma prevalences range from 0.8% to 1.4% in the Scandinavian countries, from 1.8% to 4.8% in the United Kingdom, from 4.9% to 12.1% in the United States, and from 4.6% to 20% in Australia (*1*).

In San José, Costa Rica, asthma was diagnosed in 25% of the children subsequently discharged from the emergency medical service known as "Medicine 6" of the Dr. Carlos Sáenz Herrera National Children's Hospital in the early 1980s (*2*). However, important changes in the therapeutic approach to childhood asthma were introduced in this hospital at the end of 1983. This article describes the nature of these changes and the results obtained.

MATERIALS AND METHODS

At the end of 1983, routine use of epinephrine to treat asthmatic children coming to the National Children's Hospital for respiratory difficulty was discontinued. In its place, salbutamol[4] aerosol treatments were introduced, together with short courses of corticosteroids, following the procedure described in Annex 1.

The aerosol treatments were administered at 30-minute intervals, up to a maximum of three times. To facilitate their administration, average doses based upon the children's ages were estab-

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[4]Salbutamol is a bronchoselective beta-adrenoceptor agonist used in treating bronchial asthma. It is administered by inhalation, intravenous infusion, or orally.

lished as follows: 0.3 ml for those under two years old; 0.5 ml for those between two and five; 0.7 ml for those between five and eight; and 1 ml for older children. The effective dosage utilized according to this procedure constituted an adaptation of the commonly recommended 0.01 to 0.03 ml per kg of 0.5% solution. Physiologic saline was added to the amount of salbutamol indicated so as to make a total volume of 2 ml. This was administered using a Dia Model C compressor (Air Shields Inc., Hatboro, Pennsylvania) fitted with a "jet" nebulizer, together with a face mask for children under five years old and a mouthpiece for older children.

If the child had not received theophylline in the preceding four to six hours, a dose of this medication (5 mg/kg) was administered.

Besides the salbutamol, another innovative program feature was use of corticosteroids in treating a larger proportion of the asthmatic children seen. These medications were administered to all cases of frequent episodic asthma and all cases of persistent or chronic episodic asthma, as well as to cases involving moderate or severe respiratory difficulty, even when infrequent episodic asthma had been diagnosed (see Annex 1).

For this purpose, hydrocortisone succinate in 100 mg ampoules was employed. Half an ampoule was administered intramuscularly to children under three years old and one ampoule was administered to older children (the normal dose per treatment being 5–10 mg/kg every 4–6 hours). If hydrocortisone succinate were not available, dexamethasone sodium phosphate could be used. (If one uses 1 ml ampoules containing 4 mg of dexamethasone per ml, a quarter of an ampoule can be given to children one to three years old, three-quarters of an ampoule to children three to five, and one ampoule to older children.) Immediately afterward, a five-day course of oral prednisolone (1–2 mg per kg of body weight per day) was started.

A pediatric asthma patient receiving treatment at the National Children's Hospital in San José.

For purposes of administering the initial treatments, an outpatient consultation room was provided. This was equipped with six chairs (each with nebulizing equipment) to care for the same number of asthmatic children, a small desk for the intern in charge of the Nebulization Unit, an examination couch, and diagnostic equipment.

If the response to treatment was favorable, the child was discharged from the clinic with instructions concerning proper follow-up, environmental control, allergic precautions, and medications to be administered orally at home. (The instructions regarding medications direct that salbutamol be administered every six hours for 10 days, with children under a year old receiving a quarter of a tea-

spoon,[5] children between one and three years old half a teaspoon, and children over three one teaspoon. In addition, they call for theophylline to be administered in a 5 mg/kg dose every six hours for 10 days, and for children who received corticosteroids in the Unit to start receiving the above-mentioned five-day course of prednisolone at 1–2 mg/kg once in the morning for five days.)

The attending physician fills out a one-page form for each patient (see Annex 2) and provides a copy to the person who accompanies the child. This provides quick information on the treatment received by the child at each visit to the hospital, lists eight conditions needing to be evaluated by the physician, and permits special recommendations for the child to be noted. It also provides a telephone number that the child's family members can call in case of emergency. (In addition, the physician in charge fills out another document summarizing the treatment given to each asthmatic child, and this is the document the hospital retains.)

Children who continue to experience difficulty breathing despite the three nebulizer treatments with salbutamol, administration of theophylline if indicated, and parenteral administration of hydrocortisone or dexamethasone are hospitalized for evaluation and further treatment.

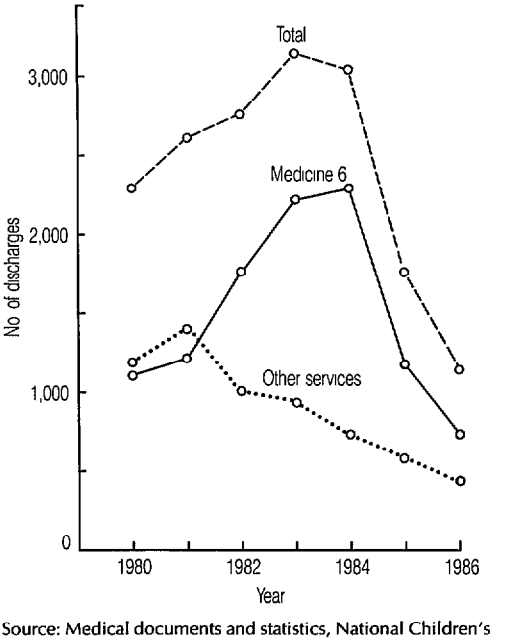
RESULTS

Since the introduction of this program, the attitude of the treated children's parents, the children themselves, and their physicians has been favorable. And because repeated doses of subcutaneously administered epinephrine are no longer used, the resulting trauma and subsequent reluctance to visit a hospital center have been reduced.

Also, having a specific asthma treatment area for children has facilitated interaction among the children and among those accompanying them, and has increased the opportunity for health workers to provide more guidance concerning prevention of the disease, administration of medication, identification of signs of respiratory difficulty, and occasions when medical care should be sought.

As a result of the program, since 1984 discharges from the National Children's Hospital for asthma have declined sharply (Figure 1). In 1983 the hospital services provided care for 3,124 children with asthma; in 1986 the number receiving such care was only 1,134 and in 1989 the number was 950, despite an increase

Figure 1. Discharges of asthma patients by facilities of the National Children's Hospital in 1980–1986.



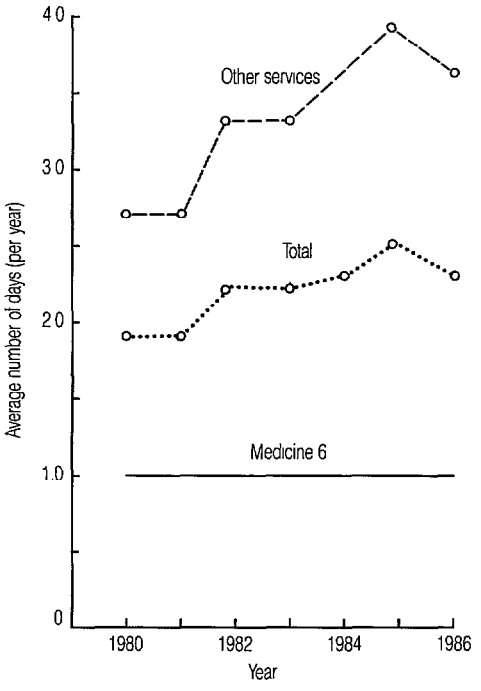
Source: Medical documents and statistics, National Children's Hospital, San José.

[5] 1 teaspoon = 5 ml containing 2 mg of salbutamol as sulphate.

in the national pediatric population and greater demand for highly specialized services at the National Children's Hospital. The number of asthma patients discharged by the emergency medical service (Medicine 6) also fell sharply—from 2,200 in 1983 to 686 in 1986 and 681 in 1989—a reduction of nearly 70%.

After 1983, pediatric asthma patients admitted to the hospital had severe problems that did not respond to the usual measures provided for outpatients. It was therefore logical to expect that the average length of the hospital stay for asthma patients would tend to increase in the first years of the new program (Figure 2). Such an increase did occur—although some reduction also occurred in 1986, and the average hospitalization times (24 hours at the emergency facilities and 3.5 days in the hospital for severe cases in both 1986 and 1989) are within very acceptable limits.

Figure 2. Average length of hospitalization per asthma patient at facilities of the National Children's Hospital in days per year, 1980–1986.



Source: Medical documents and statistics, National Children's Hospital, San José.

The number of readmissions also provides a good indication of the new treatment program's impact. In 1983, 28% of the total number of children treated for asthmatic crises were readmitted to the emergency service with an asthmatic crisis. In 1986 only 9% of such asthmatic children were readmitted—another reduction of nearly 70%. In a similar vein, the need to treat hospitalized asthma patients with intravenous aminophylline fell by 50% between 1984 and 1986.

DISCUSSION

Contemporary advances in understanding the physiopathology and pharmacologic treatment of asthma can diminish the frequency and intensity of asthmatic crises and reduce the need for hospitalization. In this regard, the data obtained from our experience are clear and illustrative.

Bronchodilation through beta-2 agonists is an initial measure that is generally effective in dealing with acute asthma attacks (*3*). In many countries, aerosols of these medications have replaced epinephrine since they are more specific, require smaller doses, and are felt to produce fewer adverse reactions (*4*). In general, the beta-2 agonists have been shown safe and effective in controlling asthma symptoms and reducing the frequency of hospitalizations (*5*).

Also, corticosteroids can reduce the inflammatory process, improve recovery from hypoxemia, and help restore responsiveness to beta-adrenergic agents. (It is surprising to see how long it has taken to document the value of corticosteroids in managing acute asthma attacks—*6*.) Together with their anti-inflammatory action, corticosteroids

appear to sensitize beta-2 receptors to endogenous and exogenous sympathicomimetic drugs (*7*). It should be stressed that short treatments are perfectly safe and are not associated with any side-effects such as adrenal suppression or growth retardation (*8*).

In addition, initiation of oral therapy in the emergency room offers an excellent tool for educating asthmatic patients about the use of medication that can be administered at home. In this situation, theophylline is one of the drugs of choice for treating both chronic asthma and acute exacerbations of bronchospasm (*9*). In the future, emphasis should be placed on the administration of salbutamol via a polystyrene coffee cup (giant size) held over the child's face. This is almost as effective as a hospital nebulizer for delivering salbutamol, so cheap as to be universally applicable, and available almost everywhere (*8*).

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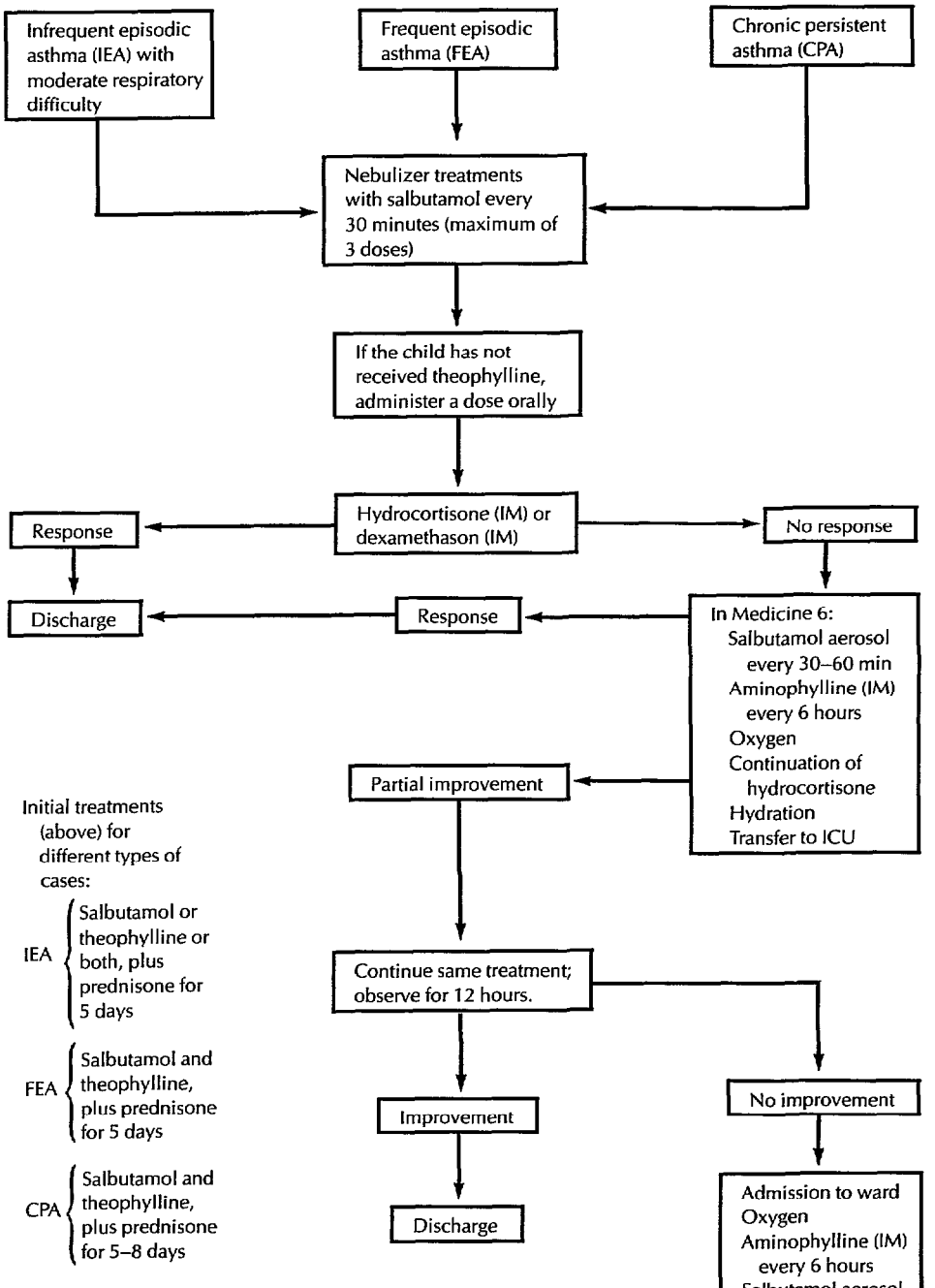
ANNEX 1. A diagram showing the procedures followed at the National Children's Hospital in San José for managing children with acute asthma crises.[a]



[a]Adapted from M. Soto, Guía diagnóstica y de tratamiento para el niño con asma bronquial, Unidad de Enseñanza, Hospital Nacional de Niños, San José, 1985.

ANNEX 2. The form completed by the attending physician at the National Children's Hospital for each pediatric asthma patient.

Recommendations of your consulting physician

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If you have any questions or in case of emergency, consult your pediatrician or call the Emergency Services, National Children's Hospital.

Costa Rican Social Security Fund
National Children's Hospital
ASTHMATIC CHILD'S CARD

Name: _____

Insurance No.: _____

HNN File No.: _____

Symptoms and conditions that need to be evaluated by the physician:

1. Persistent cough or sibilant rales not responding to oral treatment
2. Vomiting that prevents oral drug administration
3. Difficulty sleeping due to sibilant rales, difficulty breathing, or cough
4. Difficulty speaking as a result of the respiratory problem
5. Fever
6. Pain in the "chest," neck, or throat
7. Chest congestion
8. Absence from school due to the illness

RECORD OF HOSPITAL CARE RECEIVED
(Place an X next to the medication received)

Date	Place of treatment	Medication							Name of physician
		T	OS	NS	A	OST	PST	O2	

Key: T: Oral theophylline
OS: Oral salbutamol
NS: Nasal salbutamol
A: Aminophylline
OST: Oral steroids
PST: Parenteral steroids
O2: Oxygen