

## Acute asthma management in children: knowledge of the topic among health professionals at teaching hospitals in the city of Recife, Brazil\*

Manejo de crises asmáticas em crianças: conhecimento de profissionais de saúde quanto ao tópico em hospitais-escola do Recife (PE)

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### Abstract

**Objective:** Knowledge of acute asthma management in children is a subject that has rarely been explored. The objective of this study was to assess the level of such knowledge among health professionals in the city of Recife, Brazil. **Methods:** This was a cross-sectional survey involving 27 pediatricians and 7 nurses, all with at least two years of professional experience, at two large pediatric teaching hospitals in Recife. The participants completed a self-administered multiple-choice questionnaire. **Results:** The pediatricians and nurses all possessed insufficient knowledge regarding the use of metered dose inhalers, nebulization, and types/doses of medications, as well as techniques for decontamination and disinfection of the equipment. **Conclusions:** Insufficient knowledge of acute asthma management in children can lead to less effective treatment in hospitals such as those evaluated here. Educational programs should be developed in order to minimize this problem.

**Keywords:** Asthma; Health knowledge, attitudes, practice; Nebulizers and vaporizers.

### Resumo

**Objetivo:** O conhecimento sobre o manejo da asma aguda em crianças é um tema pouco explorado. O objetivo deste estudo foi avaliar o conhecimento de profissionais de saúde do Recife (PE) sobre o assunto. **Métodos:** Estudo transversal de tipo inquérito com 27 médicos e 7 enfermeiros, com mais de 2 anos de trabalho, de dois grandes hospitais-escola de pediatria do Recife, avaliados através de questionários autoaplicáveis com questões fechadas. **Resultados:** Tanto os pediatras quanto os enfermeiros apresentaram conhecimento inadequado sobre o uso de inaladores dosimetrados, nebulização, tipo e dosagem dos medicamentos, assim como técnicas de descontaminação e desinfecção do material. **Conclusões:** O conhecimento inadequado do manejo da asma aguda em crianças pode refletir em um tratamento menos efetivo nesses hospitais. Medidas educativas são necessárias para minimizar o problema.

**Descritores:** Asma; Conhecimentos, atitudes e prática em saúde; Nebulizadores e vaporizadores.

### Introduction

Acute asthma accounts for a large number of emergency room visits and hospitalizations, as well as leading to school absenteeism, restriction of physical activity, and parents having to take time off from work.<sup>(1,2)</sup> In 2010, asthma accounted for 192,601 hospital admissions in Brazil, and

expenditures—in Brazilian reais (R\$)—amounted to R\$ 100,537,934.90. In that same year, asthma accounted for approximately 6% of all hospital admissions in children under 14 years of age in the Brazilian state of Pernambuco, being the third leading cause of such admissions.<sup>(3)</sup>

Although acute asthma management might seem simple at first glance, it requires that

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health professionals know the basics so that they can act effectively, reducing the risk of hospitalization and minimizing side effects, as well as maximizing cost-effectiveness. Two well-established principles to be considered in asthma management, for patients of all ages, are that inhalation is the most effective way of delivering medication and that short-acting  $\beta_2$  agonists are the first-line drugs. Inhaled medications are most often delivered via nebulizers or metered dose inhalers (MDIs).<sup>(1,2,4,5)</sup> The most common way of delivering  $\beta_2$  agonists is by nebulization. However, a systematic review of the literature, involving 2,295 children and 614 adults, showed that MDIs are as efficient as are nebulizers and provoke fewer side effects.<sup>(6)</sup> In children, MDIs should be used with a spacer.<sup>(1,2,4,5)</sup> Various studies have shown that the use of MDIs attached to a spacer, be it conventional or homemade, is as effective as is that of conventional nebulization.<sup>(7-10)</sup> In choosing between using MDIs and nebulization, another important aspect to be considered is the cost. Studies conducted in the United States<sup>(11)</sup> and in Brazil<sup>(12)</sup> have shown that MDIs are more economical than are nebulizers.

There are no guidelines specifying the preferred type of device for managing acute asthma in children. However, how to choose the type of inhalation device in the long-term management of asthma, by age group, is described in the National Institutes of Health/World Health Organization Global Initiative for Asthma guidelines on asthma management in children up to five years of age.<sup>(13)</sup> Those recommendations can inform decisions regarding the devices to be used in acute asthma, except for dry powder inhalers, which, in Brazil, are available only for long-acting  $\beta_2$  agonists, medications that are not indicated for children with asthma.<sup>(1,2)</sup>

The effective disinfection of semi-critical items, which include spacers and nebulizers, requires adequate knowledge, such as knowledge of methods of decontamination/disinfection and knowledge of proper storage of solutions. The Brazilian National Health Oversight Agency has established guidelines for these procedures.<sup>(14)</sup>

Although acute asthma is a common cause of emergency room visits, the level of knowledge of its management among health professionals is a subject that has rarely been explored. A

search of the *Biblioteca Regional de Medicina* (Bireme, Regional Library of Medicine), SciELO, and PubMed databases revealed only one study on this topic. In that study, conducted in Rio de Janeiro, 50 of the 72 physicians interviewed did not know how to prescribe an MDI with a spacer as the device of choice for treating acute asthma and rarely classified asthma on the basis of the symptoms of the attack.<sup>(4)</sup>

The objective of the present study was to assess the level of knowledge of acute asthma management among health professionals—pediatricians and nurses working in pediatric emergency rooms at teaching hospitals.

## Methods

This was a cross-sectional study involving pediatricians and nurses working in the emergency rooms of pediatric teaching hospitals affiliated with the Brazilian Unified Health Care System in the city of Recife, Brazil, between January and April of 2010. We enrolled a convenience sample of attending pediatricians and nurses at the *Instituto de Medicina Integral Prof. Fernando Figueira* (IMIP, Professor Fernando Figueira Institute of Comprehensive Medicine) and at the Barão de Lucena Hospital, since these are two important teaching centers for pediatric emergency care in the state of Pernambuco. We included all health professionals with at least two years of work experience at either of the two hospitals. We used self-administered multiple-choice questionnaires, one for physicians and one for nurses (Appendices 1 and 2). The research project was approved by the IMIP Research Ethics Committee (Protocol no. 1594-09). All participants gave written informed consent.

## Results

Of the 45 health professionals at the two hospitals, 10 were excluded because they had less than two years of work experience. One nurse declined to participate in the study, without providing a reason for doing so. Of the remaining 34 health professionals, 27 were physicians and 7 were nurses. The median age of the pediatricians and nurses was 37 years (range, 28-61 years) and 29 years (range, 26-42 years), respectively. The median time since graduation was 13 and 6 years, respectively, and the median

length of professional experience was 12 and 6 years, respectively. Table 1 shows other sociodemographic characteristics of the sample.

All of the nurses reported that MDIs were not available in the emergency rooms in which they worked. Sixteen (59%) of the 27 physicians and 3 (43%) of the 7 nurses opined that MDIs are easier to use than are nebulizers. Only 10 of the physicians (37%) and 1 of the nurses (14%) responded that MDIs are as efficient as are nebulizers.

Of the 27 physicians, 20 (74%) stated that a dose of 2.5 mg of nebulized fenoterol is too high for a child weighing 20 kg. Twenty-two of the physicians (81%) reported that they did not use the ipratropium bromide- $\beta_2$  agonist combination in moderate or severe asthma. In addition, 22 (81%) stated that they do not approve of the use of the ipratropium bromide- $\beta_2$  agonist combination in a mild asthma.

Only 13 of the 27 physicians (48%) responded that oxygen is the optimal nebulizer gas. Regarding the gas flow rate, 17 physicians (63%) recommended the use of 6–8 L/min. All stated that saline is the recommended nebulizer solution.

Regarding the types of nasal/oral adapter (masks and mouthpieces), 13 (48%) of the 27 physicians and 6 (86%) of the 7 nurses responded that five-year-old children do not need a mouthpiece for nebulization. When questioned about the MDI technique, 21 (78%) of the physicians responded correctly (slow and deep inhalation), compared with only 3 (43%) of the nurses, 4 (57%) of the nurses responding that inhalation should be rapid and deep. Regarding how the MDI should be attached to the spacer (with the canister upward or downward), 18 of the physicians (67%) and 4 of the nurses (57%) checked the option stating that the position does not interfere with the delivery of the drug to the respiratory tract. Only the nurses were questioned about the age group in which MDIs can be used: 4 (57%) did not know; and 1 (14%) stated that MDIs are suitable for all ages. Of the 7 nurses, 4 (57%) stated that the nebulizer circuit and the spacer should be cleaned and disinfected once a week (Table 1).

## Discussion

Acute asthma is a common problem, and knowledge of acute asthma management is

a subject that has rarely been explored in the literature. In light of the current knowledge, the present study raises an important question: Do health professionals in Brazil have sufficient knowledge of acute asthma management in children?

Currently, there is not enough scientific evidence to make the use of MDIs more common in the treatment of acute asthma. A systematic review of randomized trials<sup>(6)</sup> confirmed that aerosol  $\beta_2$  agonists are as efficient as are nebulized  $\beta_2$  agonists, as well as being safer. In addition, delivering  $\beta_2$  agonists via an MDI is known to be less costly than is doing it by nebulization.<sup>(11,12)</sup> This raises the question of why a cheaper and more efficient technology is less commonly used, as has been observed here. The present study was not designed to address this question. However, we can speculate on two factors. The first is related to paradigm shifts. According to Kuhn, an obsolete scientific theory is replaced not merely because it has been scientifically refuted, but because its former advocates cease to act.<sup>(15)</sup> Although the problem in question does not involve a scientific theory but rather an evidence-based technology, the argument can be applied to the case in question. The second factor is related to the lack of sufficient knowledge of the subject among health professionals directly involved in the treatment of patients and among health care managers. In the topics addressed in the questionnaires of the present study, it is evident that physicians and nurses do not have sufficient knowledge of the use of MDIs. These data are in accordance with those obtained in a study conducted in São Paulo, Brazil.<sup>(16)</sup> The lack of availability of MDIs and spacers in the facilities studied can explain, in part, the insufficient knowledge of the subject among health professionals. However, knowledge of the low cost and effectiveness of the method, per se, is sufficient for health professionals to argue that health care managers should make such devices available in pediatric emergency rooms. In contrast, it was expected that, since nebulization is the available method of treatment with  $\beta_2$  agonists, health professionals would have sufficient knowledge of this procedure. However, this was also not observed. Parameters for nebulized medication doses, types of nebulizer gas, and nebulizer gas flow rates, as well as for types of nasal/oral

**Table 1** – Sociodemographic characteristics of physicians and nurses working in pediatric emergency rooms at teaching hospitals in the city of Recife, Brazil, between January and April/2010.

Characteristic	Type of professional		
	Physician	Nurse	Total
	(n = 27)	(n = 7)	(n = 34)
	n (%)	n (%)	n (%)
Workplace			
IMIP	22 (82)	6 (85)	28 (82)
HBL	5 (18)	1 (15)	6 (18)
Gender			
Female	25 (92)	6 (85)	31 (91)
Male	2 (8)	1 (15)	3 (9)
Level of education			
Bachelor's degree	2 (8)	2 (8)	4 (11)
Specialization	2 (8)	3 (42)	5 (14)
Residency	20 (74)	1 (15)	21 (64)
Master's degree	3 (11)	1 (15)	4 (11)
Continuing education			
Attendance of conferences in the previous year	4 (14)	4 (57)	8 (24)
Reading of articles in the previous week	19 (70)	3 (42)	22 (65)
Reading of articles online in the previous month	4 (14)	0 (0)	4 (11)

IMIP: *Instituto de Medicina Integral Prof. Fernando Figueira* (Professor Fernando Figueira Institute of Comprehensive Medicine); and HBL: *Hospital Barão de Lucena* (Barão de Lucena Hospital).

adapter, have previously been established—in the Brazilian Guidelines for Asthma Management<sup>(1)</sup> and in an international consensus guideline.<sup>(2)</sup> These documents are available online and have been widely disseminated in the pediatric community. Therefore, a lack of valid scientific evidence cannot be the reason for the results obtained. A systematic review showed that administration of multiple doses of ipratropium bromide, especially during attacks that are more severe, reduces the risk of hospitalization.<sup>(17)</sup> The respondents evaluated in the present study showed a lack of knowledge of that aspect as well.

We can presume that the lack of sufficient knowledge for treating children with acute asthma in emergency rooms leads to a greater chance of hospitalization, more emergency room visits, more time spent in the emergency room, and an increased risk of treatment side effects. This also increases health care expenditures, because the direct costs associated with the use of nebulizers are higher than are those associated with that of MDIs,<sup>(11,12)</sup> as well as because the numbers of hospital admissions and emergency room visits are increased.

The present study has certain limitations. First, the choice of the hospitals in the sample

was non-probabilistic, which might have biased the results. However, the inclusion of the IMIP, which is the center with the greatest number of pediatric visits in the state of Pernambuco, as well as having the greatest number of residents and graduate students in pediatrics, makes the sample significant in terms of teaching hospitals. The Barão de Lucena Hospital is also a major center for pediatric education in the state. We can suppose that the potential sample selection bias would have the effect of minimizing the problem, that is, in emergency rooms used exclusively for patient care, the level of knowledge on acute asthma management would be even less sufficient. Another limitation is the fact that we used an unvalidated questionnaire. However, the questions asked were based on Brazilian and international consensus guidelines on asthma management,<sup>(1,2,18)</sup> on systematic reviews of the literature,<sup>(6,17)</sup> and on other studies of good methodological quality, making it possible to establish a reliable profile of the health professionals in Brazilian Unified Health Care System emergency rooms in capital cities in northeastern Brazil, in terms of their level of knowledge regarding the treatment of children with acute asthma. In addition, this study did not include facilities located in the interior the

state or in other northeastern states. However, it seems unlikely that the level of knowledge of such health professionals is better than is that of those in Recife.

In summary, pediatricians and nurses working in two large emergency rooms in northeastern Brazil have insufficient knowledge of acute asthma management. In view of the large number of children with asthma who seek emergency room treatment, federal, state, or even institutional educational programs should be developed in order to make asthma management more efficient and less costly.

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