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University and public health system partnership: A real-life intervention to improve asthma management

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ABSTRACT

Objective: Asthma is under-diagnosed in many parts of the world. We aimed to assess the outcome of a capacitating program on asthma for non-specialist physicians and other healthcare professionals working in the public system in Ribeir o Preto, Brazil. **Methods:** A group of 16 asthma specialists developed a one-year capacitating program in 11 healthcare clinics in the Northern District of the city, which included lectures on asthma, training on inhalation device use and spirometry, and development of an asthma management protocol. Researchers visited one health unit 2–4 times monthly, working with doctors on patients' care, discussing cases, and delivering lectures. Asthma education was also directed to the general population, focusing on recognition of signs and symptoms and long-term treatment, including production of educational videos available on YouTube. Outcome measures were the records of doctors' prescriptions of individual asthma medications pre- and post-intervention. **Results:** Prior to the program, 3205 units of inhaled albuterol and 2876 units of inhaled beclomethasone were delivered by the Northern District pharmacy. After the one-year program, there was increase to 4850 units (51.3%) for inhaled albuterol and 3526 units (22.6%) for inhaled beclomethasone. The albuterol increase followed the recommendation given to the non-specialist doctors by the asthma experts, that every patient with asthma should have inhaled albuterol as a rescue medication, by protocol. No increase was observed in other districts where no capacitating program was conducted. **Conclusion:** A systematic capacitating program was successful in changing asthma prescription profiles among non-specialist doctors, with increased delivery of inhaled albuterol and beclomethasone.

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Asthma; wheezing; professional education; diagnosis; regional medical programs

Introduction

According to the Global Initiative for Asthma (GINA) Management and Prevention 2016 report, asthma is a heterogeneous disease, usually characterized by chronic airway inflammation. It is defined by a history of respiratory symptoms, such as wheezing, shortness of breath, chest tightness, and cough, which vary over time and in intensity, together with variable expiratory airway limitation [1].

An estimated 300 million people worldwide currently have asthma, with prevalence rates ranging from 1 to 18% in different countries; worldwide, 250 000 deaths occur each year due to asthma [1, 2]. In the US, the prevalence of active asthma is approximately 8% in adults and

9.3% in children. In contrast, over half of Latin American countries report a prevalence of childhood asthma above 15% [3].

The International Study of Asthma and Allergies in Childhood (ISAAC) Phase Three surveyed approximately 1 200 000 children from 233 centers in 98 countries. Sol  et al. summarized the studies carried out in Brazil, which revealed that the prevalence of asthma is among the highest in the world. The mean prevalence of active asthma in ISAAC Phase 1 was 23.3% for children and 22.7% for adolescents, and in ISAAC Phase 3 was 24.3% and 19%, respectively, without any relationship to socioeconomic status [4–6]. These results indicate that asthma among Brazilian children and adolescents should be regarded as a major public health problem. Few studies have addressed

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asthma prevalence among Latin American adults. Studies carried out in Colombia and in Mexico reported a prevalence of 6.3% and 5%, respectively, for physician-diagnosed asthma in adults [3].

A survey conducted in 10 Latin American countries (AIRLA), including Brazil, found that poorly controlled asthma imposes considerable costs, with 73% of the costs attributed to unscheduled visits to emergency departments (EDs) [7]. A National Program for Asthma implemented in Costa Rica in 2003, focusing on universal access to medication, propagation of the program, and promotion of inhaled corticosteroid use by non-specialist doctors, resulted in a decline of 53% in hospital admissions and of 80% in asthma-related deaths over 14 years [8].

In Brazil, regional asthma programs have led to improved quality of life, reduced absences at school and work, and decreased hospitalization and demand for ED care (9–12). In the city of Salvador, Northeast Brazil, an integrated action between the health ministry and the Federal University of Bahia (ProAR Program) resulted in a reduction of 82.3% in hospitalizations for asthma [12]. However, these programs are local initiatives, and a national program designed to promote training of all healthcare professionals involved in asthma care is needed. In keeping with the GINA 2016 report, we have attempted to develop an asthma program adapted to fit local healthcare resources, with careful evaluation of local needs and barriers to the implementation of asthma management recommendations [1], as a step towards development of a national asthma program.

In the present study, we report the results of a capacitating program on asthma, developed as a partnership between the university and the public health system of the city of Ribeirão Preto, Southeast Brazil. The capacitating program was a set of actions, including lectures, workshops, and discussion of clinical cases, aimed at providing training to non-specialist doctors and other healthcare workers in the diagnosis and management of asthma in children and adults. This real-life study was conducted in 11 health clinics of the Northern District of the city, which comprises a population of 120 000, approximately 20% of the current population of 666 323. The population in this part of the city is characterized by a low socio-economic status and high rates of ED usage for health care, including the treatment of acute asthma, mainly due to cultural reasons and expectations of more prompt medical care [13].

Subjects and methods

Study design

The study design comprised an initial cross-sectional observational analysis, followed by an ecological study with intervention.

Formative research

Before the start of the capacitating program, we performed two surveys to evaluate asthma knowledge and diagnosis. The first survey was conducted among patients seeking care at the ED because of acute asthma symptoms. Questionnaires to evaluate self-definition of asthma and frequency of symptoms in the past 12 months were administered by a member of the research group to adults and to parents or caregivers of children younger than 14 years who presented to the ED and received a prescription of an inhaled, short-acting beta-2 agonist by the attending physician. The adult questionnaire comprised 11 questions and was constructed based on the European Community Respiratory Health Survey ECRHS II (14), whereas the children's questionnaire encompassed 9 questions based on the ISAAC (4). This survey was conducted during the month of July 2011 at the ED serving mostly patients from the Northern District, one month prior to the intervention program.

A trained researcher remained in the ED collecting information for 12 hours daily, 5 days per week, during this period. Questionnaires were administered to a group of 400 patients (109 children younger than 14 years of age and 291 adults). There was no concordance of reports of asthma symptoms in the past twelve months and either reports of asthma ever or physician-diagnosed asthma (Figure 1), with kappa indexes of 0.04 to 0.06, indicating low or no concordance. When asked about the use of the health clinics of the Northern District, 45% of adults and adolescents older than 14 years of age and 21% of the parents of children 14 years old and younger reported that they seek care only at the ED during acute attacks and do not use the health clinics for follow-up or long-term treatment.

The second survey included an asthma questionnaire comprising 37 questions regarding several aspects of asthma knowledge, modified from a questionnaire previously validated in Brazil (15). This questionnaire, which was originally designed to assess asthma knowledge among individuals from the general population, was administered to 198/216 (91.6%) healthcare professionals from the 11 health clinics of the Northern District, in the months of June and July 2011. Results revealed that the group of doctors, pharmacists, and nurses performed significantly better than technical professionals and community health workers (Figure 2).

Capacitating program

The capacitating program was developed by a group of 16 allergists/pulmonologists undertaking the project in 11 public health clinics of the city of Ribeirão Preto. All members of the group had present or past affiliations

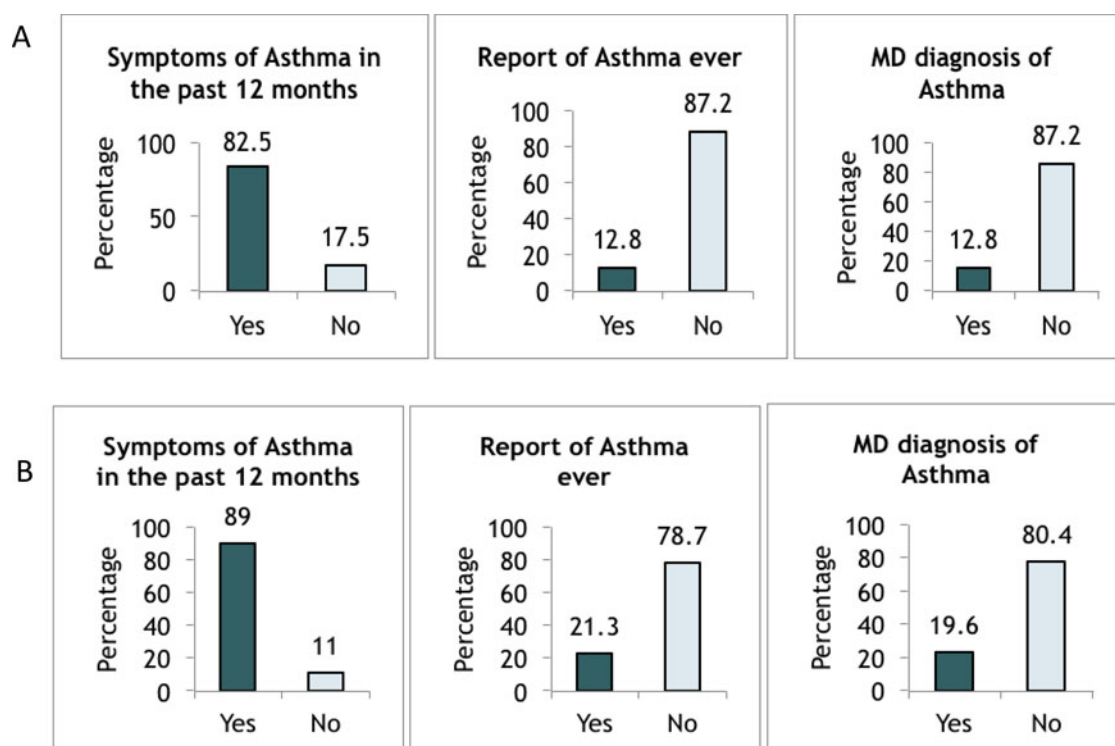


Figure 1. Responses to questionnaire on definition of asthma among patients who sought emergency department care due to asthma symptoms, and received a prescription of short-acting inhaled beta-2 agonist bronchodilator. A. Responses among children under 14 years-old ($n = 109$). B. Responses among teenagers 14 years and older, and adults ($n = 291$). Association between asthma symptoms in the past 12 months and the reports of ever having had asthma and MD diagnosis of asthma were evaluated by kappa statistics to assess concordance, using the SAS program. *MD diagnosis of asthma = asthma diagnosis by a physician.

with the School of Medicine of Ribeirão Preto, as faculty members, hospital staff members of the allergy or pulmonology clinics, post-doctoral fellow, former PhD students, Allergy and Immunology fellows, former medical students, technical personnel and a statistician. The driving forces behind the establishment of the group and performance of the study were based on the experience of the healthcare practitioners involved in the group. First was the observation that most patients with severe asthma who were referred to our tertiary hospital by the Public Health System were in fact undertreated, and would improve substantially after appropriate treatment. Second was the recognition that there was a delay of many years in starting long-term asthma therapy, particularly inhaled corticosteroids. Third was the fact that most patients did not have an Asthma Action Plan or an albuterol inhaler as a rescue medication, and would receive bronchodilators at Healthcare Units' nebulization rooms. Finally, there was evidence of a gap in the knowledge of non-specialist doctors about the use of inhaled medications for asthma, including indications and correct technique. Prior to the initiation of the study, there were three meetings of the whole group within the period of one year, with frequent in-between discussions by email, addressing the format of the capacitating program and elaboration of

questionnaires and protocol. After the program was started, the group met every month, to discuss experiences and difficulties in each Healthcare Unit.

The training program was directed to healthcare professionals working at the Northern District, including non-specialist doctors (pediatricians, general practitioners and family doctors), pharmacists, nurses, nursing assistants, and community health workers. The focus was on training non-specialist doctors in the care and treatment of patients with asthma. The study encompassed a one-year capacitating program, operating from August 2011 to July 2012. The main outcome measure was change in asthma prescription profiles among non-specialist doctors.

Information about the delivery of medications for acute and long-term treatment of asthma was obtained before the study and during the capacitating program. The records of medication delivery by Ribeirão Preto Public Health System pharmacies are very accurate. Any medication is only dispensed with a medical prescription, and records are kept in a well-equipped informatics center by trained personnel. Longitudinal dispensation of medications to individual patients was not assessed. Data on Northern pharmacy delivery of asthma medications were obtained from the official database of the city's health

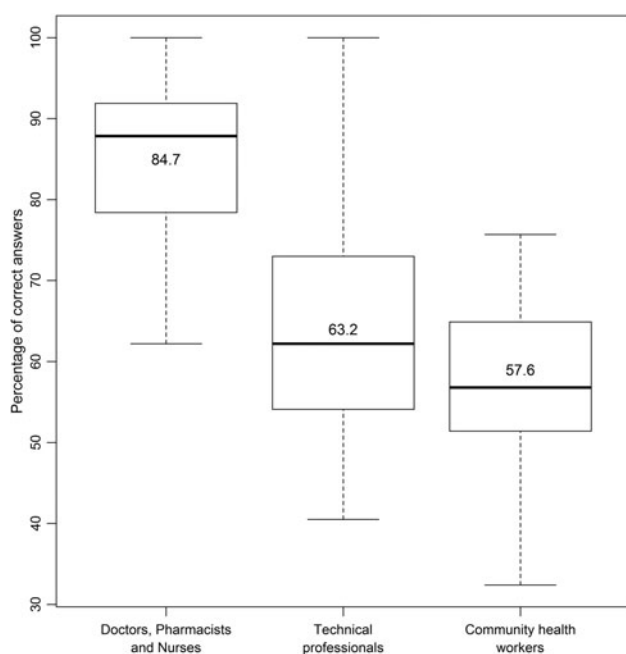


Figure 2. Percentage of correct answers to the questionnaire on knowledge about asthma among healthcare professionals. The questionnaire was originally designed and validated to assess knowledge about asthma in the general population, with an average rate of 50.8% correct answers in a population of Ribeirão Preto [15]. Median, 25% and 75% percentiles and range are represented for each category. Data were analyzed by ANOVA (comparison between the 3 groups), followed by Tukey's post-test, using the SAS program.

secretariat, and were compared to those obtained from the Eastern, Central, and Southern Districts, where no intervention was performed. We have excluded the Western District from the analysis, since it participates in a long-term partnership primary care program with our university.

The present study, designated as the “FOCA Project (Focus on Control of Asthma)”, was approved by the medical ethics committee of the Clinical Hospital of Ribeirão Preto Medical School (protocol number 8228/2011), and all healthcare professionals, patients, or their guardians who participated in the study signed an informed consent.

Capacitating program strategies

The one-year capacitating program comprised of three major components: a general capacitating program, an in-service capacitating program, and actions directed to the community.

The first step of the general capacitating program was to develop a protocol for long-term management of asthma in children and adults. The protocol was based on national and international guidelines [1,16,17]. However, it was adapted to the availability of medications in the Pharmacy Division of the Municipal Secretariat of Health

and agreed upon with simplicity to allow for easy consultation. The initial draft of the protocol was developed by investigators JMLM and LKA; however, all authors contributed with revisions until the final version of the protocol was prepared. The main aspects of the protocol were discussed in detail during the lectures and workshops. Subsequently, printed versions of the protocol were distributed, including charts summarizing its main aspects, and made available on the computers of each Healthcare Unit. The protocol was also available for downloading without cost at the Municipal Government website.

Medications available for treatment of asthma were: albuterol HFA spray, 100 mcg; albuterol solution for nebulization (for ED use only), 5 mg/mL; albuterol syrup, 2 mg/5 mL; albuterol tablets, 2 mg; aminophylline (theophylline derivative) tablets, 100 mg; beclomethasone HFA spray, 50 and 250 mcg; fenoterol solution for nebulization (for ED use only), 5 mg/mL; ipratropium bromide solution for nebulization (for ED use only), 0.25 mg/mL; prednisolone syrup, 3 mg/mL; and prednisone tablets, 5 mg and 20 mg. For those patients who did not have control of symptoms with high-dose inhaled corticosteroid alone, the combination of formoterol/budesonide as dry powder capsules was available on a different track.

As part of the general capacitating program, lectures and workshops directed to doctors and other health care professionals took place at the headquarters of the São Paulo Medical Association at Ribeirão Preto on four different occasions, with paid compensation from work. The lectures addressed diagnosis of asthma, including recognition of early signs and symptoms of asthma exacerbations; and treatment of asthma, both of acute attacks and long-term treatment, using medications available in the pharmacies of the health care units provided free of cost. The attendance rate was 75% for healthcare professionals, with no variation across the groups. The 30-minute lectures were delivered by LKA, and were followed by workshops conducted by allergists and pulmonologists of the group (LKA, JMLM, LMM, ESOV, VPLF, MCB, PRJr, JMS, PSS, RVA, ACSA, RAFF, ACVAC, MRG, LFOP, LBQ). The workshops involved rotating 20-minute practical stations addressing spirometry, inhalation devices, protocol management, and an asthma control test (ACT).

The in-service capacitating program comprised visits 2–4 times a month during one year to each of the participating health clinics by at least one member of the research group. The 16 asthma experts performed various systematic actions, with self-evaluation meetings every 4 months. Each expert accompanied the non-specialist doctor during the care of patients with asthma, discussing clinical cases and aspects of asthma treatment based on protocol. In addition, the asthma expert provided

practical guidance on the use of inhaled medications during the consultation, and made available support for the non-specialist doctors by phone or email. Short lectures on asthma were delivered to other healthcare professionals working in the health clinic, and active search for patients with asthma by community healthcare workers was encouraged.

During the year of the capacitating program, community events were held in areas assisted by the Healthcare Clinics of the Northern Region, including lectures about asthma in schools and public events with spirometry exams and referral of patients to specialized services on World Asthma Day 2011 and 2012. An educational, 50-minute play on asthma was developed. The play was presented on three different occasions, at locations in the Northern District of the city. The first presentation was at Ipanema Club, a popular family club, as part of the celebrations of Children's Day (October 12th in Brazil). The second performance took place at a settlement of rural workers, during the inauguration of the "Mobile Doctor," an itinerant bus equipped by the City Administration for assistance to patients living at remote areas. The third performance was at a state public school, as part of the commemorative events of World Asthma Day 2012, with participation of 300 children and adolescents and 100 parents/caregivers. The play's script was developed as a joint initiative by LKA and ASM together with a local theater group, and it focused on raising awareness about signs and symptoms of asthma and addressing myths and treatment strategies for the disease. At all times, the play was well attended and raised a lot of interest and praise, in the context of a fun activity.

Advertisement through media, including television, radio and street posters, to disseminate knowledge about asthma, and production of texts and educational brochures on asthma for distribution in schools, hospitals, and health centers, were also carried out.

Resources provided by the program

Spacers and spirometers were provided, as well as technical training of nurse technicians on the performance of spirometry. The research group produced five educational videos, 8–20 minutes in length, addressing various issues related to asthma, including treatment, spirometry, inhaled devices and spacers, asthma and pregnancy, exercise and asthma, the role of environment and tobacco smoking in asthma, and the FOCA Project, available on YouTube in Portuguese (<http://youtu.be/tGFocMnigII>; <http://youtu.be/Ur7TxizGN8c>; <http://youtu.be/tNnjvOXBplg>; <http://youtu.be/-QKa5YOyU5g>; http://youtu.be/dW2Td0HRp_M). Collectively, the videos have reached over 32 000 views. Funding for acquisition of spacers

and spirometers at the beginning of the study, and for paying costs of production and editing of educational videos, honoraria of theater performers and printing educational materials throughout the study was provided by a grant from the Foundation for Research Support of the State of São Paulo and Brazilian National Health System (FAPESP/SUS, PPSUS Program) issued to LKA.

Results

Records of asthma medications provided to patients upon physicians' prescription in the public health clinics of the Northern District

During the year prior to the capacitating program, 3205 vials of inhaled albuterol were prescribed, increasing at the end of the program to 4850 vials (51.3% increase). Similarly, prior to the program, 2876 vials of inhaled beclomethasone were prescribed. At the end of the one-year capacitating program, this number had increased to 3526 vials (22.6% increase). No such increase was observed in the Southern, Central, or Eastern Districts, where no capacitating program was conducted (controls) (Figure 3). Comparable numbers of prescriptions filled for inhaled albuterol in the same period were: 1736 to 1813 for the Eastern (4.4% increase); 2602 to 2662 for the Central (2.3% increase); and 1535 to 1795 for the Southern District (16.9% increase). The number of prescriptions of beclomethasone in the period analyzed were: 1210 to 1074 for the Eastern District (12.6% decrease); 1882 to 1468 for the Central District (28.2% decrease); and 1347 to 1244 for the South District (8.2% decrease). The number of prescriptions filled for albuterol tablets and aminophylline tablets decreased in most regions, whereas prescriptions filled for albuterol syrup remained unchanged, with high prescription rates during the fall and winter months.

Discussion

In the present study, we report the results of a one-year intervention program on asthma, developed as a partnership with the university and public health system. After one year of a multifaceted intervention, the program was successful in changing the prescription profiles of non-specialist doctors working in healthcare units of the Northern District of the city of Ribeirão Preto, Brazil, with an increase in prescriptions of inhaled albuterol and inhaled beclomethasone for acute and long-term treatment of patients with asthma, respectively. The FOCA project included education and training of non-specialist doctors and other healthcare professionals according to a protocol based on national and international asthma guidelines, but adapted to local resources. Specifically, use

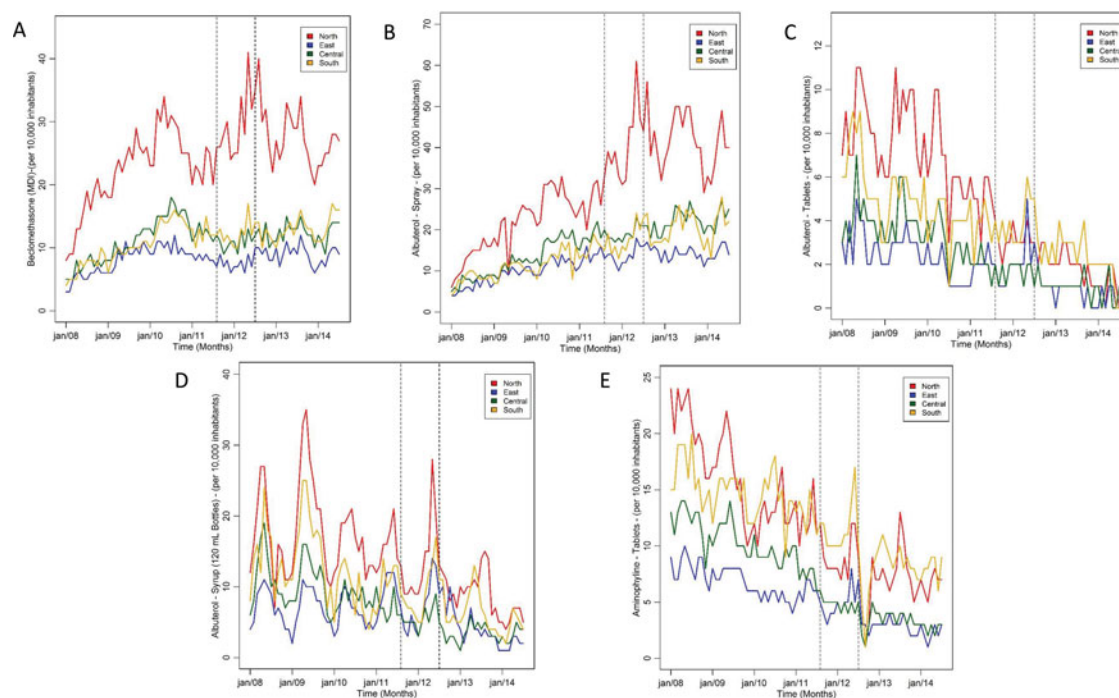


Figure 3. Prescription profiles of asthma medications in the Northern health district of the city of Ribeirão Preto, before (Jan/2008–July/2011), during (Aug/2011–July/2012) and after (Aug/2012–July/2014) the capacitating program, as compared to districts where no intervention was carried out. A. Beclomethasone spray; B. Albuterol spray; C. Albuterol tablets; D. Albuterol syrup; and E. Aminophylline.

of asthma medications not freely available in the public system pharmacies including tiotropium, leukotriene receptor antagonists or slow-release theophylline (1) was not encouraged, as well as action plans based on personal peak flow measurements, since peak flow meters were not provided; referral for joint care with an asthma specialist was recommended when patients did not respond to high dose inhaled beclomethasone and were switched to combination of formoterol plus budesonide, had severe exacerbations or $FEV_1 < 60\%$ of predicted value.

Our results of lower rates of reports of ever having had asthma and of physician-diagnosed asthma compared with symptoms of asthma are in keeping with the results of the ISAAC study, highlighting under-recognition of the disease [4,5]. In a study in Lebanon, a representative sample of 330 registered general practitioners completed a questionnaire on management of newly diagnosed patients with moderate-to-persistent asthma aged 5 years and above [18]. The results revealed that asthma management was not at an acceptable standard, according to international guidelines, indicating the need for implementation of asthma guidelines and improvement of patient education [18]. Likewise, the Asthma Insight and Management (AIM) study, which analyzed surveys conducted on patients with asthma from 20 regions of the world, including the United States, Canada, and countries in Europe, Latin America, and the Asia-Pacific

region, revealed that only 9% of patients presented with well-controlled asthma using criteria from asthma guidelines (19). A recent report by the UK National Review of Asthma Deaths revealed that overall asthma management (acute and chronic) was satisfactory in only 31 (16%) out of 195 people who died of asthma [20]. These observations highlight the importance of making the correct diagnosis and providing proper treatment for asthma to achieve control of the disease and to reduce risks.

In the present study, the finding of limited knowledge about asthma among technical professionals and community workers highlighted the importance of training the whole team of professionals involved in asthma care. In our health system, technical professionals are responsible for post-consultation orientation, and community workers are involved in periodic home visits, which could be an opportunity to actively search for asthma patients who are not receiving appropriate care in the community. Pharmacists may be the last link in the chain of asthma treatment, and they usually inform patients about the use of medications and devices. As complementary practice to provide asthma education, the FOCA Project produced educational materials and videos accessible on YouTube and appropriate websites. Videos received many views, particularly those addressing asthma treatment and use of inhaled devices, suggesting a rising interest in these topics.

Our intervention resulted in a marked increase in prescriptions of metered-dose albuterol inhalers, due to the recommendation given to the non-specialist doctors by the asthma experts that every patient with asthma should have inhaled albuterol as a rescue medication, by protocol, as part of their personal asthma action plan. It should be highlighted that, at the initiation of the project, most patients did not have an albuterol metered-dose inhaler as a rescue medication; instead, they would receive a prescription for albuterol by nebulizer, to be administered at the so-called “nebulization rooms” at the Healthcare Units. In this regard, we consider the increase in prescriptions of metered-dose albuterol inhalers as a successful result, and indeed, at the end of the capacitating program, there was a marked decrease in use of the nebulization rooms, with discontinuation of one of them and redirection of the space to other functions. Eventually, we expect that prescriptions of albuterol metered-dose inhalers will fall, as prescriptions of inhaled corticosteroid for persistent asthma increase. However, we were not successful in reducing prescriptions of albuterol syrup, which pediatricians often use to treat wheezing children, despite the fact that spacers appropriate for use in children are available through the program. Prescriptions for albuterol syrup showed a yearly seasonal pattern, peaking in the autumn/winter period, coinciding with our season of Respiratory Syncytial Virus (February–May) and Rhinovirus (April–August) [21]. These data suggest that more work is required to reinforce the preferential use of inhaled rather than oral bronchodilators.

Limitations of our study include the fact that changing prescription profiles is an indirect measurement, and we could not be sure of whether the medications were taken, or whether better control of asthma was achieved. In addition, we have not formally investigated whether the program was acceptable to the patients, or considered useful by the healthcare practitioners. However, one of the problems we have faced was lack of a systematic, coded registry of ED visits, which hampered analysis of the effect of the intervention on acute asthma exacerbations. Efforts to make a coded registry obligatory are being pursued. Our study also encouraged us to target doctors who work in the ED for training on treatment of asthma, as these doctors are responsible for the first line of care, and could be key to referral of patients for follow-up shortly after an attack. Additional issues include difficulties in maintaining information and training due to the high turnover of healthcare professionals, particularly in the ED, emphasizing the need for building a continuous program and in-house training.

The FOCA project contributed to changes in physicians’ prescription profiles, which is not an easy task to do,

mainly through its multidisciplinary training and creating multipliers of information on asthma. Current asthma guidelines emphasize that all patients with asthma should have a written personal action plan for prompt treatment of acute flare-ups, and that inhaled corticosteroids are the first-line therapy for persistent asthma [22]. In this regard, we consider our intervention successful. The utility of asthma action plans has been recently questioned among primary care physicians in private practice in the United States [23]. Data of the DocStyles quantitative tool obtained from 1006 primary care providers revealed that over 80% of the professionals agreed or strongly agreed that providing a written educational asthma plan improves compliance [23]. However, our study indicates that efforts to improve the diagnosis and treatment of asthma patients are required, especially within public service settings. Strategies, including frequent updates of health care professionals, production of on-line educational materials, and ultimately construction of a national asthma program, would certainly benefit patients with asthma in Brazil.

Conclusions/key findings

Our systematic capacitating program was successful in changing asthma prescription profiles among non-specialist doctors working in the public health system. In particular, the intervention resulted in an increase in prescriptions of inhaled albuterol and inhaled beclomethasone for acute and long-term treatment of patients with asthma, respectively. Our results indicate that improvement of diagnosis and treatment of asthma could be achieved by education of health care professionals on asthma.

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Declaration of interest

The authors have no conflict of interests to declare. The authors alone are responsible for the content and writing of this article.

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