

What do nurses and residents know about childhood asthma?

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J-F Lemay, SI Moore, M Zegray, FM Ducharme. What do nurses and residents know about childhood asthma? Can Respir J 1999;6(5):417-422.

OBJECTIVES: To assess residents' and pediatric nurses' basic knowledge of childhood asthma and to identify areas needing educational reinforcement.

DESIGN: Survey using a validated self-administered questionnaire containing 25 true-false and six short open-ended questions.

PARTICIPANTS: Pediatric residents and family medicine residents who were on rotation at a tertiary care pediatric hospital over a six-month period, and pediatric nurses on duty in the emergency department, on the wards and on the pediatric intensive care unit over a month period.

RESULTS: The participation rate was 80% (28 of 35) of pediatric residents, 89% (33 of 37) of family medicine residents, and 50% (81 of 163) of pediatric nurses. The mean score (\pm standard deviation) on the 31-point questionnaire was 27.7 \pm 1.8 for pediatric residents, 25.5 \pm 3.6 for family medicine residents, and 22.3 \pm 3.8 for pediatric nurses (ANOVA, $P < 0.001$). Most (at least 75%) participants correctly identified bronchospasm and airway inflammation as two potential mechanisms of asthma and were able to list three routinely used drugs to treat exacerbations. However, 32% of pediatric residents, 12% of family medicine residents and 72% of pediatric nurses failed to identify all three main

symptoms of asthma (wheezing, cough, dyspnea). Although most participants recognized that children with frequent exacerbations should receive prophylactic therapy, 25% of pediatric residents, 52% of family medicine residents and 81% of pediatric nurses were unable to name at least two preventive asthma medications. More than 50% of participants could not name two drugs used in the prevention of exercise-induced asthma.

CONCLUSIONS: Residents and nurses had adequate basic knowledge of the treatment of acute exacerbations. However, most individuals needed reinforcement in preventive asthma therapy and daily management.

Key Words: Asthma; Children; Education; Health personnel Knowledge; Prevention; Questionnaire

Que connaissent les infirmières et les résidents sur l'asthme infantile?

OBJECTIFS : Évaluer les connaissances de base des résidents et des infirmières en pédiatrie relativement à l'asthme infantile et cerner les domaines qui pourraient faire l'objet d'une formation complémentaire.

MÉTHODE : Enquête menée à l'aide d'un questionnaire, validé, d'auto-évaluation, comptant 25 questions « vrai ou faux » et six courtes questions ouvertes.

PARTICIPANTS : Ont participé à l'étude; des résidents en pédiatrie; des résidents en médecine familiale qui ont fait un

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stage de pédiatrie au cours d'une période de six mois, ainsi que des infirmières pédiatriques qui ont travaillé au cours d'un mois à l'urgence, à l'étage et à l'unité des soins intensifs dans un hôpital de soins tertiaires en pédiatrie.

RÉSULTATS : Le taux de participation a été de 80 % (28 sur 35) pour les résidents en pédiatrie, de 89 % (33 sur 37) pour les résidents en médecine familiale et de 50 % pour les infirmières (81 sur 163). Le résultat moyen (\pm écart type) sur le questionnaire de 31 points a été de $27,7 \pm 1,8$ pour les résidents en pédiatrie, de $25,5 \pm 3,6$ pour les résidents en médecine familiale et de $22,3 \pm 3,8$ pour les infirmières en pédiatrie (analyse de la variance, $p < 0,001$). La plupart (75 %) des participants ont indentifié le bronchospasme et l'inflammation des voies respiratoires comme deux mécanismes possibles d'asthme et ont été capable de nommer trois médicaments utilisés fréquemment pour traiter les crises.

Cependant, 32 % des résidents en pédiatrie, 12 % des résidents en médecine familiale et 72 % des infirmières n'ont pas reconnu les trois principaux symptômes de l'asthme, soit le sifflement, la toux et la dyspnée. Même si la plupart des participants étaient d'avis qu'un traitement prophylactique était approprié pour les enfants qui présentaient des crises fréquentes, 25 % des résidents en pédiatrie, 52 % des résidents en médecine familiale et 81 % des infirmières en pédiatrie ont été incapable de nommer au moins deux médicaments préventifs. Plus de 50 % des participants n'ont pu nommer deux médicaments pour prévenir l'asthme d'effort.

CONCLUSION : Les résidents et les infirmières ont fait preuve d'une connaissance de base adéquate du traitement des crises d'asthme. Cependant, la plupart des participants auraient besoin d'une formation complémentaire relatif au traitement préventif de l'asthme et au traitement d'entretien.

Despite the prevalence and morbidity of pediatric asthma in Canada, many children with asthma do not receive optimal preventive care (1-3). Implementation of adequate preventive care requires appropriate diagnosis, adequate knowledge of the changing concepts of asthma management, good physician-patient communication and patient adherence to the treatment plan. Major inadequacies in the knowledge and application of guidelines for diagnosis, and in the management of asthma have recently been recognized among several groups of health care professionals, including physicians (4-7). Yet, asthma knowledge can be improved by changes in curriculum and continuing medical education (4,8-11). It appears crucial to ascertain the level of asthma knowledge among physicians and nurses caring for Canadian children to focus appropriate educational resources and correct, if necessary, this weak link in optimal preventive care.

Three questionnaires have been designed to evaluate basic knowledge of childhood asthma (12-14). Two questionnaires were intended for parents and patients, and were developed ad hoc, ie, for the purpose of a given study without formal validation (12,13). To our knowledge, only one questionnaire has been designed and validated among health care professionals, namely the Asthma Knowledge Questionnaire designed by Fitzclarence and Henry (14). This questionnaire contains 31 questions covering the following issues pertaining to pediatric asthma: epidemiology, pathophysiology, symptoms, triggering factors, preventive drugs, treatment of acute exacerbations, possible consequences on health and lifestyle, and common misconceptions. This questionnaire discriminated well between parents of children with asthma and those of children without asthma, and displayed high intra-individual reproducibility on repeat testing ($r=0.94$). Using this questionnaire, various strengths and weaknesses of different groups of health care professionals in Australia and of parents of children with asthma were identified (7,15,16). The importance of tailoring education programs to the specific needs of groups was highlighted in each survey. In North America, no survey of asthma knowledge among health care professionals caring for asthmatic children has yet been published.

Using a validated questionnaire, the objectives of the present study were to assess basic childhood asthma knowledge and to identify areas requiring educational reinforcement among pediatric and family medicine residents, and pediatric nurses working at The Montreal Children's Hospital, a tertiary care pediatric hospital in Montreal, Quebec.

MATERIALS AND METHODS

This survey was carried out at The Montreal Children's Hospital, a tertiary care pediatric hospital with 14,000 emergency department visits and 2000 hospital admissions for asthma annually. Between January and June 1994, pediatric residents and family medicine residents on rotation at this institution were surveyed. In addition, pediatric nurses working day or evening shifts in the emergency department, hospital wards and intensive care unit during the month of June were invited to participate. Fitzclarence and Henry's (14) self-administered questionnaire was distributed to residents during teaching time and to nurses during their shifts. Family medicine residents were surveyed in the middle of their three-month pediatric rotation. The anonymity of respondents was assured.

The questionnaire consists of 25 true/false and six fill-in questions, each worth one point, for maximum score of 31 (Table 1). All portions of each fill-in questions had to be completed to be scored as correct. Correct answers were determined by a consensus of experienced staff members (one respirologist, one allergist, two pediatricians and two nurses) who worked in the hospital's Asthma Centre, which receives 3000 visits annually. The answers provided by the staff members were in keeping with the 1996 Canadian Asthma Consensus Guidelines (17) and corroborated within 98% with those originally proposed by Fitzclarence and Henry in 1990 (14). The only difference from the answers proposed by Fitzclarence and Henry (14) pertained to the lower prevalence of pediatric asthma in Canada compared with Australia (1). The residents' level of training and nurses' years of experience were documented.

Statistical analyses: The participation rate and the percent of correct answers were examined between groups with

TABLE 1
Asthma Knowledge Questionnaire used to test the knowledge of asthma of pediatric nurses and pediatrics and family medicine residents

- Questions requiring a true/false response are marked (T/F)
1. More than one in 10 children will have asthma at some time during their childhood (T/F).
 2. Children with asthma have abnormally sensitive air passages in their lungs (T/F).
 3. If one child in a family has asthma then all his or her brothers and sisters are almost certain to have asthma as well (T/F).
 4. Most children with asthma have an increase in mucus when they drink cow's milk (T/F).
 5. During an attack of asthma, the wheeze may be due to muscles tightening in the wall of the air passages in the lungs (T/F).
 6. During an attack of asthma, the wheeze may be due to swelling in the lining of the air passage in the lungs (T/F).
 7. Asthma damages the heart (T/F).
 8. Antibiotics are an important part of treatment for most children with asthma (T/F).
 9. Most children with asthma should not eat dairy products (T/F).
 10. Allergy injections cure asthma (T/F).
 11. If a person dies from an asthma attack, this usually means that the final attack must have begun so quickly that there was no time to start any treatment (T/F).
 12. People with asthma usually have 'nervous problems' (T/F).
 13. Asthma is infectious (ie, you can catch it from another person) (T/F).
 14. Inhaled medications for asthma (eg, ventolin puffers, rotacaps) have fewer side effects than tablets (T/F).
 15. Short courses of oral steroids (such as prednisolone) usually cause significant side effects (T/F).
 16. Some asthma treatments (such as ventolin) damage the heart (T/F).
 17. During an attack of asthma which you are managing at home, your child requires the nebulizer (mask) every 2 h. He/she is gaining benefit but is breathless after 2 h. Provided that he or she doesn't get any worse, it is fine to continue with 2 h treatments (T/F).
 18. Children with asthma become addicted to their asthma drugs (T/F).
 19. Swimming is the only suitable exercise for asthmatics (T/F).
 20. Parental smoking may make the child's asthma worse (T/F).
 21. With appropriate treatment most children with asthma should lead a normal life with no restrictions on activity (T/F).
 22. The best way to measure the severity of a child's asthma is for the doctor to listen to his chest (T/F).
 23. Asthma is usually more of a problem at night than during the day. (T/F).
 24. Most children with asthma will have stunted growth (T/F).
 25. Children with frequent asthma should have preventive drugs (T/F).
 26. What are the three main symptoms of asthma?
 27. Write down all the things you know that cause asthma (sometimes call trigger factors).
 28. Write down two asthma treatments (medicines) which are taken every day on a regular basis to *prevent attacks* of asthma from occurring.
 29. What are three asthma treatments (medicines) which are useful *during an attack* of asthma?
 30. A 5 year old boy has an attack of asthma and takes two puffs of ventolin from a puffer (metered dose inhaler). After 5 mins he is no better. Give some reasons why this might have happened.
 31. Write down ways of helping to *prevent* attacks of asthma during exercise.

Questionnaire reproduced with the authors' permission (RL Henry)

the χ^2 test. The mean questionnaire scores were compared across groups using ANOVA (SPSS for Windows, Chicago, Illinois). $P < 0.05$ was considered statistically significant.

RESULTS

The overall participation rate was 80% (28 of 35) for pediatric residents, 89% (33 of 37) for family medicine residents and 50% (81 of 163) for nurses. The characteristics of participants are displayed in Table 2. Surveyed nurses had a mean \pm standard deviation (SD) of 8.5 ± 3.4 years of experience in pediatrics.

Table 3 describes the performance of the participants on the 31-point childhood Asthma Knowledge Questionnaire. The 28 pediatric residents obtained a mean SD score of 27.7 ± 1.8 , the 33 family medicine residents averaged 25.5 ± 3.6 while the 81 pediatric nurses scored 22.3 ± 3.8 ($P < 0.001$). Pairwise comparisons of overall performance revealed statistical differences only between residents and

TABLE 2
Demographics of the pediatric and family medicine residents, and pediatric nurses who participated in the study

Health care professionals	Level of training/ nursing units	N (%)
Pediatric residents	Year 1	11 (39)
	Year 2	8 (29)
	Year 3	5 (18)
	Years 4 to 5	4 (14)
	Subtotal	28 (100)
Family medicine residents	Year 1	14 (42)
	Years 2 to 3	19 (58)
	Subtotal	33 (100)
Pediatric nurses	Emergency department	19 (24)
	Hospital wards	52 (64)
	Intensive care unit	10 (12)
	Subtotal	81 (100)

TABLE 3
Responses to individual questions of 28 pediatric residents (PR), 33 family medicine residents (FMR) and 81 pediatric nurses (PN)

Question number	Model answers	% of correct responses			P
		PR	FMR	PN	
1	False	86	70	74	NS
2	True	100	91	71	<0.001
3	False	96	91	93	NS
4	False	93	91	67	<0.001
5	True	96	94	75	<0.05
6	True	93	94	86	NS
7	False	79	88	82	NS
8	False	100	97	92	NS
9	False	100	94	83	<0.05
10	False	97	97	91	NS
11	False	90	81	65	<0.05
12	False	100	88	85	NS
13	False	100	97	98	NS
14	True	75	75	58	NS
15	False	100	94	89	NS
16	False	100	81	74	<0.01
17	False	93	85	71	<0.05
18	False	97	94	81	<0.05
19	False	100	94	92	NS
20	True	100	100	96	NS
21	True	100	97	88	NS
22	False	76	91	51	<0.001
23	True	61	61	38	<0.05
24	False	97	88	82	NS
25	True	93	91	83	NS
26	Three of wheezing, cough and dyspnea	68	88	28	<0.001
27	Three of infection, exercise, allergens, environmental triggers, emotions, weather	100	82	77	<0.05
28	Two of inhaled steroids, sodium cromoglycate, ketotifen, nedocromil, theophylline	75	48	19	<0.001
29	Two of theophylline, oral steroids, ipratropium bromide, beta-agonists, oxygen	93	79	90	NS
30	Two of empty puffer/out of date medication, insufficient dose, insufficient delay between puffs (less than 30 s), incorrect technique, severe attack, airway inflammation, insufficient delay to observe peak of action	93	70	52	<0.001
31	Two of pre-exercise salbutamol or sodium cromoglycate, warm-up, improved general asthma control, nose breathing, warm humid environment	29	33	50	NS

nurses. The mean score obtained by pediatric residents was not influenced by the level of training (year 1 27.0, year 2 28.7, year 3 27.4, years 4 to 5 27.5). Among family medicine residents, a slight trend towards higher scores with the increased training was observed (year 1 23.8±4.7, years 2 to 3 26.9±1.9). Among nurses, no differences in score were observed with years of experience or nursing units.

At least 75% of nurses and residents correctly identified bronchospasm and airway inflammation as potential causes in the pathogenesis of asthma (questions 5 and 6), but large group differences were observed for the following questions. Thirty-two per cent of pediatric residents, 12% of family medicine residents and 72% of nurses were unable to name

all three main symptoms of asthma (question 26): wheezing, cough and dyspnea with cough, the most frequently omitted symptom. Thirty-nine per cent of residents and 62% of nurses failed to recognize that childhood asthma was predominantly a night-time problem (question 23). More nurses (49%) than pediatric (24%) or family medicine (9%) residents incorrectly believed that chest auscultation was the best way to assess the asthma severity (question 22).

With regards to the management of acute exacerbations, more than 75% of nurses and residents were able to name three appropriate treatments (question 29). All groups recognized that antibiotics were not the cornerstone of asthma treatment (question 8) and that allergy injections would not

cure asthma (question 10). Most participants stated that beta₂-agonists did not damage the heart (question 16) and that short courses of oral steroids did not cause significant side effects (question 15); however, many did not know that medications delivered by inhalation, such as beta₂-agonists, had fewer side effects than when administered systemically (question 14). Family medicine residents and nurses had difficulty suggesting two reasons (such as airway inflammation, poor technique, empty metered dose inhaler) why a beta₂-agonist metered-dose inhaler might not effectively relieve acute symptoms (question 30).

With regards to preventive therapy, basic knowledge was deficient in all groups. A notable proportion of family medicine residents and nurses was unable to name two preventive treatments for children with frequent symptoms (question 28). Less than half of individuals within each group were able to name two drugs to prevent exercise-induced asthma (question 31).

Over 80% of nurses and residents acknowledged that most asthmatic children grow normally (question 24) and can lead normal lives with no activity restrictions (question 21); that swimming was not the only suitable sport (question 19); that parental smoking may be detrimental to the child's asthma control (question 20); and that asthma was not infectious (question 13). Regarding common misconceptions, 33% of nurses believed that asthmatic children have an increase in mucus production after drinking cow's milk (question 4). Yet, 83% of them believed these children could continue eating dairy products (question 9).

DISCUSSION

Pediatric and family medicine residents, and pediatric nurses had remarkably better knowledge of acute asthma treatment than of chronic management. Residents generally scored higher than pediatric nurses on the Asthma Knowledge Questionnaire. No significant differences in scores were observed among residents according to level of training and among nurses according to clinical units and years of pediatric experience.

These observations are in keeping with the traditional training of medical residents and nurses, which is centred around the treatment of exacerbations. While it is expected that future pediatricians, allergists and respirologists would have better understanding of pediatric asthma care than nonspecialists, the majority of Canadian children are cared for by nonspecialists. Consequently, family medicine trainees should develop excellent skills to recognize asthma symptoms, and to implement basic preventive management and the routine treatment of acute exacerbations. Pediatric residents who will serve as consultants for children unresponsive to regular management need to acquire even broader knowledge of preventive and chronic management of childhood asthma. Pediatric nurses are expected to reinforce and teach day to day management of asthma while dispelling the frequent misconceptions that may interfere with compliance. Thus, important deficiencies in basic pediatric asthma knowledge among trainees and nurses should be

recognized and corrected to ensure that health professionals can fulfil their expected role in the Canadian health care system.

A large number of the residents surveyed did not realize that pediatric asthma was more of a problem at night than during the day and that cough was a key asthma symptom. If this deficiency is not corrected, a substantial proportion of children with cough-variant asthma will continue to be misdiagnosed and inadequately managed with antibiotics, decongestants or anti-tussive preparations (18).

Major inadequacies were also observed among residents and nurses on the subject of preventive and maintenance therapy. These observations are in keeping with Henry et al (7), and Fitzclarence and Henry (15) reports of significant discomfort with preventive therapy and home management of childhood asthma among medical students and pediatric nurses in Australia. Insufficient knowledge of this area can tremendously affect a patient's asthma control. Children with repeated emergency visits or hospital admissions usually need maintenance therapy (17,19-21). Health professional trainees caring for these children, particularly in a tertiary care setting, need to learn and incorporate this information in management plans. Although recommended in all consensus statements, maintenance therapy is still universally underused in children with recurrent and/or chronic asthma (22,23). Unfortunately, Canada is no exception to this observation (24). Underuse of maintenance preventive therapies has clearly been associated with higher morbidity (25,26). Although guidelines and consensus statements are believed to be efficient means of summarizing current knowledge, this knowledge has not adequately reached our pediatric and family medicine trainees, and pediatric nurses (27).

Outdated beliefs continue to be perpetuated. For instance, the impression that chest auscultation is the best means of assessing asthma severity possibly results from the fact that this manoeuvre is commonly observed during an acute exacerbation. It is still widely believed that the ingestion of dairy products increases mucus production and, hence, can aggravate asthma, but little convincing data exist in the literature to substantiate this belief (28-30). The misconception concerning milk and mucus may lead to confusion among parents, and can be dispelled by nurses who are frequently the providers of nutritional advice to families.

The results of the survey must be interpreted in light of the following limitations. While the participation rate was high for all residents, only half of targeted nurses completed the questionnaire. With no demographic information available for the nurses who declined participation, it is impossible to examine whether the surveyed nurses were truly representative of all those working at our institution. The modest participation rate (50%) of nurses may be due, in part, to the timing of the survey (June), which corresponds to the beginning of the summer holidays, and to the difficulty in reaching part-time nurses. This may have resulted in a greater representation of the most knowledgeable nurses in the survey either because of their full-time position or because of self-selection. Such a selection bias, if present, would likely

overestimate the asthma knowledge among nurses. Yet the similar findings among Australian nurses suggest that our observations may reflect strengths and weaknesses among nurses practising in tertiary care hospital settings (7). Whether our findings can be generalized to other settings is not known.

No apparent increase in knowledge with years of training was observed among pediatric residents. First year pediatric residents, tested after a minimum of six months of training, scored very high (27 of 31). First year family medicine residents, tested after four to six weeks of pediatric training, scored slightly lower than first year pediatric residents (24 of 31). In contrast, a recent survey of medical students documented a steady increase in basic asthma knowledge from mean score of 11 of 31 among first year students to 23 of 31 among fifth year students (31). The Asthma Knowledge Questionnaire contains relatively few questions specific to preventive and management issues (eight questions) but includes several questions addressing common misconceptions, clearly identified as such by most residents early in their training. Our findings suggest that this questionnaire as-

esses basic knowledge, which is rapidly mastered by any resident after a few months of pediatric training. Thus, we believe that the similar performance of our pediatric residents, irrespective of their level of training, reflects the rapid acquisition of basic asthma knowledge and the inability of the questionnaire to assess advanced knowledge. More focused questionnaires have been used to assess knowledge after specific educational programs (9-11,32-34). However, the knowledge tested in these questionnaires often is too focused. The Asthma Knowledge Questionnaire, thus, remains a valuable screening tool for assessing basic, not advanced, knowledge of childhood asthma among various groups of health care professionals and caregivers.

CONCLUSIONS

Residents and nurses at The Montreal Children's Hospital generally have adequate basic knowledge of acute childhood asthma management, yet they need reinforcement in the interpretation and management of chronic and/or recurrent symptoms. Educational interventions should be tailored to the specific needs of each health care professional group.

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