A B S T R A C T

Objective: To determine the variability in physician knowledge, attitudes, and behaviours in relation to influenza vaccination of children.

Method: A 17-item cross-sectional questionnaire, with follow-up mailings to non-responders, was mailed to a random sample of 100 family physicians and 100 community pediatricians within Metropolitan Toronto and all 130 subspecialists at The Hospital for Sick Children, Toronto.

Results: Of 315 eligible physicians, 243 (77%) responded. Of the three groups, community pediatricians were more likely than either family physicians or subspecialists, to recommend vaccination for all but one of the high-risk conditions. Pediatricians (54%) were also the most likely to use active strategies to contact families of high-risk children compared with family physicians and subspecialists (both 23%). Only 44% of all physicians were themselves vaccinated against influenza.

Conclusions: Influenza vaccination is recommended by most physicians; however, the responsibility for vaccination appears to fall to those in the community. Physician education plus further research and a review of provincial strategies for improving vaccination are needed.

A B R É G É

Objectif : déterminer la variabilité dans les connaissances, les attitudes et les comportements des médecins vis à vis de la vaccination des enfants contre la grippe.

Méthode : un questionnaire d'enquête transversale comprenant 17 questions, avec envois de suivi aux non répondants, a été envoyé à un échantillon aléatoire de 100 médecins de famille et 100 pédiatres communautaires dans la région métropolitaine de Toronto ainsi qu'à 130 spécialistes de l'Hôpital des enfants malades de Toronto.

Résultats : sur les 315 médecins remplissant les conditions requises, 243 (77 %) ont répondu. Des trois groupes, les pédiatres communautaires, par rapport aux médecins de famille et aux spécialistes, sont apparus comme ceux qui avaient la plus grande probabilité de recommander la vaccination dans toutes les conditions à risque élevé sauf une. Les pédiatres (54 %) étaient également plus enclins à recourir à des stratégies actives pour contacter les familles d'enfants à risque élevé en comparaison avec les médecins de famille et les spécialistes (23 % dans chaque catégorie). Seulement 44 % de tous les médecins s'étaient faits vacciner contre la grippe.

Conclusions : la vaccination contre la grippe est recommandée par la plupart des médecins; toutefois, la responsabilité semble en incomber à ceux de la communauté. Il est nécessaire de mieux éduquer les médecins, de faire davantage de recherche et d'examiner les stratégies provinciales pour améliorer la vaccination.

Influenza Vaccination of High-Risk Children: A Survey of Three Physician Groups

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Influenza is an important cause of morbidity and mortality in children, particularly in those with an underlying chronic illness.¹ Vaccination against influenza has been recommended by the National Advisory Committee on Immunization (NACI) and the American Academy of Pediatrics (AAP) for "high-risk" children, e.g., those with chronic pulmonary disease or hemodynamically significant cardiac disease, children receiving immunosuppressive treatment or long-term acetylsalicylic acid therapy, and those residing in chronic-care facilities.^{1,2}

Vaccination is also recommended for close contacts of high-risk patients, such as health care personnel and household contacts (including children). Despite these recommendations, fewer than 10% of all children in the USA, for whom the vaccine is recommended, actually receive it.³ Health care workers fare only slightly better; in one study, for example, almost two-thirds of pediatricians did not follow the recommendation that they themselves be vaccinated.⁴

Several factors may contribute to the poor vaccination rate by physicians of high-risk children, including a lack of knowledge about the conditions that warrant vaccination, controversy over the recommendations, and inadequate dissemination of the recommendations. Failure to implement the recommendations into clinical practice

may also result from uncertainty about which type of physician (primary care or specialist) is responsible for vaccination, or from the lack of an active strategy to recall eligible patients for annual vaccination.⁴ Recent studies suggest that physician advice is the most important factor influencing the decision by parents to have their children vaccinated.⁵ Primary care physicians are assumed to be responsible for vaccinating high-risk children,^{6,7} but without an active strategy for identifying these children each autumn, the majority of high-risk children may go unvaccinated.

The purpose of this study was to determine the variability in physician knowledge, attitudes, and behaviours in relation to influenza vaccination of children.

SUBJECTS AND METHODS

A cross-sectional survey design using a mailed 17-item questionnaire was used.

Family physicians were defined as physicians with specialty certification in family medicine and membership in the College of Family Physicians of Canada. A sample of 100 were randomly selected from the database of the College of Family Physicians of Canada.

Pediatricians were defined as physicians recognized as specialists in the health care of children by the Royal College of Physicians and Surgeons of Canada. One hundred community pediatricians were randomly selected using the Canadian Medical Directory as the sampling frame. Pediatricians with subspecialty qualifications and those with strictly consulting practices were excluded.

All subspecialists working full-time at The Hospital for Sick Children (HSC), Toronto, were surveyed.

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Support for this study was provided by funding from Pasteur Merieux Connaught Laboratories, Toronto, and Department of Pediatrics at The Hospital for Sick Children, Toronto.

TABLE I
Frequency of Recommendation of Influenza Vaccine for Specific Childhood Conditions Across Three Physician Groups

Condition	Family Physicians n=76		Pediatricians n=72		Subspecialists n=95		P-value
	n	(%)	n	(%)	n	(%)	
Children at High Risk							
Cardiac disease	60	(79)	70	(97)	46	(48)	< 0.001
Chronic asthma	56	(74)	68	(94)	35	(37)	< 0.001
BPD/Cystic fibrosis	58	(76)	69	(96)	45	(47)	< 0.001
Chronic disease	58	(76)	64	(89)	47	(49)	< 0.001
Immunosuppressive therapy	47	(62)	51	(71)	53	(56)	0.139
Long-term salicylate therapy	31	(41)	51	(71)	23	(24)	< 0.001
Residence in a chronic care facility	46	(61)	53	(74)	34	(36)	< 0.001
Healthy siblings	26	(34)	29	(40)	24	(25)	0.113
Household contacts	33	(43)	26	(36)	22	(23)	0.017
Children with Asthma							
All asthmatics	31	(41)	24	(33)	10	(11)	< 0.001
Prior hospitalization	41	(54)	39	(54)	16	(17)	< 0.001
Prior use of prednisone	41	(54)	38	(53)	18	(19)	< 0.001
Maintenance inhaled steroids	36	(47)	51	(71)	18	(19)	< 0.001
Children at Low Risk							
Healthy	9	(12)	9	(13)	5	(5)	0.199
In day care	25	(33)	26	(36)	22	(23)	0.157
Recurrent otitis media	21	(28)	13	(18)	5	(5)	<0.001

To maximize the response rate, a modified Dillman's Total Design Method for mailed surveys was used.⁸ This approach involves design features such as personalizing the questionnaire and printing it in a booklet format, with no questions on the first or last page. A postcard follow-up reminder was sent one week after the initial mailing. Three weeks after the first mail-out, another covering letter and questionnaire were sent to each non-responder.

The questionnaire collected information on physician demographics (age and sex), awareness of the national influenza vaccination program, and knowledge of the specific recommendations pertaining to high-risk children. The questionnaire listed the recommended high-risk groups for vaccination, rather than asking the open-ended question: for which risk groups do you recommend vaccination? Data were also collected regarding physicians' opinions on vaccinating mild asthmatics and low-risk children (healthy children, those in day care, or those with recurrent otitis media); whether the physician or nursing staff actually administered the vaccine (as opposed to simply recommending the vaccine); strategies for contacting the families of high-risk children—active (contact by telephone or mail) or passive (as children come to the office, rely on parents to contact the office, vaccination left to another physician); and personal vaccination status.

The primary outcome variable was whether physicians were aware of the

national influenza vaccination program, and if they recommended influenza vaccination for high-risk children. Differences between the physician groups were tested using the χ^2 test for categorical variables and ANOVA for continuous variables. Because of multiple testing, p values <0.005 were considered statistically significant. Secondary outcome measures included the criteria for vaccinating asthmatic children, opinions on the vaccination of low-risk children, strategies for contacting parents of high-risk children, and personal vaccination status of physicians.

RESULTS

In total, 330 questionnaires were mailed. Of these, 15 physicians were excluded: 8 had no children in their practice; 5 had an incorrect mailing address; and 2 had retired. Of the 315 eligible physicians, 3 (1%) refused to participate. The overall response rate was 243/315 (77%), including 76/98 (78%) of family physicians, 72/87 (83%) of community pediatricians, and 95/127 (75%) of HSC subspecialists. There were no significant differences between the three groups by response rate or sex distribution; however, community pediatricians were, on average, older (48 years) than subspecialists (45 years) and family physicians (40 years). Almost all physicians (96% of community pediatricians and family physicians alike, and 84% of subspecialists) reported awareness of the national influenza vaccination program.

Table I shows the frequency of recommendation of influenza vaccination for specific childhood conditions across the three physician groups. For all but one of the 'high-risk' conditions (household contacts), community pediatricians were more likely to recommend influenza vaccination compared with both family physicians and hospital subspecialists. For example, pediatricians were significantly more likely ($p<0.001$) to recommend influenza vaccination for children with cardiac disease, chronic asthma, BPD/cystic fibrosis, and chronic disease, compared with family physicians and subspecialists. For these conditions, almost all pediatricians, around 75% of family physicians, and approximately 45% of subspecialists recommended influenza vaccination. Vaccination of children receiving immunosuppressive therapy, long-term salicylate therapy, or of those resident in chronic care facilities was less frequently recommended by all groups. Pediatricians, however, were significantly more likely (compared with both family physicians and subspecialists) to recommend vaccination of children on long-term salicylate therapy. Only around one third of physicians recommended vaccination of healthy siblings or household contacts of high-risk children, with no significant differences between the three physician groups.

Pediatricians and family physicians were significantly more likely to recommend influenza vaccination of children with asthma, compared with subspecialists. For

example, in children with a previous history of hospitalization or prednisone use because of asthma, just over half of all pediatricians and family physicians recommended influenza vaccination, compared with less than one fifth of subspecialists ($p < 0.001$). For asthmatic children on maintenance inhaled steroids, pediatricians were significantly more likely to recommend vaccination (71%), compared with both family physicians (47%) and subspecialists (19%).

For children with 'low risk' conditions, around 10% of all physicians recommended vaccination of healthy children, while around 30% recommended vaccination of children in day care, with no significant differences between the three physician groups. Family physicians and pediatricians, however, were more likely to recommend vaccination of children with recurrent otitis media (28% and 18%, respectively), compared with subspecialists (5%).

Community pediatricians and family physicians were significantly more likely to administer the vaccine (83% and 79%, respectively), compared with subspecialists (19%, $p < 0.001$). Pediatricians were also significantly more likely (54%) to use an active strategy (telephone or mail) to contact families of high-risk children, compared with family physicians and subspecialists (both 23%, $p < 0.001$). Family physicians were more likely to rely on passive family contact to initiate vaccination (62%), compared with pediatricians (42%) and subspecialists (28%). Further, 48% of subspecialists considered that vaccination was the responsibility of the primary care physician, whereas, only 14% of family physicians, and 4% of pediatricians felt that the responsibility fell to the subspecialist.

Last, only 44% of all physicians were themselves vaccinated against influenza, with no significant differences between the three groups. Of those not vaccinated, 54% indicated no need; 31% were too busy; and 15% were concerned about side effects.

DISCUSSION

This study confirms previous reports^{1-7,9} that physicians do recommend influenza

vaccination for high-risk children. However, for all but one of the high-risk conditions, community pediatricians were more likely than either family physicians or subspecialists to recommend vaccination. Further, less than 50% of subspecialists recommended vaccination, even though the majority of high-risk patients are seen in the hospital setting. Ideally high-risk patients should be identified by hospital-based subspecialists. This would permit the establishment of a database of 'at risk' children for whom annual influenza vaccination could be recommended. The vaccine could be administered (based on the family's preference) either at the hospital or by their primary care physician. Indeed, 83% of all physicians in this survey felt that hospitals should have a specific policy for recommending and implementing influenza vaccination of high-risk children.

It is generally accepted that primary care physicians should be responsible for implementing influenza vaccination.^{6,7} Who should notify the family or patient that they require vaccination, however, is less clear. Almost half of all subspecialists thought that vaccination was the responsibility of the primary care physician. This belief likely explains the limited efforts (active and passive) of subspecialists to contact families to initiate vaccination. Research has shown that active strategies such as the establishment of a computer data bank for high-risk patients and a personalized computer-generated letter in the fall of each year significantly improves vaccination rates.¹⁰

It should be noted that there is wide divergence between provinces in how the national recommendation for influenza vaccination is implemented, e.g., in terms of promotion or eligibility for free vaccine.¹¹ Much of the provincial effort in Ontario is aimed at nursing homes for the elderly, rather than vaccination of high-risk children.

Asthma is the most common chronic childhood condition for which influenza vaccination is indicated and warrants special consideration. Although the current guidelines recommend vaccination for asthmatic children who require medical follow-up or hospital care, this recommendation does not necessarily take into

account asthma severity. In other words, many moderate to severe asthmatics may be well controlled on maintenance medication and not require hospitalization or frequent follow-up care, yet they remain vulnerable to influenza infection. This makes the decision of who to vaccinate more difficult for physicians, since they must use their own judgement in determining vaccine eligibility, and is reflected in the diversity of responses in this study. Of note, community pediatricians were the most likely to vaccinate children in relation to the "severity" of their asthma.

Community pediatricians were also more likely than either family physicians or subspecialists to vaccinate children on long-term salicylate therapy. This may be related to better awareness of this recommendation and to the fact that community pediatricians are more likely to follow children with juvenile rheumatoid arthritis or Kawasaki disease on a continual basis.

No consideration has been given in the current guidelines¹ to vaccination of healthy children, children in day-care centres, or those with recurrent otitis media. A recent international conference supported the principle of general immunization of young infants and children, provided the new live attenuated, cold-adapted influenza virus vaccine was used.¹² There is some evidence that otherwise healthy children might benefit from influenza vaccination: In several studies, influenza vaccination of infants and children was associated with a decreased incidence of otitis media.¹³⁻¹⁵ In healthy adults, vaccination against influenza has been shown to have considerable health-related benefits.¹⁶ All physician groups in our study showed a low commitment to vaccinating healthy or low-risk children at this time.

Two of the barriers to successful vaccination are inadequate perception by physicians of the value of the program and their own concerns about vaccination, as evidenced by low rates of self-vaccination.⁴ Less than half the physicians in this study were vaccinated against influenza, despite the recommendation that health care personnel be vaccinated. Nearly one third of physicians who reported themselves unvaccinated were "too busy" to be vaccinated; over half did not perceive a need. It may be

difficult for physicians to implement a vaccination program if they themselves are not committed to the guidelines. Physician awareness of the benefits of self-vaccination, not only for themselves but for the patients they take care of, must be stressed—particularly since it has been shown that vaccination of health care workers against influenza is associated with reduced rates of influenza-like illness and mortality in long-term-care settings.¹⁷ This may be important for health care workers in childhood settings, where nosocomial infections via unvaccinated health care workers may be a factor in spreading influenza to high-risk children.¹⁸

Possible limitations of this survey include sampling and information bias. Sampling bias was considered unlikely, given that all hospital-based subspecialists were surveyed and that random sampling was used to select community pediatricians and family physicians (although general practitioners who were not certified with the College of Family Physicians were not included). In addition, the response rate was high (77%). Information bias was reduced by using a standardized questionnaire. Another possible limitation was whether the questionnaire responses accurately reflected physician behaviour. Agreement between written responses to patient scenarios and actual physician behaviour has been noted in some studies.¹⁹ However, the frequency of vaccine recommendation for high-risk groups was probably maximal, given that physicians were presented with a list of risk groups, rather than responding to an open-ended question. Last, this survey was

restricted to Canadian physicians; therefore, whether the results are generalizable to physicians practicing in other health care systems is unknown.

In conclusion, influenza vaccination is recommended by physicians for high-risk children although there were significant differences between the three groups: community pediatricians were the most likely to recommend vaccination, followed by family physicians, with less than 50% of subspecialists recommending vaccination of high-risk children. The responsibility for vaccination appears to have fallen to community physicians. Community pediatricians are more likely than other physicians to use active strategies to contact families of high-risk children for vaccination. There are differences of opinion among physicians as to which asthmatic children should be vaccinated. Last, less than half of all physicians were themselves vaccinated against influenza.

ACKNOWLEDGEMENT

Special thanks to Kerah Gordon and Odelia Moco for their assistance.

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Received: January 22, 1998

Accepted: August 14, 1998

ERRATA

Une erreur s'est glissée dans le titre du tableau IV de l'article de Massé et al. paru dans le volume 1998;89(3):186. Le titre devrait se lire non pas «Résultats de l'analyse factorielle» mais plutôt : «Résultats des régressions logistiques exprimant l'influence du niveau de détresse psychologique sur les risques de présenter les facteurs concomitants».

Dans le tableau III de l'article de Massé et al. 1998;89(5):352-57, le titre de la dernière colonne de droite devra se lire : «Score brut bien-être (1-4,70)» et non pas «Score brut détresse».