

Peril of the pox

Are primary care providers aware of varicella vaccination guidelines?

Darshini Persaude, MBBS, CCFP Lorna Teape-Humphrey, MBBS, CCFP
Raquel Adelstein, MD, CCFP Sharon Domb, MD, CCFP Liisa Jaakkimainen, MD, MSC, CCFP

ABSTRACT

PURPOSE To determine whether physicians providing primary care in Ontario were aware of guidelines published by Health Canada's National Advisory Committee on Immunization (NACI), their opinions about the varicella vaccine, and factors that influence use of the vaccine.

METHODS A questionnaire examining awareness, knowledge, and perceived barriers to using varicella vaccine was developed and mailed to a random sample of 500 family physicians and 400 pediatricians practising in Ontario.

RESULTS To the 900 questionnaires mailed, 284 family physicians (56.9%) and 232 pediatricians (59.2%) responded. Fifty-six percent of family physicians and 95.4% of pediatricians providing primary care were aware of the Health Canada guidelines. Physicians who were aware of the Health Canada guidelines were more knowledgeable about the vaccine and were more likely to recommend it. Both groups of physicians identified cost (not covered by the government), problems with storage and handling, and concerns about long-term immunity as barriers to use of the vaccine.

CONCLUSION While awareness of the guidelines was associated with better knowledge of and following recommendations for the vaccine, Health Canada guidelines were not widely distributed to all primary care providers. One way to encourage incorporation of varicella vaccine guidelines into practice would be to improve dissemination of the guidelines to all primary care providers.

RÉSUMÉ

OBJECTIF Déterminer si les médecins qui dispensent des soins de première ligne en Ontario étaient au courant des lignes directrices publiées par le Comité consultatif national de l'immunisation de Santé Canada, leurs opinions concernant le vaccin contre la varicelle et les facteurs qui influencent le recours au vaccin.

MÉTHODOLOGIE Un questionnaire examinant la notoriété du vaccin contre la varicelle, les connaissances à son sujet et les obstacles perçus à son utilisation a été élaboré et envoyé par la poste à un échantillon aléatoire de 500 médecins de famille et de 400 pédiatres exerçant en Ontario.

RÉSULTATS Au total, 900 questionnaires ont été postés et au nombre des destinataires, 284 médecins de famille (56,9%) et 232 pédiatres (59,2%) y ont répondu. Les lignes directrices de Santé Canada étaient connues de 56% des médecins de famille et de 95,4% des pédiatres de première ligne. Les médecins au courant des lignes directrices de Santé Canada avaient plus de connaissances au sujet du vaccin et étaient plus enclins à le recommander. Les deux groupes de médecins ont identifié les coûts (qui ne sont pas couverts par le gouvernement), les problèmes d'entreposage et de manutention ainsi que les préoccupations entourant l'immunité à long terme comme étant des obstacles à son utilisation.

CONCLUSION La connaissance des lignes directrices était associée à un plus grand savoir sur le vaccin et à une plus forte propension à suivre les recommandations. Par ailleurs, les lignes directrices de Santé Canada n'ont pas été distribuées largement à tous les dispensateurs de soins de première ligne. Un des moyens d'encourager l'intégration dans la pratique des lignes directrices sur le vaccin contre la varicelle serait d'améliorer la diffusion des lignes directrices auprès de tous les dispensateurs de soins de première ligne.

This article has been peer reviewed.

Cet article a fait l'objet d'une évaluation externe.

Can Fam Physician 2002;48:316-323.

Varicella vaccine has been available for several years in Japan, Korea, New Zealand, the United States, and several European countries.¹ Shortly after Varivax became licensed for use in Canada (December 1998), Health Canada's National Advisory Committee on Immunization (NACI) gave a grade A recommendation for vaccination of healthy people more than 1 year old who are susceptible to chickenpox.² This recommendation was based on level 1 evidence obtained from randomized controlled trials.³⁻⁵ The NACI guideline was distributed along with the May/June 1999 edition of the *Journal of Paediatric & Child Health*.⁶

Similarly, the American Academy of Pediatrics, the Advisory Committee on Immunization Practices, and the American Academy of Family Physicians endorse recommendations for universal varicella immunization for all susceptible children and adolescents.^{7,8} Introduction of the vaccine generated much controversy, however, and the recommendations have not been universally adopted in the United States.^{9,10} A survey conducted in Washington State in 1998 revealed that fewer than 50% of pediatricians were recommending universal varicella vaccination.^{11,12} Several reasons for not recommending the varicella vaccine were identified as barriers. Some physicians believed that varicella is a benign illness. Others expressed concern about waning immunity as a person aged, with universal immunization shifting the disease burden to older patients among whom the disease is more severe. The vaccine also has stringent storage and handling requirements. Varicella vaccination is not required for child care and school entry. Finally, a universal vaccination program was not seen as justifying its expense.

An effective vaccination program requires that providers and consumers know and believe in the benefits and risks of the vaccine. How many primary care physicians in Ontario are aware of the NACI recommendation for universal varicella vaccination is unknown. In addition, current opinions and other factors that influence use of the varicella vaccine in Canada have not been fully explored.

.....
Dr Persaude, Dr Teape-Humphrey, and Dr Adelstein are former residents of the postgraduate family medicine program at the University of Toronto in Ontario. **Dr Domb** is an Assistant Professor in the Department of Family and Community Medicine at the University of Toronto. **Dr Jaakkimainen** is an Assistant Professor in the Department of Family and Community Medicine at the University of Toronto and is a scientist at the Institute for Clinical Evaluative Sciences in Toronto, Ont.

We carried out a survey to look at primary care physicians' (family physicians' and primary care pediatricians') awareness of the NACI recommendations, their knowledge about the vaccine, and whether or not they recommend the vaccine to patients. We also examined perceived barriers to use of the vaccine.

METHODS

Sample selection and inclusion criteria

A random sample of 500 family physicians was obtained from the membership list of the College of Family Physicians of Canada. Southam Publishing (publishers of the *Canadian Medical Directory*) provided a randomly selected list of 400 pediatricians in Ontario. Family physicians who saw patients in either family practice or walk-in clinics and pediatricians who practised primary care pediatrics were eligible for the study. Subspecialist pediatricians and family physicians doing only emergency room work, only psychotherapy, or only nursing home care were excluded.

Questionnaire

The questionnaire was a modified version of a previously validated questionnaire used in a survey about the varicella vaccine.¹² Modifications included an added section on knowledge of the vaccine and variations in wording of questions about recommending practices and demographics. The modified questionnaire consisted of 41 closed or partially closed-ended questions in four main domains: 1) current practice with regard to varicella immunization, 2) knowledge of the varicella vaccine, 3) opinions about the varicella vaccine, and 4) demographics. A six-point Likert scale was employed to evaluate physicians' opinions about the vaccine.

Pretesting

The questionnaire was pretested initially on family practice residents (N=40) at the University of Toronto. A few modifications were made after the first pretest. A second pretest was undertaken with staff physicians in the Department of Family and Community Medicine at the Sunnybrook and Women's College Health Sciences Centre and with pediatric residents and staff at the Hospital for Sick Children. The study received ethics approval from Sunnybrook and Women's College Health Sciences Centre Ethics Review Board.

Survey design

In fall 1999, a self-administered questionnaire was mailed to 900 physicians. A modified Dillman technique¹³ was

RESEARCH

Peril of the pox

employed to elicit responses to the mail survey. This consisted of three mailings. The first mailing included a cover letter, the questionnaire, and a preaddressed stamped return postcard with the doctor's name. Physicians were asked to return the card separately from the completed survey so that anonymity could be maintained. To maintain confidentiality, the survey bore neither numbers nor names. Questionnaires were colour coded to distinguish between responses from family physicians and pediatricians. A reminder postcard was mailed out 2 weeks after the first mailing. A second mailing of the entire survey was sent to nonresponding physicians 4 weeks after the first mailing.

Analysis

Statistical analyses were performed using the Statistix for Windows Version 2 software.¹⁴ A descriptive analysis was undertaken of physicians' demographic data and their responses to survey questions. Responses of family physicians were compared with those of pediatricians. Sample sizes were calculated to detect an odds ratio of 1.75 for an awareness of the guidelines, with a power of 80% and a confidence interval (CI) of 95%.¹⁵ The sample size required was 220 completed questionnaires from both pediatricians and family physicians. Assuming 50% of family physicians and 60% of pediatricians would return a completed survey, a minimum of 806 questionnaires needed to be mailed.

Bivariate analyses were conducted using the χ^2 test for categorical variables and *t* test for continuous variables. Results were considered significant at a *P* level of less than .05. Logistic regression analysis was undertaken comparing physicians aware or not aware and knowledgeable or not knowledgeable of NACI guidelines. A physician was knowledgeable of NACI guidelines if he or she scored more than four out of eight on the knowledge section of the questionnaire. As well, physicians who recommended and did not recommend the vaccine were compared.

RESULTS

Study population

A total of 900 surveys were mailed. Nine were undeliverable owing to changed addresses. In all, 516 of the 891 physicians surveyed returned questionnaires, yielding an overall response rate of 57.9%. Specifically, 284 surveys (56.9%) were received from family physicians and 232 surveys (59.2%) from pediatricians. Of the 516 responders, 336 (65.1%) practised primary care medicine and were therefore eligible for the study. Within the family physician

group, 80.0% (n=227) were eligible; 47.0% (n=109) of pediatricians were eligible.

Demographic data on eligible respondents is presented in **Table 1**. Pediatricians tended to be older, with more years in practice than family physicians. More pediatricians than family physicians were in solo practices. Family physicians were more often in group practices.

Table 1. Demographic characteristics of family physicians and pediatricians

CHARACTERISTIC	FAMILY PHYSICIANS		PEDIATRICIANS	
	NO.	%	NO.	%
Age (y)*				
• <30	13	6	0	0
• 30-39	95	42	14	13
• 40-49	73	32	34	31
• 50-59	42	19	40	37
• >60	2	1	21	19
Sex				
• Male	131	58	75	69
• Female	95	42	34	31
Practice type*				
• Solo	65	29	65	60
• Group	133	59	31	28
• Teaching hospital	8	4	2	2
• Health centre	8	4	1	1
• Hospital	0	0	3	3
Years in practice*				
• 0-5	63	28	4	4
• 6-10	52	23	20	18
• 11-19	60	26	32	29
• >20	51	23	52	48
Number of patients seen weekly				
• <50	14	6	4	4
• 51-100	62	27	18	17
• 101-150	85	37	42	39
• 151-200	48	21	35	32
• >200	16	7	8	7
Children in practice*				
• <25	134	59	2	2
• 25-50	82	36	5	5
• 51-75	5	2	20	18
• >75	0	0	81	74
No. of varicella vaccinations weekly*				
• <1	211	93	49	45
• 1-4	11	5	42	39
• 5-10	0	0	13	12
• >10	0	0	4	4

**P* < .001 for differences between family physicians and pediatricians.

Awareness of NACI guidelines and knowledge of the vaccine

In the bivariate analysis, pediatricians were more likely to be aware of the NACI guidelines (95.4%) than family physicians were (56.3%) ($P < .001$). The mean knowledge score for pediatricians was higher (5.5 ± 1.4 SD) than for family physicians (3.4 ± 2.1 SD) ($P < .001$); 82.6% of pediatricians and 36.6% of family physicians answered four or more questions about the varicella vaccine correctly ($P < .001$).

Logistic regression analysis found pediatricians 6.9 times (95% CI 2.3, 21.1) more likely than family physicians to be aware of the NACI guidelines (Table 2). Also, physicians (family physicians or pediatricians) providing more than one vaccine per week were 3.9 times (95% CI 1.03, 14.9) more likely to be aware of the NACI guidelines. Physicians (family physicians or pediatricians) aware of the guidelines were 2.6 times (95% CI 1.4, 4.6) more knowledgeable about the varicella vaccine. In addition, pediatricians were 3.8 times (95% CI 1.7, 8.6) and physicians (family physicians or pediatricians) providing more than one vaccine per week were 2.8 times (95% CI 1.2, 6.8) more knowledgeable about the vaccine.

Physicians indicated their main sources of information about the varicella vaccine were Health Canada (45%), followed by continuing medical education (40%), pharmaceutical representatives (33%), journals (30%), colleagues (27%), the Internet (7%), and books (3%). Pediatricians indicated they received their varicella information more from Health Canada, continuing medical education, and pharmaceutical representatives than family physicians did.

Recommending practices

Physicians (family physicians or pediatricians) aware of NACI guidelines were more likely to routinely recommend varicella vaccination ($P < .001$). A higher percentage of pediatricians (66.1%) than of family physicians (16.7%) routinely recommended varicella vaccination (Table 3). Both groups of physicians reported recommending the vaccine because it would reduce serious complications of the disease or because parents (or patients) expressed an interest in it (Figure 1). For pediatricians, reasons for recommending the vaccine included Health Canada's recommendation of the vaccine, a belief that there are no serious side effects, and their observation of serious complications of varicella infection.

The most common reasons cited by both family physicians and pediatricians for not recommending the vaccine were that questions regarding duration

Table 2. Knowledge of vaccine and awareness of National Advisory Committee on Immunization guidelines

PHYSICIAN AND PRACTICE CHARACTERISTICS	AWARENESS OF NACI GUIDELINES		KNOWLEDGE OF VARICELLA VACCINE	
	ODDS RATIO	95% CONFIDENCE INTERVAL	ODDS RATIO	95% CONFIDENCE INTERVAL
Male physicians	0.7	0.4, 1.3	0.95	0.54, 1.7
Physicians younger than 50 years	1.0	0.47, 2.3	1.2	0.59, 2.6
Pediatricians*	6.9	2.3, 21.0	3.8	1.7, 8.6
Less than 25% children in practice	0.6	0.3, 1.1	0.8	0.43, 1.5
Less than 100 patients seen weekly	1.7	0.9, 3.2	0.9	0.5, 1.6
Urban region	0.83	0.17, 4.0	1.5	0.39, 6.2
More than 10 years in practice	1.7	0.88, 3.3*	0.77	0.4, 1.5
More than one varicella vaccine given weekly*	3.9	1.03, 14.9	2.8	1.2, 6.8
Aware of NACI guidelines			2.6	1.4, 4.6

* $P < .05$.

Table 3. Physicians' practices for recommending vaccine

PRACTICES	FAMILY PHYSICIANS (%)	PEDIATRICIANS (%)	P
Routinely recommend vaccine	16.7	66.1	< .001
Vaccinate all people older than 12 mo	26.0	65.1	< .001
Vaccinate adolescents older than 13 y	30.0	51.4	< .001
Vaccinate younger children (12 mo-12 y)	18.9	40.4	< .001
Vaccinate women of childbearing age	43.6	30.3	< .05
Vaccinate adults susceptible to varicella	40.1	31.2	< .05
Stock the vaccine	7.5	30.3	< .001

of immunity are still unanswered, that the cost is not covered by the government, that parents and patients were not requesting the vaccine, and that the vaccine is hard to store (Figure 2).

From the logistic regression analysis, factors associated with routinely recommending the vaccine were age younger than 50 years (odds ratio 2.8; 95% CI 1.1, 7.0), practising for more than 10 years (odds ratio 3.7;

Figure 1. Reasons physicians recommend varicella vaccine

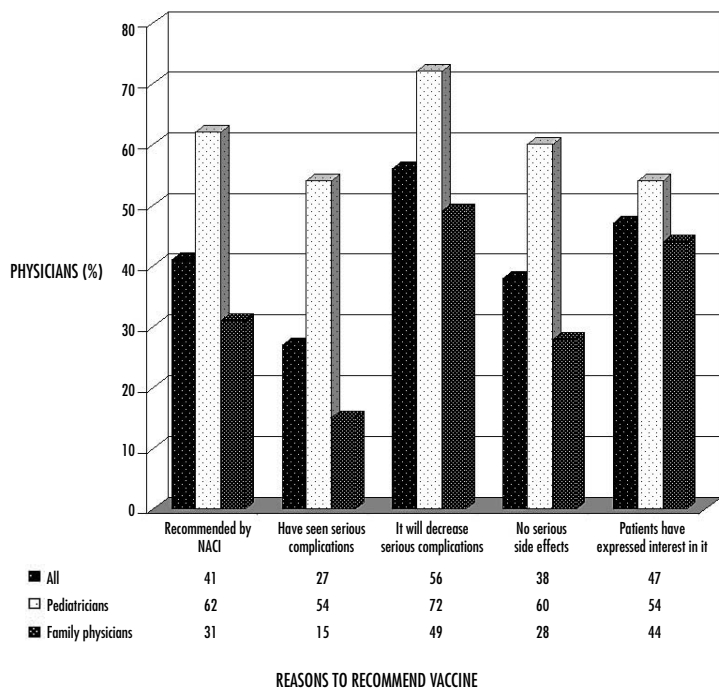
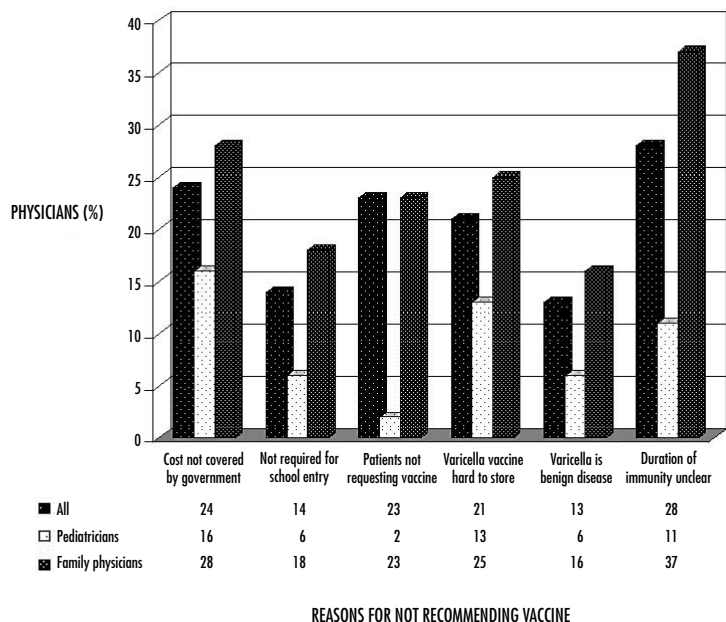


Figure 2. Reasons physicians do not recommend varicella vaccine



95% CI 1.6, 8.6), and providing more than one vaccine per week (odds ratio 12.6; 95% CI 5.0, 31.8). Type of physician (family physician or pediatrician), practice location, and sex were not associated with routinely recommending vaccination. Physicians (family physicians or pediatricians) aware of the NACI guidelines were 4.1 times (95% CI 1.5, 11.4) more likely and physicians (family physicians or pediatricians) more knowledgeable about the guidelines were 2.3 times (95% CI 1.1, 4.8) more likely to routinely recommend the varicella vaccine.

Opinion of the varicella vaccine

The proportion of pediatricians and family physicians who agreed with statements on the questionnaire regarding the varicella vaccine is found in **Table 4**. Both groups of physicians agreed that potential benefits of the vaccine were not well known and that use of the vaccine could be limited because the government does not cover cost. Both groups of physicians disagreed with the statement that varicella vaccination reduces vaccination rates for other

vaccines because of concerns regarding number of immunizations.

DISCUSSION

This survey found awareness of NACI guidelines was higher among pediatricians than among family physicians. Knowledge about the varicella vaccine was related to awareness of NACI guidelines. Routine recommendation of varicella vaccine was associated with awareness of NACI guidelines and knowledge about the vaccine, but not with physician type (family physician or pediatrician).

Dissemination of NACI guidelines seems to have had a substantial role in distinguishing between awareness of the guideline itself and knowledge of the vaccine. Dissemination efforts were targeted at pediatricians, as the guideline was distributed along with the May/June 1999 issue of the *Journal of Paediatric & Child Health*.⁶ This journal of the Canadian Paediatric Society is sent to all pediatricians who are members. Only a few family physicians receive this journal in Ontario.

Table 4. Physicians' opinions about the varicella vaccine

	PERCENTAGE COMPLETELY AGREEING, AGREEING, AND SOMEWHAT AGREEING			
	ALL PHYSICIANS	PEDIATRICIANS	FAMILY PHYSICIANS	P*
FINANCIAL				
Varicella vaccine not medically cost effective	34.2	22.0	40.1	< .001
Use affected because government does not cover cost	95.8	97.2	95.1	.62
ADMINISTRATION MECHANICS				
Handling cumbersome, costly to store	55.7	57.8	54.6	.41
Difficult to know which adolescents to immunize	63.4	56.0	67.0	< .05
POTENTIAL BENEFITS				
Will reduce rare but serious varicella complications	92.0	96.3	89.9	.20
Will reduce varicella infection discomfort	92.3	97.2	89.9	.09
Parents lose less time at work	88.7	94.5	85.9	.06
Will help to prevent congenital varicella	90.5	95.4	88.1	.16
POTENTIAL RISKS				
Could adversely affect other vaccination rates	25.6	22.9	26.9	.43
Fewer natural infections, leading to larger pool of susceptible adults among nonimmunized	67.3	69.7	66.1	.66
Vaccine immunity might not be lifelong	66.7	56.9	71.4	< .01
OTHER				
Little impetus to give because not required for school	59.8	40.4	69.2	< .001
Less need because serious complications are rare	52.1	33.0	61.2	< .001

*P value for the difference between pediatricians and family physicians.

RESEARCH

Peril of the pox

A review of the *Canadian Medical Association Journal* and *Canadian Family Physician* (November 1998 to January 2000 issues) did not reveal any articles pertaining to the varicella vaccine or the NACI recommendations. An article on the vaccine appeared in the September 1999 issue of *Informed*, published by the Institute for Clinical & Evaluative Sciences (ICES).¹⁶ However, this publication is sent only to physicians who request it.

Previous studies have shown that differences exist between family physicians' and pediatricians' awareness and implementation of new vaccine recommendations.^{17,18} A nine-state survey in the United States¹⁷ found that family physicians were slower than pediatricians to adopt hepatitis B vaccine recommendations. Another American study of the new polio virus vaccine recommendations found that family physicians were less likely than pediatricians to be aware of the recommendations.¹⁸ Studies also noted differences between specialties in dissemination of information, with pediatricians hearing the details of a new vaccine first. Detailed recommendations on poliovirus vaccine appeared in *Pediatrics*¹⁹ in 1997 and *American Family Physician* in January 1999.²⁰

Part of this difference can be explained by examining how awareness of guidelines affects actual practice. The awareness-to-adherence model states that "For physicians to comply with practice guidelines, they must first be aware of the guidelines, then intellectually agree with them, then decide to adopt them in the care they provide and finally regularly adhere to them at appropriate times."²¹ In fact this model was supported using data on physicians' use of pediatric vaccine recommendations.¹⁶ Our study findings also support the awareness-to-adherence model, since physicians who were aware of the guidelines were more knowledgeable about the vaccine and were more likely to recommend it.

Both groups identified three main barriers to use of the vaccine: problems with storage and handling, concerns about the duration of immunity, and cost not being covered by the government. The issue of storage and handling might no longer be a barrier because, at the time this article was written, we learned that Varivax II, a refrigerator-stable varicella vaccine, had become available.²² Among physicians currently not using the vaccine, the introduction of Varivax II will encourage its uptake. The issue of long-term immunity is a more difficult barrier to overcome, and perhaps only time will tell. In fact, the long-term effects of

Editor's key points

- In 1999, Health Canada published grade A recommendations for varicella vaccination in a pediatric journal.
- This survey found that 56% of family physicians and 95% of pediatricians were aware of the guidelines.
- Pediatricians were much more likely to recommend varicella vaccine routinely (66%) than family physicians (17%) were. Pediatricians were also less concerned about side effects.
- Barriers to routine immunization were cost, lack of demand from patients, and difficulty with storage (before the refrigerator-stable version).
- Dissemination of Health Canada's guidelines was targeted only at pediatricians—a lapse in coverage.

Points de repère du rédacteur

- En 1999, Santé Canada publiait dans une revue de pédiatrie des recommandations de classe A en faveur de la vaccination contre la varicelle.
- L'enquête a révélé que 56% des médecins de famille et 95% des pédiatres étaient au courant des lignes directrices.
- Les pédiatres étaient beaucoup plus susceptibles (66%) de recommander systématiquement le vaccin contre la varicelle que les médecins de famille (17%). Les pédiatres étaient aussi moins préoccupés par les effets secondaires.
- Les obstacles à la vaccination systématique se situaient dans le coût, le manque de demande de la part des patients et les problèmes d'entreposage (avant l'arrivée d'une préparation stable au réfrigérateur).
- La diffusion des lignes directrices de Santé Canada ne ciblait que les pédiatres—une lacune dans la communication.

other vaccines, such as those for measles and polio, were unknown at the time they were initially recommended. The Canadian Varicella Consensus Conference in May 1999²³ recommended that all provinces and territories introduce a routine varicella immunization program within 2 years after a refrigerator-stable vaccine becomes available. If this is implemented as a government-funded program, cost will no longer be an issue. Also, the higher the vaccination levels achieved, the greater the chance of preventing the possible shift in epidemiology of the disease to an older population more susceptible to severe disease.²⁴

Given the specialist perspective of pediatricians, they were more likely to have seen serious complications related to varicella infection and therefore to be more likely to believe the vaccine would reduce these complications. Family physicians are often more skeptical. Since family physicians see patients through all ages, they were more likely to be concerned with long-term immunity. Family physicians were also more likely to think that serious complications of varicella infection are rare. These perspectives could explain differences in recommending the vaccine.

Some limitations of our study included a nonresponse bias, in that the 50% who did not respond could have been less likely to be aware of the vaccine and the guidelines regarding its use. Only family physicians certified through the College of Family Physicians of Canada were included in the survey; other general practitioners were not well represented. Because the data were self-reported, physicians could have attempted to place themselves in a positive light by characterizing their practice as being consistent with NACI recommendations.

CONCLUSION

The effectiveness of a varicella vaccination program will depend on maximizing awareness of NACI guidelines and knowledge about the vaccine. Varicella vaccination is aimed not only at children, but also at adolescents and adults who are not immune. Greater awareness can be achieved through improved measures to disseminate information to all physicians practising primary care and not only to specialty groups. ❁

Acknowledgment

We thank Jan Whately for assistance with mailings, Dr Jacqui Lewis for reviewing our questionnaire, and Judith Marshall for help in coordinating the study. This study was funded by a grant from the Physicians' Services Incorporated Foundation.

Author contributions

Dr Persaude developed the concept, contributed to study design, was responsible for study implementation and data acquisition, assisted with analysis, wrote the paper, and was extensively involved in all revisions. **Dr Teape-Humphrey** contributed to study design, was responsible for study implementation and data acquisition, assisted with analysis, wrote the paper, and was extensively involved in all revisions. **Dr Adelstein** was responsible for study implementation and data acquisition. She reviewed and contributed to drafts of the paper. **Dr Domb** developed the concept, assisted with interpretation of results, and critically reviewed and revised

drafts of the paper. **Dr Jaakkimainen** contributed to study design, conducted the analysis, and helped with data interpretation. She contributed to writing the paper and made the final revisions.

Competing interests

None declared

Correspondence to: Liisa Jaakkimainen, Primary Care Research Unit, Room E349, Department of Family and Community Medicine, Sunnybrook and Women's College Health Sciences Centre, 2075 Bayview Ave, Toronto, ON M4N 3M5; telephone (416) 480-4753; fax (416) 480-4536

References

1. Varicella vaccines. *Wkly Epidemiol Rec* 1998;73(32):241-8.
2. The National Advisory Committee on Immunization (NACI) statement on recommended use of varicella virus vaccine. *Can Commun Dis Rep* 1999;25:1-15.
3. White CJ, Kuter BJ, Hildebrand CS, Isganitis KL, Matthews H, Miller WJ, et al. Varicella vaccine (VARIVAX) in healthy children and adolescents: results from clinical trials, 1987 to 1989. *Pediatrics* 1991;87(5):604-10.
4. Weibel RE, Neff BJ, Kuter BJ, Guess HA, Rothenberger CA, Fitzgerald AJ, et al. Live attenuated varicella virus vaccine. Efficacy trial in healthy children. *N Engl J Med* 1984;310:1409-15.
5. Kuter BJ, Weibel RE, Guess HA, Matthews H, Morton DH, Neff BJ, et al. Oka/Merck varicella vaccine in healthy children: final report of a 2-year efficacy study and 7-year follow-up studies. *Vaccine* 1991;9:643-7.
6. Personal communication, Editor of *Journal of Paediatric & Child Health*.
7. Recommendations for the use of live attenuated varicella vaccine. American Academy of Pediatrics Committee on Infectious Disease. *Pediatrics* 1995;95(5):791-6.
8. Prevention of varicella: recommendations of the Advisory Committee on Immunization Practices (ACIP). Centers for Disease Control and Prevention. *MMWR Morb Mortal Wkly Rep* 1996;45(RR-11):1-36.
9. MacFarlane LL, Sanders ML, Carek PJ. Concerns regarding universal varicella immunization. Time will tell. *Arch Fam Med* 1997;6(6):537-41.
10. Gershon AA, LaRussa P, Hardy I, Steinberg S, Silverstein S. Varicella vaccine: the American experience. *J Infect Dis* 1992;166(Suppl 1):S63-S68.
11. Schaffer SJ, Bruno S. Varicella immunization practices and the factors that influence them. *Arch Pediatr Adolesc Med* 1999;153(4):357-62.
12. Newman RD, Taylor JA. Reactions of paediatricians to the recommendation for universal varicella vaccination. *Arch Pediatr Adolesc Med* 1998;152(8):792-6.
13. Dillman DA. *Mail and telephone surveys: the total design method*. New York, NY: John Wiley and Sons; 1978.
14. Analytical Software. *Statistix for Windows Version 2*. Tallahassee, Fla: Analytical Software; 1998.
15. Fleiss JL. *Statistical methods for rates and proportions*. 2nd ed. New York, NY: Wiley Series; 1981. p. 38-46.
16. A disease most fowl. An update on the varicella-zoster virus. *Informed* 1999;5(4):1,3,8.
17. Freed GL, Freeman VA, Clark SJ, Konrad TR, Pathman DE. Paediatrician and family physician agreement with and adoption of universal hepatitis B immunization. *J Fam Pract* 1996;42(6):587-92.
18. Kimmel SR, Puczynski S, McCoy RC, Puczynski MS. Practices of family physicians and pediatricians in administering poliovirus vaccine. *J Fam Pract* 1999;48(8):594-600.
19. American Academy of Pediatrics, Committee on Infectious Diseases. Poliomyelitis prevention: recommendations for use of inactivated poliovirus vaccine and live oral poliovirus vaccine. *Pediatrics* 1997;99(2):300-5.
20. Zimmerman RK, Spann SJ. Poliomyelitis vaccine options. *Am Fam Physician* 1999;59(1):113-20.
21. Pathman DE, Konrad TR, Freed GL, Freeman VA, Koch GG. The awareness-to-adherence model of the steps to clinical guideline compliance. The case of paediatric vaccine recommendations. *Med Care* 1996;34(9):873-89.
22. Merck Frosst Canada Inc. *Varivax® II* [product monograph]. Kirkland, Que: Merck Frosst Canada and Company; 2000.
23. Proceedings of the National Varicella Consensus Conference; 1999 May 5-7; Montreal, Que. *Can Commun Dis Rep* 1999;2555(Suppl 5).
24. American Academy of Pediatrics, Committee on Infectious Diseases. Varicella vaccine update. *Pediatrics* 2000;105(1):136-41.