ABSTRACT

Objective: To estimate the prevalence and correlates of influenza vaccination in a Home Care population.

Methods: This was a cross-sectional investigation involving linkage of three population-based databases from a rural Alberta Regional Health Authority, i.e., the Regional immunization and the Regional home oxygen information systems to the Regional home care information system. The sample comprised 649 persons who had been admitted or discharged from the Regional Home Care Program in the period Oct. 1-Dec. 31, 1998. An anonymous data file was released to the investigators. We estimated the proportion ever vaccinated against influenza, the proportion vaccinated in the period Oct. 1-Dec. 31, 1998 ("currently vaccinated"); and explored sociodemographic and program correlates of current vaccination.

Results: 67% had ever been vaccinated against influenza; 60.7% were currently vaccinated. Factors associated with current vaccination (multivariate analysis) include older age, being married, not receiving nursing services, district of residence and program status.

Conclusions: Influenza vaccination rates were sub-optimal. The correlates of vaccination suggest systems-level impediments to influenza vaccination.

ABRÉGÉ

Objectif : Évaluer la prévalence et les corrélats de la vaccination antigrippale au sein d'une population recevant des soins à domicile.

Méthode : Enquête transversale recoupant trois bases de données représentatives d'un office régional albertain de la santé. L'office a relié ses systèmes d'information régionaux sur l'immunisation, sur l'oxygénothérapie à domicile et sur les soins à domicile. L'échantillon comprenait 649 personnes admises au programme régional de soins à domicile ou sorties de ce programme entre le 1^{er} oct. et le 31 déc. 1998. Nous avons eu accès à un fichier de données anonymes. Nous avons estimé la proportion de personnes ayant déjà été vaccinées contre la grippe et la proportion de personnes vaccinées entre le 1^{er} oct. et le 31 déc. 1998 (« actuellement vaccinées »), puis étudié les corrélats de la vaccination actuelle à l'égard du profil socio-démographique et de la participation au programme.

Résultats : 67 % des personnes de l'échantillon avaient jamais été vaccinées contre la grippe; 60,7 % l'étaient actuellement. Les facteurs associés (par analyse multivariable) à la vaccination actuelle sont la vieillesse, le fait d'être marié, le fait de ne pas recevoir de services infirmiers, le district de résidence et la participation au programme.

Conclusions : Les taux de vaccination contre la grippe sont sous-optimaux. Les corrélats suggèrent la présence d'obstacles systémiques au vaccin antigrippal.

The Prevalence and Correlates of Influenza Vaccination Among a Home Care Population

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Approximately 75,000 hospitalizations and 6,700 deaths are attributed to pneumonia and influenza each year in Canada.¹ Most people who die during the influenza season are elderly.² Vaccinating elderly nursing home residents against influenza can reduce hospitalizations and pneumonia by 40-50%.² Vaccination of elderly persons living in the community reduces rates of hospitalization and death from influenza complications and produces direct dollar savings.³ Influenza vaccination is recommended annually for all elderly persons, for persons of any age with chronic diseases and for their caregivers.^{4,5} While home care and home health providers are encouraged to vaccinate their clients, including against influenza,⁵⁻⁷ there are few data as to the implementation of these programs, the coverage rates attained, or factors that may act as facilitators or barriers to timely vaccination. As part of a quality assurance process in a rural (population about 50,000 persons) Alberta Regional Health Authority (RHA), we estimated the proportion of Home-Care clients vaccinated against influenza in the fall of 1998 and explored for sociodemographic and program correlates of client vaccination by a secondary analysis of administrative data.

METHODS

In Alberta, all persons aged 65 years or older and all younger persons with chronic

health conditions are eligible for publicly funded influenza vaccine. Vaccine is delivered by public health and home care nurses and by private physicians. Each provider must give the RHA nominal data on the vaccinees. These data are entered in a computerized vaccination information system.

Persons of any age except those living in a nursing home may be eligible for publicly funded home care services. This Regional Home Care program delivers services through five district offices, each with its own team of registered nurses. A Home Care nurse makes an in-person assessment of eligibility for the publicly funded services, and an entry is made for the person in the centralized Regional Home Care Database. We used these data sources to identify all persons who had received one or more home care services (including assessment for program eligibility) between October 1, 1998 and December 31, 1998. This is the interval in which influenza vaccination programs are most commonly delivered in Alberta, and precedes the usual winter peak period of influenza virus activity.

The following data were available and were abstracted from the Home Care Database: district of residence within the RHA, lived in lodge or community, marital status, type of service provided to the individual (nursing vs. other) and age. Data on status within the program were also obtained: admitted; discharged; not admitted; admitted solely for provision of aids to daily living (ADL). The dates of the most recent influenza vaccine for these clients were obtained from the public health vaccine immunization information system and merged with the data from the Home Care database. The Regional Respiratory Therapist manually reviewed the files of all clients in this sample and

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identified those who were receiving home oxygen (considered to be a marker of being at particularly high risk of adverse outcomes from influenza complications). The data were compiled into a non-nominal data file which was released to the investigators for analysis. Subjects were considered to be "currently vaccinated" if they had received influenza vaccine in the interval October 1-December 31, 1998.

The proportions of persons ever and currently vaccinated against influenza among those admitted or discharged were calculated using the total number of persons admitted and discharged in the Home Care sample as the denominator. We selected this group as they were most clearly clients receiving services from the program during the interval of interest and would provide the cleanest picture of persons for whom opportunities to immunize existed. Persons who received only an assessment for program eligibility or aids to daily living were excluded from the primary analysis. Although their program contact may have provided an opportunity to immunize, they may not have been perceived by Home Care staff as being program "clients". Odds ratios and chi square tests of association were used to explore correlates of vaccination. Data were screened at $\alpha = 0.10$ in univariate analysis and a parsimonious model of current vaccination constructed using SAS maximum likelihood logistic regression models⁸ and backwards elimination.

RESULTS

Of 820 persons in the Home Care database for the period of interest, 12 (all aged under 18 years) were excluded from analysis because of missing data. There were 649 persons who had a program status of admitted or discharged. Their characteristics are displayed in Table I.

The proportion of subjects admitted or discharged who had ever been vaccinated against influenza was 67.0% compared to 60.7% who had received "current" vaccination. Among those aged 65 years and older, 65.2% were currently vaccinated against influenza (Table I). Residents of district 5 were less likely to be vaccinated than were residents of other districts. More

females were currently vaccinated (63.1%) than males (54.9%). Only 49.6% of those who received nursing services were vaccinated in contrast to 67.0% of those who did not receive nursing services. A larger proportion of those who lived in a lodge (74.4%) than those who lived elsewhere in the community (55.8%) were currently vaccinated. Married (56.8%) and widowed (68.9%) persons were more likely to be vaccinated than were never married (46.0%) or divorced (37.5%) persons. A larger proportion of those admitted to the program (67.9%) than those discharged (46.6%) were currently vaccinated. Two thirds (66.7%) of persons on home oxygen compared to 60.4% of those not on home oxygen were currently vaccinated.

As place of residence was significantly associated with program status (those in lodge more likely to be admitted) and with provider (those in lodge less likely to have nurse provider), place of residence was included in the multivariate models in addition to those factors that were screened in univariate analysis. The final model for the total sample contained only age, marital status, district, nurse as care provider, lodge residence, and program status (Table II). A comparable model was observed for persons aged 65 years and older (Table II). Even after controlling for age, district, lodge residence, marital status and program status, those who received nursing services were less likely to be vaccinated than were others.

DISCUSSION

Despite the calls to action for vaccination of Home Care clients^{6,7} little is known of influenza vaccine coverage among Home Care populations. The current Alberta target for influenza vaccine coverage among the elderly is 75%. There is no target for home care clients; however given that Home Care clients tend to be both frail and elderly, a target of at least 75% would be reasonable. Among the Home Care clients, the proportions ever or currently vaccinated against influenza were well below target even when only persons aged 65 years or older were considered. According to the Region, the vaccinated population-based proportion of

TABLE I
Percent Distribution (number) of Sociodemographic and Program Characteristics Among Home Care Clients, Rural Health Region

Characteristic	Total Sample (n=649)	65+ Years (n=555)
Age		
Mean (sd)	77.1 (14.3)	81.8 (7.8)
Median	80.0	82.0
Sex		
Female	69.9 (453)	69.7 (386)
Male	30.1 (195)	30.3 (168)
Marital Status		
Married	38.2 (243)	34.9 (192)
Single/Divorced	12.8 (82)	9.4 (52)
Widowed	49.0 (312)	55.7 (307)
District of Residence		
1	25.1 (163)	23.1 (128)
2	19.6 (127)	20.0 (111)
3	19.1 (124)	19.6 (109)
4	20.5 (133)	22.9 (127)
5	15.7 (102)	14.4 (80)
Place of Residence		
Lodge	26.5 (172)	30.8 (171)
Community	73.5 (477)	69.2 (384)
Provider		
Nurse	36.1 (234)	35.7 (198)
Other	63.9 (415)	64.3 (357)
Home Oxygen		
No	94.9 (616)	94.4 (524)
Yes	5.1 (33)	5.6 (31)
Program Status		
Admitted	66.3 (430)	68.1 (378)
Discharged	33.7 (219)	31.9 (177)
Influenza Vaccination History		
Ever	67.0 (435)	70.8 (393)
Current	60.7 (394)	65.2 (362)

persons aged 65 years and older for this Region was 59.5%; 73.3% for elders having chronic health conditions. Overall, the proportion of vaccinated Home Care clients (60.7%) is similar to the vaccinated proportion of the elderly population as a whole. Among elderly Home Care clients, the proportion vaccinated somewhat exceeded (65.2%) the vaccinated proportion of the elderly population as a whole but was still substantially less than the population-based proportion of vaccinated elderly with chronic health conditions. The vaccinated proportion of Home Care clients who were on home oxygen was only 66.7%, a proportion that is still less than the vaccinated proportion of Regional elders with chronic health conditions. Although no data on the diagnoses of the Home Care clients were available, it

TABLE II
Estimated Odds Ratios (95% CI) of Current Influenza Vaccination Among Home Care Clients, by Sociodemographic and Program Characteristics, Total Sample and 65+ Years

Variable	Adjusted OR† (95% CI) Total Sample (N = 649)	Adjusted OR† (95% CI) Age 65+ (N = 555)
Age (10-year increase)	1.24 (1.07, 1.45)**	0.98 (0.75, 1.28)
Sex		
Marital Status		
Married	1.00	1.00
Single/Divorced	0.56 (0.31, 0.96)*	0.56 (0.29, 1.08)
Widowed	1.16 (0.78, 1.74)	1.22 (0.80, 1.85)
District of Residence		
1	1.00	1.00
2	1.11 (0.65, 1.89)	1.10 (0.62, 1.98)
3	1.13 (0.66, 1.94)	1.15 (0.64, 2.06)
4	0.62 (0.37, 1.04)	0.63 (0.37, 1.08)
5	0.36 (0.21, 0.63)***	0.35 (0.19, 0.65)***
Place of Residence		
Community	1.00	1.00
Lodge	1.38 (0.89, 2.16)	1.57 (1.00, 2.48)
Provider		
Other	1.00	1.00
Nurse	0.60 (0.42, 0.86)**	0.64 (0.43, 0.94)*
Home Oxygen		
No		
Yes		
Program Status		
Admitted	1.00	1.00
Discharged	0.49 (0.34, 0.71)***	0.52 (0.35, 0.77)**

† obtained from multivariate logistic regression model, adjusted for all other variables listed in the table

** p<0.01

* p<0.05

*** p≤0.0001

is reasonable to assume that a major reason for people to require Home Care Services is having a chronic health condition given that 82% of Canadian seniors living at home have a chronic health condition⁹ and that, among the elderly, the prevalence of health conditions specifically considered to be indications for influenza vaccination is more than 40%.¹⁰ Further, all persons listed in the database in the interval of interest had contact with a health professional during the flu vaccination season. One would thus expect that the proportion of elders vaccinated should considerably, rather than slightly, exceed the proportion of elders vaccinated for the Region. Why was this not so? The possibilities include health care provider factors, systems level factors and client factors. We have no data on client beliefs and attitudes. However, the lower coverage rate among Home Care clients when combined with the observed associations between current vaccination, district of residence, living in a lodge and nature of service provider are strongly suggestive of one or more of provider and systems-level

factors. The data also suggest that these factors may have resulted in barriers to immunization.

Why were those who received care from a registered nurse *less* likely to be vaccinated than those who did not? This association was robust to district, age, living in a lodge and to marital status. *A priori*, one would anticipate that the opposite would have been found. Were clients who received nursing services perceived to be “too ill” to be vaccinated, or to have an inadequate quality of life to support vaccination? It has been suggested that such actions might be appropriate in a small number of published articles.^{11,12} It may also be that the focus for care perceived to be relevant by the nurses did not include preventive care, or that like physicians¹³⁻¹⁵ the nurses were so busy providing other care that they did not have time to deal with preventive needs, or assumed that other caregivers were already meeting those needs. However, other studies¹⁶ have shown that health system characteristics are major factors. Data from health maintenance organizations show that the inten-

sity and consistency with which immunization is addressed within care systems is positively associated with vaccination rates.¹⁷

Why was there no association between being on home oxygen and being vaccinated? Conceivably there may be misclassification in the data. Home oxygen patients may have been under the care of a pulmonologist from outside the Region (there are no chest specialists within the boundaries of this rural Health Authority). If they were vaccinated by their out-of-region doctors, then their immunization records would be held in the databases of the Regional Health Authority of the pulmonologist, rather than of the patient. We have no data to test this hypothesis. It is also possible that these persons were perceived to be too ill to be vaccinated, or that these persons may have refused vaccination.

The correlation between marital status and influenza immunization rates parallels that observed by Maxwell et al.¹⁸ for other preventive behaviours in a Canadian population-based study; and has been observed for influenza vaccination elsewhere.¹⁹ Persons who are married or widowed, relative to those never married or divorced, may have more social supports and thus be more likely to effectively access preventive health services.

Finally, what of the observation that persons who were discharged from Home Care were less likely to be vaccinated than those admitted? We think this is most likely a systems/roles factor: health professionals doing assessments for discharge may neither think of such a role for themselves nor be instructed to vaccinate as a matter of policy. This example of what we perceive to be missed opportunities to immunize is consistent with findings of lower vaccination rates among persons who had been assessed but not admitted to the programs and those who were admitted only for ADL (data not shown). As such persons were assessed by a nurse, this may be an important area for future interventions to increase opportunistic vaccination.

In summary, among Home Care clients, 86% of whom were elderly, vaccination coverage was similar rather than superior to that for the general elderly population in this Region. There were marked disparities

in vaccine coverage by place of residence, district, age, type of service provider and by program status. System-level problems are the most likely cause of the findings. Despite the recent recommendations of the Canadian National Advisory Committee on Immunization,²⁰ appropriate influenza vaccination practices were sub-optimal among this home care population. In Alberta, influenza vaccine is frequently not delivered by home care nurses according to recent discussions held by one of us (MLR) with Medical Officers of Health, Public Health Immunization Managers and Home Care Managers from both rural and urban RHAs. Several changes are planned in the Regional Health Authority that we studied as a result of this work, and vaccination coverage of this population will be actively monitored in the future.

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