BLAKE ZIEGLER

Blake Ziegler was a University of Toronto PharmD student on an OPEN research rotation and took an interest in the Pharmacists-as-Immunizers project. Specifically, he wanted to understand whether Ontario pharmacists were protecting themselves from influenza by getting vaccinated and how pharmacist vaccination rates compared to other health care professional rates.

B. Ziegler, étudiant au doctorat en pharmacie à l'Université de Toronto s'est intéressé au projet « Des Pharmaciens pour administrer les vaccins » lors d'un stage en recherche OPEN. Plus précisément, il a cherché à savoir si les pharmaciens de l'Ontario se protégeaient contre la grippe en se faisant vacciner et a comparé les taux de vaccination des pharmaciens par rapport aux autres professionnels des soins de santé.

Protecting our patients by protecting ourselves: An analysis of the personal influenza immunization rate of Ontario community pharmacists

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ABSTRACT

Background: With recent expansions to scope of practice that have allowed Canadian pharmacists to play a larger role in administering influenza vaccinations to the public, it is important that pharmacists themselves meet Canadian guidelines recommending that 80% of health care professionals and 100% of vaccinators receive an annual influenza vaccination. Unvaccinated health care professionals pose an infection risk to patients they serve and are at an increased risk of infection themselves.

Methods: An online, anonymous survey was sent to Ontario community pharmacists to determine whether they had received the influenza vaccination during the 2013–2014 influenza season. All significant univariate chi-square analysis respondent characteristics were included in a multivariate regression analysis model to determine predictors of vaccination status.

Results: A total of 780 pharmacists completed the survey (18.1% response rate), which showed that 7 in 10 Ontario community pharmacists received the influenza vaccine. Those certified to immunize were nearly 3 times more likely to have received the influenza vaccine than those not certified (81.6% versus 61.2%, respectively).

Discussion: Having 70% of Ontario community pharmacists vaccinated against influenza is both an accomplishment and an opportunity to improve vaccination rates. While similar to the influenza immunization rates of other health care professions, Ontario community pharmacists did not meet Public Health Canada's recommendations. Comprehensive worksite programs, including promotion, education and convenient access to influenza vaccination at no cost, could increase community pharmacist influenza vaccination rates.

Conclusion: The authors issue a call to arms to encourage all pharmacists to receive the influenza vaccine to protect the public and themselves. *Can Pharm J (Ott)* 2016;149:246-255.

Introduction

Influenza places a significant burden on the Canadian health care system and contributes nationally to an estimated 12,200 hospitalizations and 3500 deaths each year.^{1–3} Vaccination is a key component in prevention and control of

influenza.⁴ As such, vaccinating priority groups such as health care professionals is a major focus of disease-prevention efforts.^{5,6} Both the National Advisory Committee on Immunization in Canada and the Centers for Disease Control and Prevention in the United States recommend

annual influenza vaccination for all health care professionals,^{7,8} with the Public Health Agency of Canada recommending influenza vaccine coverage of 80% for health care professionals in general and 100% for vaccinators specifically.⁹

Health care professionals should receive the influenza vaccine to protect themselves and their patients and to lessen the burden of influenza on the health care system. Systematic reviews have demonstrated that annual influenza vaccination of health care professionals lowers mortality, hospitalizations and prevalence of influenza-like illness among their patients, particularly among long-term care residents.^{10–12} Data are not available on the impact on patient outcomes of vaccinated health care professionals in ambulatory care settings. However, as highly accessible health care professionals interacting with large numbers of patients daily, community pharmacists could be significant vectors of influenza virus. Many health care professionals will continue to work despite running a fever,¹³ and infected individuals can shed the virus from 1 day before onset of symptoms to 4 to 5 days (or more) after symptom onset.¹³ Furthermore, the influenza virus is virulent for 24 to 48 hours on nonporous surfaces and for 5 minutes on hands.^{13,14} Thus, health care professionals could put patients at risk by interacting with them before they know they have contracted influenza and by continuing to work even when they feel sick.

Health care professionals also need to consider the value of being vaccinated to protect themselves. They have a higher risk of acquiring influenza, as they are exposed to patients both through their workplace and their interactions in the community. While 5% to 10% of healthy adults living in a community will contract influenza,¹⁵ a UK study demonstrated that during a community outbreak, up to 23% of health care professionals contracted clinical or subclinical influenza.¹⁶ Nichol noted that healthy adults (within the age range of most health care professionals) who received influenza vaccination had lower rates of lab-confirmed and clinical illness, reduced physician visits, reduced days of illness and reduced work loss days.¹⁷ These outcomes benefit health care professionals, their employers and institutions and the patients who rely on their care.

Despite the well-documented benefits of vaccination, influenza vaccination rates among health care professionals in both Canada and the United States remain suboptimal. In the United States, health care professionals' influenza vaccination rates were estimated at 77.3% in 2015.¹⁸

KNOWLEDGE INTO PRACTICE

- Public Health Canada recommends that 80% of health care professionals and 100% of vaccinators receive the influenza vaccine.
- US surveys indicate suboptimal pharmacist influenza vaccination rates, but Canadian rates are not available.
- A total of 780 Ontario community pharmacists completed an online survey, and approximately 70% indicated they were vaccinated against influenza.
- Certification to vaccinate was the only significant factor that predicted pharmacists' own influenza vaccination status.
- The authors issue a call to arms to pharmacists to be immunized against influenza (Box 1).
- Pharmacists and other health care providers can use an online comic, developed from the results of this article, to spread the word regarding the importance of pharmacist influenza vaccination so as to protect patients, fellow staff members, family and friends and the public.

In Canada, the 2012 rate of vaccination for health care professionals in close contact with patients was 68.6%.¹⁹ While these rates are substantially higher than in the general population (37.2% of Canadian adults in 2012¹⁹ and 43.6% of US adults in 2015¹⁸), they remain lower than recommended. As well, much of the focus of advocacy efforts has been on health care professional vaccination in hospitals and continuing care facilities, where challenges have been identified in collecting accurate influenza vaccination coverage data.^{20–22}

Community pharmacists have become frontline health care professionals who vaccinate the public and should meet national standards. Ontario pharmacists began administering influenza vaccines in October 2012 (and must complete an injection certification course and have current cardiopulmonary resuscitation and first aid training to immunize) and administered 901,300 influenza vaccines in the 2014–2015 influenza season. Two surveys in the United States have estimated pharmacist vaccination rates at 78%²³ and 96%¹⁸ (the latter based on only 68 survey respondents) in 2008 and 2015, respectively. In the 2008 report, coverage was found to vary across practice settings, with a vaccination rate of 88% for those employed in hospital, 86% in academia, 83% in clinical and 75% in community settings.²³ Data on the subgroup of pharmacists who were vaccinators were not provided. This study's aim was to estimate the influenza vaccination rate of community pharmacists in Ontario during the 2013–2014 influenza season and to understand predictors associated with their influenza vaccination.

MISE EN PRATIQUE DES CONNAISSANCES

- Sécurité publique Canada recommande que 80 % des professionnels de la santé et 100 % des personnes administrant les vaccins reçoivent le vaccin contre la grippe.
- Les sondages américains indiquent que les taux de vaccination des pharmaciens contre la grippe ne sont pas optimaux, mais au Canada, les taux ne sont pas disponibles.
- Sept cent quatre-vingts pharmaciens communautaires de l'Ontario se sont prêtés à un sondage en ligne, et environ 70 % d'entre eux ont déclaré être vaccinés contre la grippe.
- La certification visant l'administration des vaccins était le seul facteur important prédictif du statut vaccinal contre la grippe des pharmaciens.
- Les auteurs appellent les pharmaciens à se vacciner contre la grippe.
- Les pharmaciens et les autres fournisseurs de soins de santé peuvent utiliser une bande dessinée en ligne, conçue à partir des résultats de cet article, afin de souligner l'importance de la vaccination des pharmaciens contre la grippe pour protéger les patients, les collègues, la famille, les amis et le public.

Methods

Pharmacist survey

A survey was developed to collect data on Ontario community pharmacists' current practices regarding influenza vaccination. Survey questions were pilot tested with several pharmacists, pharmacy students and research staff to ensure that questions were understandable, content was valid and survey logic was functional. Modifications were made based on this qualitative feedback. This anonymous survey took approximately 10 minutes to complete and was distributed electronically on July 30, 2014, to pharmacists in the Ontario College of Pharmacists register who indicated they practised in a community pharmacy setting and who had agreed to be contacted for participation in research. The email introduced the study and its objectives and included a link to the electronic survey delivered using Qualtrics online survey software (Qualtrics LLC, Provo, UT, USA). A paper version of the survey was made available upon request. Two reminders were sent—on August 11 and September 2, 2014. The survey was closed on September 12, 2014. An incentive was offered to respondents in the form of a draw for 1 of 4 fitness watches valued at \$150 each.

Survey questions included identification of respondents' practice site(s) and demographics, workplace and personal involvement in administering influenza vaccinations. The outcome of

interest for this analysis was obtained by a survey question that specifically asked, "Did you personally receive the influenza vaccine in the 2013–2014 season (October 2013–March 2014)?" Response options included "yes," "no" and "prefer not to answer." The survey was approved by the Office of Research Ethics at the University of Waterloo and the Health Sciences Research Ethics Board at the University of Toronto.

Data analysis

To account for participation bias, survey responses were weight adjusted using the proportion of injection-certified pharmacists in our response group to injection-certified pharmacists for all of Ontario. Characteristics of vaccinated respondents versus not vaccinated were compared using the Rao-Scott chi-square test.²⁴ All respondent demographics and practice characteristics that were significant in the univariate test were included in a multivariate logistic regression model to identify predictors of influenza vaccination and estimate adjusted odds ratios for receiving influenza vaccination. Variables were kept in the final model if they improved model fit using Akaike and Bayesian Information Criterion²⁵ and if they were significantly associated with the outcome as determined by Wald's *t* test.²⁵ Survey results were analyzed using SAS 9.4 (SAS Institute Inc., Cary, NC, USA).

Results

Overall, 4307 community pharmacists in Ontario (30.9% of registered provincial pharmacists) were contacted by email, and 780 completed the survey; the response rate was 18.1%. Among those who completed the survey, 87 did not answer the question about personally receiving the influenza vaccine in the 2013–2014 season and were therefore excluded from the analysis. Of the 693 included responses, 81% (*n* = 561) of pharmacists were certified to administer the influenza vaccine, versus the certification rate of 43.5% among all Ontario pharmacists (personal communication, Ontario College of Pharmacists, April 25, 2014). Personal receipt of the vaccine was reported by 539 (77.8%) of respondents. The weight-adjusted rate of personal receipt of the vaccine among all Ontario pharmacists was estimated at 70.3% (95% CI, 65.2%–75.2%). Characteristics of all 693 respondents, both crude and weighted, are presented in Table 1.

TABLE 1 Characteristics of survey respondents who reported personal vaccination status

Characteristic	Responses	Weighted frequencies			Rao-Scott chi-square test p value
		Received vaccine (n = 483, 70.3%)	Did not receive vaccine (n = 204, 29.7%)	Total (N = 687)	
Type of community pharmacy	No answer	—	—	—	0.08
	Independent (1 owner up to 6 stores)	164 (33.9%) SD 2.35	98 (48.1%) SD 2.13	262 (38.1%) SD 2.67	
	Chain (more than 6 stores with 1 owner)	64 (13.4%) SD 1.26	19 (9.4%) SD 0.81	84 (12.2%) SD 1.48	
	Banner	66 (13.6%) SD 1.53	26 (12.7%) SD 1.08	92 (13.3%) SD 1.81	
	Franchise	119 (24.7%) SD 1.71	36 (17.6%) SD 1.19	155 (22.6%) SD 2.0	
	Mass merchandiser or food store	56 (11.6%) SD 1.32	24 (11.8%) SD 1.0	80 (11.6%) SD 1.62	
	Other	14 (2.8%) SD 0.87	1 (0.5%) SD 0.11	15 (2.1%) SD 0.87	
Current pharmacy involvement with influenza immunizations	No answer	—	—	—	0.11
	Yes, staff pharmacist(s) administer the vaccine	338 (69.9%) SD 2.64	112 (54.9%) SD 2.02	450 (66.5%) SD 2.74	
	Yes, nurses/nursing agencies contracted by the pharmacy administer the vaccine	15 (3%) SD 0.89	9 (4.4%) SD 0.76	24 (3.5%) SD 1.15	
	No current involvement but planning to participate in the future	60 (12.4%) SD 1.81	42 (20.5%) SD 1.53	102 (15%) SD 2.24	
	No current involvement and no immediate plans for involvement in the future	63 (13%) SD 1.74	38 (18.8%) SD 1.38	101 (15%) SD 2.11	
Personal certification to administer vaccines	No answer	—	—	—	<0.01
	Yes	246 (50.9%) SD 2.09	55 (27.1%) SD 0.84	301 (44%) SD 2.41	
	No	235 (48.6%) SD 2.82	149 (72.9%) SD 2.58	384 (56%) SD 2.41	
Gender	Man	242 (50%) SD 2.49	99 (48.3%) SD 2.03	340 (49.5%) SD 2.63	0.10
	Woman	239 (49.5%) SD 2.42	104 (50.7%) SD 2.01	343 (49.8%) SD 0.46	

(continued)

TABLE 1 (continued)

Characteristic	Responses	Weighted frequencies			Rao-Scott chi-square test <i>p</i> value
		Received vaccine (<i>n</i> = 483, 70.3%)	Did not receive vaccine (<i>n</i> = 204, 29.7%)	Total (<i>N</i> = 687)	
	Other (e.g., Trans)	1 (0.1%) SD 0.08	3 (1.5%) SD 0.43	4 (0.5%) SD 0.44	
	Prefer not to answer	2 (0.3%) SD 0.14	—	2 (0.2%) SD 0.14	
Practice location	No answer	—	—	—	0.09
	Urban	381 (78.8%) SD 2.79	151 (73.8%) SD 2.5	531 (84.6%) SD 2.17	
	Rural	57 (11.7%) SD 1.64	40 (19.6%) SD 1.59	97 (15.4%) SD 2.17	
Years in practice	<5	67 (13.8%) SD 1.37	20 (9.6%) SD 0.82	86 (12.6%) SD 1.56	0.68
	5–10	42 (8.8%) SD 0.89	19 (9.4%) SD 0.81	62 (9%) SD 1.19	
	11–15	40 (8.4%) SD 1.02	20 (9.8%) SD 0.9	60 (8.8%) SD 1.34	
	16–20	44 (9.1%) SD 1.1	26 (12.6%) SD 1.14	70 (10.1%) SD 1.54	
	>20	290 (59.9%) SD 2.62	121 (59.1%) SD 2.24	410 (59.6%) SD 2.49	
Age (y)	No answer	—	—	—	0.46
	<26	6 (1.3%) SD 0.49	1 (0.3%) SD 0.08	7 (1%) SD 0.5	
	26–40	101 (20.8%) SD 1.57	41 (20.2%) SD 1.37	142 (21.5%) SD 1.99	
	41–55	189 (39%) SD 2.31	96 (47.2%) SD 2.04	285 (43.1%) SD 2.65	
	56–64	114 (23.6%) SD 2.07	35 (17.1%) SD 1.34	149 (22.5%) SD 2.32	
	≥65	56 (11.5%) SD 1.73	23 (11.3%) SD 1.18	79 (11.9%) SD 2.01	
Highest degree(s) obtained	BSc pharmacy	389 (80.6%) SD 2.64	167 (81.8%) SD 2.42	556 (80.9%) SD 2.05	0.87
	BSc pharmacy and other degree(s)	91 (18.7%) SD 1.68	38 (18.6%) SD 1.3	129 (18.7%) SD 2.02	
	No answer	—	—	—	

Most respondents practised in an urban setting and held a bachelor's degree in pharmacy as their highest degree. Approximately half of the respondents practised in franchise or independent pharmacies. More than three-quarters practised in community pharmacies where influenza vaccinations were offered by staff pharmacists, and an equal proportion were personally certified to administer vaccines.

Personal certification to administer vaccines was the only variable significantly related to receiving the vaccine, with 81.6% of those certified receiving the vaccine versus 61.2% of those not certified ($p < 0.01$). After adjusting for all covariates, pharmacists certified to administer the vaccine were nearly 3 times more likely to have received the influenza vaccine in 2013–2014 versus those not certified (adjusted OR, 2.81; 95% CI, 1.86–4.26). Other characteristics, including type of pharmacy, current pharmacy involvement in vaccination services, gender, urban or rural practice location, years in practice, age and academic degree were not predictive of pharmacists receiving the influenza vaccine in the multivariate model.

In a sensitivity analysis, pharmacists who did not answer the question about personally receiving the influenza vaccine in the 2013–2014 season in the analysis were assigned a “no” answer. This strategy decreased the estimation of the adjusted rate of personal receipt of the vaccine among all Ontario pharmacists from 70.3% (95% CI, 65.2%–75.2%) to 62.3% (95% CI, 57.5%–67.1%). However, the adjusted OR was very similar to the original analysis (OR, 2.54; 95% CI, 1.40–4.61).

Discussion

Our survey of Ontario community pharmacists estimates that in the 2013–2014 influenza season, 7 in 10 Ontario community pharmacists personally received the influenza vaccine. Those certified to immunize were nearly 3 times more likely to have received the influenza vaccine than those not certified. Interestingly, other characteristics that have been reported in the literature as influencing factors in the general population, such as gender and age, were not predictive of influenza immunization in this sample.^{26,27}

This rate of Ontario pharmacist vaccination coverage was similar to that reported for Canadian health care professionals in 2013 at 68.6%.¹⁹ Despite these encouraging results, neither those

pharmacists who were vaccinators (81.6%) nor those not vaccinating (61.2%) met the Public Health Agency of Canada goals of 100% and 80%, respectively.⁹ This suggests that additional efforts are warranted to encourage pharmacists to receive the influenza vaccination.

US data for the 2014–2015 influenza season reported a 77.3% vaccination rate for health care workers overall, with physicians at 92.1% and nurses at 93.4%.¹⁸ The vaccination rate for pharmacists was reported at 96.1%, but the survey had only a small sample size of pharmacists (68 of the total 1914 survey respondents, 2.6%), did not differentiate between pharmacists in different practice settings and likely had some survey recruitment bias.¹⁸ A better comparator is the 2008 US survey of pharmacists, which found a 75% influenza vaccination rate among community pharmacists,²³ slightly higher than our 70% vaccination rate for Ontario pharmacists. While the 2008 survey reported that 38% of pharmacists were certified to immunize,²³ no adjustment was made to reflect the overrepresentation of pharmacists certified to immunize in the survey sample.

Community pharmacist influenza vaccination rates in Ontario demonstrate room for improvement to meet Public Health Agency of Canada recommendations and to be comparable to our physician and nursing counterparts. However, it is encouraging that Canadian community pharmacist rates are similar to the US rates, particularly because influenza vaccination in community pharmacies has been available in Canada for a much shorter time.

Our study showed that being certified to immunize was significantly correlated with increased pharmacist vaccination rates. Several reasons may explain this. By becoming better educated through the required training programs about the risks and benefits of vaccination, more pharmacists might choose to be vaccinated; those who choose to be trained and immunize may be more convinced of the value of vaccination to begin with; trained pharmacists may want to role model vaccination status to their patients; and working in a pharmacy that offers influenza immunization services makes it more convenient for those pharmacists to get vaccinated themselves. By increasing the number of vaccine-certified pharmacists, the public would benefit both by increased access to influenza vaccination services and by a larger percentage of pharmacists being protected from influenza.

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BOX 1 A call to arms

Community pharmacists in many jurisdictions now have the privilege of protecting the public from influenza by administering influenza vaccines. By being immunized against influenza, these accessible frontline health care professionals have the potential to enhance patient safety by reducing influenza transmission to patients and minimizing personal illness, which may affect the availability of health services. Having 70% of Ontario pharmacists vaccinated against influenza is both an accomplishment and an opportunity to improve. Workplace approaches that include increasing the number of pharmacists certified to immunize and programs that include education, promotion and convenient access to the vaccine are the next steps to meeting the Canadian influenza vaccination rates targets. To help translate the findings of this research, we have designed a comic that anyone with an interest in improving pharmacist influenza vaccination rates is encouraged to use. The comic is available freely, and further instructions about how to use and access it can be found at www.open-pharmacy-research.ca/research-projects/existing-services/pharmacist-prescribing/influenza-immunization-rate-ontario-pharmacists. We hope this call to arms will encourage community pharmacists to get the influenza vaccine and role model the importance of this preventive measure to our patients, fellow staff members, family and friends, and the public.

The literature provides examples and outcomes of interventions to improve health care professional vaccination rates that range from incentives to employer-mandated vaccination.²⁸ For example, the 2014–2015 US health professional survey demonstrated differing vaccination rates depending on whether influenza vaccination was required (96%), not required but offered at no cost for more than 1 day (83.9%), not required but offered at no cost for 1 day only (73.6%), not required or offered at no cost but promoted (59.5%) or not required, promoted or provided (44%) by the workplace.¹⁸ The 2008 pharmacist-specific survey found that pharmacists who were not vaccinated had 3 common concerns related to this decision: fear of adverse effects, perception of low risk of contracting influenza and fear of contracting influenza from the vaccine.²³ Community pharmacists in particular were significantly less likely to be vaccinated, less likely to be required to receive the influenza vaccine by their employer, less likely to be compensated for vaccination and significantly more likely to express at least one concern—largely a belief that they were at low risk of influenza infection.²³

A systematic review of influenza vaccination campaigns for health care personnel concluded that campaigns involving a combination of education or promotion and improved access to the vaccine yielded a greater increase in coverage than campaigns involving education or promotion alone.²⁸ Therefore, comprehensive worksite programs for

community pharmacists that include promotion, education and convenient access to influenza vaccination at no cost are promising options to pursue. While mandatory influenza immunization of health professionals has been found to increase vaccination rates, its application remains controversial and continues to be debated.^{29–31}

To facilitate employment of novel knowledge translation strategies, our research team worked with Santé Communications Group to create a comic that illustrates our research results and encourages pharmacists to get vaccinated. We encourage others to download the comic at <http://www.open-pharmacy-research.ca/research-projects/existing-services/pharmacist-prescribing/influenza-immunization-rate-ontario-pharmacists> and use this as part of the education component of their vaccination campaigns.

This study has several limitations. Weight adjustments to the data may not have compensated fully for participation bias, and as a result, the study sample may not be representative of the Ontario pharmacist population. While efforts were made to enhance response rates through multiple reminders, the response rate may affect the generalizability of our findings. The results of this Ontario-based survey may not reflect vaccination rates among pharmacists in other Canadian provinces, as influenza vaccination rates differ across geographic regions.⁹ Finally, recall or social desirability bias may affect the validity of respondents' reported vaccination status, and

administrative data were not used to confirm survey responses.

Conclusion

Future work should include designing and measuring the impact of community pharmacist-targeted education, promotion and increased vaccine access program on pharmacist vaccination rates; tracking of pharmacists' influenza

vaccination rates over time as uptake of this pharmacist-provided service increases (in both Ontario and other provinces); and replicating this work with other community pharmacy staff members, such as pharmacy technicians, who are also in contact with the public. The authors issue a call to arms to encourage all pharmacists to receive the influenza vaccine to protect the public and themselves (see Box 1). ■

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References

1. Schanzer DL, Langley JM, Tam TWS. Role of influenza and other respiratory viruses in admissions of adults to Canadian hospitals. *Influenza Other Respir Viruses* 2008;2(1):1-8.
2. Schanzer DL, McGeer A, Morris K. Statistical estimates of respiratory admissions attributable to seasonal and pandemic influenza for Canada. *Influenza Other Respir Viruses* 2013;7(5):799-808.
3. Schanzer DL, Sevenhuysen C, Winchester B, Mersereau T. Estimating influenza deaths in Canada, 1992-2009. *PLoS ONE* 2013;8(11):e80481.
4. Government of Canada. *Prevention of flu (influenza)*. Available: <http://healthycanadians.gc.ca/diseases-conditions-maladies-affections/disease-maladie/flu-grippe/prevention-eng.php> (accessed Nov. 17, 2015).
5. City of Toronto. *2012/2013 influenza immunization of health care workers in Toronto health care facilities*. Toronto (ON): Board of Health. Available: www.toronto.ca/legdocs/mmis/2013/hl/bgrd/backgroundfile-59893.pdf (accessed Nov. 17, 2015).
6. Bryce E, Embree J, Evans G, et al. AMMI Canada position paper: 2012 mandatory influenza immunization of health care workers. *Can J Infect Dis Microbiol* 2012;23(4):e93-5.
7. Centers for Disease Control and Prevention. *Influenza vaccination information for health care workers*. Available: www.cdc.gov/flu/healthcareworkers.htm (accessed Nov. 17, 2015).
8. Public Health Agency of Canada. National Advisory Committee on Immunization. *Statement on seasonal influenza vaccine for 2014-2015*. Available: <http://phac-aspc.gc.ca/naci-ccni/flu-grippe-eng.php> (accessed Nov. 17, 2015).
9. Public Health Agency of Canada. Final report of outcomes from the National Consensus Conference for Vaccine-Preventable Diseases in Canada. *Can Commun Dis Rep* 2007;33S3:1-56. Available: www.phac-aspc.gc.ca/publicat/ccdr-rmtc/08pdf/34s2-eng.pdf (accessed Dec. 7, 2015).
10. Ahmed F, Lindley MC, Allred N, et al. Effect of influenza vaccination of health care personnel on morbidity and mortality among patients: systematic review and grading of evidence. *Clin Infect Dis* 2014;58(1):50-7.
11. Burls A, Jordan R, Barton P, et al. Vaccinating health care workers against influenza to protect the vulnerable—is it a good use of health care resources? A systematic review of the evidence and an economic evaluation. *Vaccine* 2006;24:4212-21.

12. Thomas R, Jefferson TO, Demicheli V, et al. Influenza vaccination for health-care workers who work with elderly people in institutions: a systematic review. *Lancet* 2006;6:273-9.
13. Salgado CD, Farr BM, Hall KK, Hayden FG. Influenza in the acute hospital setting. *Lancet Infect Dis* 2002;2:145-55.
14. Bean B, Moore B, Sterner B, et al. Survival of influenza on environmental surfaces. *J Infect Dis* 1982;146:47-51.
15. Barker W, Mullooly J. Impact of epidemic type A influenza in a defined adult population. *Am J Epidemiol* 1980;112:798-811.
16. Elder A, O'Donnell B, McCruden E, et al. Influenza B: hospital activity during a community epidemic. *Diag Microbiol Infect Dis* 1983;1:177-83.
17. Nichol KL. Efficacy and effectiveness of influenza vaccination. *Vaccine* 2008;26S:D17-22.
18. Centers for Disease Control and Prevention. *Flu vaccination coverage, United States, 2014-15 influenza season*. Available: www.cdc.gov/flu/fluview/cvcoverage-1415estimates.htm (accessed Nov. 8, 2015).
19. Public Health Agency of Canada. Vaccine coverage amongst adult Canadians: results from the 2012 adult National Immunization Coverage (aNIC) survey. Available: www.phac-aspc.gc.ca/im/nics-enva/vcac-cvac-eng.php (accessed Nov. 8, 2015).
20. Quach S, Pereira JA, Hamid JS, et al. Measuring influenza immunization coverage among health care workers in acute care hospitals and continuing care organizations in Canada. *Am J Infect Control* 2013;41(4):340-4.
21. Quach S, Pereira JA, Heidebrecht CL, et al. Health care worker influenza immunization rates: the missing pieces of the puzzle. *Am J Infect Control* 2013;41(4):685-90.
22. Quach S, Pereira JA, Kwong JC, et al. Immunizing health care workers against influenza: a glimpse into the challenges with voluntary programs and considerations for mandatory policies. *Am J Infect Control* 2013;41(4):1017-23.
23. Ruiz AD, Frei CR, Barner JC, et al. Influenza vaccination rates among pharmacists. *J Am Pharm Assoc* (2003) 2010;50(4):517-22.
24. Rao JNK, Scott AJ. On simple adjustments to chi-square tests with sample survey data. *Ann Stat* 1987;15(1):385-97.
25. Hosmer DW, Lemeshow S. *Applied logistic regression*. 2nd ed. Hoboken (NJ): Wiley-Interscience; 2000.
26. Andrew MK, McNeil S, Merry H, Rockwood K. Rates of influenza vaccination in older adults and factors associated with vaccine use: a secondary analysis of Canadian study of health and ageing. *BMC Public Health* 2004;4:36.
27. Kwong JC, Rosella LC, Johansen H. Trends in influenza vaccination in Canada, 1996/1997 to 2005. *Health Reports* 2007;18(4):9-19.
28. Lam P, Chambers LW, MacDougall P, McCarthy AE. Seasonal influenza vaccination campaigns for health care personnel: systematic review. *CMAJ* 2010;182(12):542-8.
29. Ikura S, Doig C, Laupacis A. *Healthydebate. The evidence and politics of mandatory health care worker vaccination*. Available: <http://healthydebate.ca/2014/02/topic/health-promotion-disease-prevention/the-evidence-and-politics-of-mandatory-health-care-worker-vaccination> (accessed Apr. 29, 2015).
30. Gray M, Mayo P. Should influenza immunization be mandatory for all health care providers? The "pro" side. *Can J Hosp Pharm* 2015;68(1):60-1.
31. Miyata M. Should influenza immunization be mandatory for all health care providers? The "con" side. *Can J Hosp Pharm* 2015;68(1):61-3.