





Original Research

Pharmacists' immunization experiences, beliefs, and attitudes in New Brunswick, Canada

Jennifer E. ISENER , Kathryn L. SLAYTER, Donna M. HALPERIN , Shelly A. MCNEIL ,
Susan K. BOWLES 

Received (first version): 12-Jul-2018

Accepted: 1-Dec-2018

Published online: 20-Dec-2018

Abstract

Background: The expansion of pharmacist scope of practice to include provision of immunizations has occurred or is being considered in various countries. There are limited data evaluating the experiences of Canadian pharmacists in their role as immunizers.

Objective: To describe the experiences of pharmacists in the Canadian province of New Brunswick as immunizers, including vaccines administered and perceived barriers and facilitators to providing immunizations.

Methods: An anonymous, self-administered, web-based questionnaire was offered via email by the New Brunswick Pharmacists' Association to all its members. The survey tool was adapted, with permission, from a tool previously used by the American Pharmacists Association and validated using content validity and test-retest reproducibility. Pharmacist reported immunization activities and perceived facilitators and barriers to providing immunization services were assessed.

Results: Responses from 168 (response rate of 26%) were evaluable. Approximately 90% of respondents worked in community practice full time, 65% were female and 44% were practicing for 20 or more years. Greater than 75% reported administering: hepatitis A and B, influenza, and zoster vaccines. The majority of respondents felt fully accepted (agreed or strongly agreed) as immunization providers by patients, local physicians, and the provincial health department (97%, 70%, and 78%, respectively). Most commonly reported barriers were: lack of a universally funded influenza immunization program, insufficient staffing and space, and concerns around reimbursement for services.

Conclusions: Pharmacists in New Brunswick, Canada are actively participating in the provision of a variety of immunizations and felt fully supported by patients and other healthcare providers. Barriers identified may provide insight to other jurisdictions considering expanding the role of pharmacists as immunizers.

Keywords

Pharmacists; Immunization Programs; Vaccination; Public Health; Professional Practice; Attitude of Health Personnel; Health Knowledge, Attitudes, Practice; Surveys and Questionnaires; Canada

INTRODUCTION

Immunization is a cornerstone of public health through the prevention of infectious diseases and their complications.^{1,2} Prior to the introduction of vaccines, common infectious diseases were the leading cause of mortality worldwide.^{3,4} It is estimated that between 2 and 3 million deaths are prevented each year because of immunization.¹ Despite this, vaccine-preventable diseases remain a global public health concern, with most jurisdictions falling below their immunization coverage goals.⁵⁻⁷

Several strategies have been suggested to enhance vaccination coverage, including the use of non-traditional

vaccine providers (i.e. providers other than family physicians and public health nurses).^{8,9} Pharmacists, as accessible and trusted health care professionals, are in an ideal setting to fulfill multiple roles (such as educator, facilitator or immunizer) in the fight against vaccine-preventable disease.^{10,11} Recommendations to receive immunizations by a pharmacist have been shown to have a positive impact on a person's decision to be immunized.¹²

While pharmacists have functioned as immunizers in the United States since 1996, the scope of pharmacy practice in Canada began to expand to include administration of drugs, including immunizations, more recently, starting in 2007 in Alberta.¹³⁻¹⁵ Legislation in New Brunswick (NB), Canada enabled pharmacists, with appropriate training and a permit, to begin immunizing in 2009 (initiation in practice in 2010), making it the first province in the Maritime provinces of Canada to permit pharmacists to immunize, joining pharmacists in Alberta and British Columbia (2009).^{16,17} Legislation in New Brunswick allowed for the administration of most vaccines (including yellow fever with appropriate training) and injectable medications to those 5 years of age and older; however, remuneration for services were only reimbursed by the provincial government for the provision of influenza vaccines to those meeting specific criteria (e.g. over 65 years of age). The inclusion of pharmacist immunizers in the US has shown benefits, supporting the expanded scope of pharmacy practice to include immunization.¹⁸⁻²⁰ Studies have demonstrated increased influenza vaccination coverage

Jennifer E. ISENER. PharmD. College of Pharmacy, Faculty of Medicine, Canadian Center for Vaccinology, IWK Health Centre and Nova Scotia Health Authority, Dalhousie University, Halifax (Canada). jennifer.isenor@dal.ca

Kathryn L. SLAYTER. PharmD. Faculty of Medicine, Canadian Center for Vaccinology, IWK Health Centre and Nova Scotia Health Authority, Dalhousie University, Halifax (Canada). kathryn.slayter@iwk.nshealth.ca

Donna M. HALPERIN. PhD. Canadian Center for Vaccinology, IWK Health Centre and Nova Scotia Health Authority, Dalhousie University; & Elizabeth and Thomas Rankin School of Nursing, St. Francis Xavier University, Antigonish (Canada). dhalperi@stfx.ca

Shelly A. MCNEIL. MD. Faculty of Medicine, Canadian Center for Vaccinology, IWK Health Centre and Nova Scotia Health Authority, Dalhousie University, Halifax (Canada). shelly.mcneil@nshealth.ca

Susan K. BOWLES. PharmD. Department of Pharmacy, Nova Scotia Health Authority; & College of Pharmacy, Faculty of Medicine, Canadian Center for Vaccinology, IWK Health Centre and Nova Scotia Health Authority, Dalhousie University, Halifax (Canada). susan.bowles@nshealth.ca

rates in states allowing pharmacists to immunize versus those that did not, although some of the studies had methodological concerns.^{21,22} American pharmacists initially focused on provision of seasonal influenza vaccinations, gradually addressing other vaccination needs with time and experience.^{23,24}

While American pharmacists have had successes as immunizers, they have also faced challenges. Although most licensed US pharmacists are trained to administer vaccines, they face numerous barriers such as time, space and concerns about liability and reimbursement.^{23,25,26} Conversely, several facilitating factors have been identified as important, including support from management, year-round immunization programs to maintain competencies, and increasing the number of immunizers in a practice site.²⁷

As immunization administration is more recent for Canadian pharmacists, limited data is available on their perspective on their experiences, and there is no data from any of the Maritime provinces, where pharmacists are thought to fill gaps due to shortages of primary care providers.²⁸⁻³¹ The aim of the study was to determine which vaccines pharmacists in New Brunswick, Canada are providing, and to identify barriers and facilitators associated with immunizing to inform continuing education and practice policy.

METHODS

Study Design and Participants

A web-based self-administered survey, was adapted (with permission) from a survey tool previously used by the American Pharmacists Association incorporating input from Canadian experts in the field and stakeholders using the principles of Dillman.^{32,33} Content validity testing was completed by four reviewers, with expertise in immunization, using a rating worksheet with a four-point content validity index. Questions rated as 1 (not relevant) or 2 (major revisions) were removed and those rated 3 (relevant, minor revision required) or 4 (relevant and succinct) were kept. Test-retest reliability was assessed by five pharmacists completing the survey on two separate occasions, with a correlation co-efficient calculated to compare the two sets of responses. The correlation co-efficient was >0.80, which was determined sufficient to consider the responses as consistent.

The web-based questionnaire was sent via email to NB pharmacists via the New Brunswick Pharmacists' Association (NBPA) between April and June 2014. The email contained a detailed information letter and direct link to the web-based survey. Eligible participants had to be licensed pharmacists in NB working either full- or part-time in a clinical pharmacy setting (community pharmacy, ambulatory clinic or hospital). Two reminder letters were sent via email by NBPA at weekly intervals to improve the survey response rate. All surveys were completed via Opinio software.³⁴ The final survey took approximately 30 minutes to complete, though participants had the option to save their progress and complete the survey later. All contact with pharmacists was directly via NBPA. Survey

participants remained anonymous, and no personal identifiers were collected.

This study was approved by the Research Ethics Board of the Capital District Health Authority (File #CDHA-RS/2014-035 approved May 14, 2013). All research was performed in accordance with relevant guidelines and regulations.

Survey

The survey consisted of a total of 41 questions within the following five domains: 1) demographic information, including primary practice setting and years of practice; 2) immunization training status, confidence in providing immunizations, personal immunization status, and attitudes towards vaccine safety and importance; 3) immunization services offered by their practice site, vaccines provided, and perceptions of barriers to provision of immunization services; 4) immunization services provided by the individual pharmacist; and 5) reimbursement and perception of acceptance as an immunization provider.

Likert scales were a 5-point scale that ranged from Strongly Disagree to Strongly Agree for agreement with statement questions and for frequency of activity questions, the options were "Never", "Rarely", "Sometimes", "Often", and "Always". A copy of the survey may be obtained by contacting the corresponding author.

Data analysis

Survey data was analyzed using descriptive statistics to identify the general respondent characteristics and frequency of responses. Comparison of continuous variables was done using parametric and non-parametric methods as appropriate based on distribution of the data. Chi-square was used for comparison of categorical variables. All analyses were completed using Excel 2013 version (Microsoft Corporation).

Responses to open-ended questions were read and re-read in order to become familiar with the content. Codes were assigned to segments of the data that were relevant to the research question. An inductive coding process was used that informed development of common themes.

RESULTS

The overall survey response rate was 28% (180/635); however only 168 (26%) were evaluable. Table 1 outlines the demographic information of the respondents. The majority (86%, 132/154) reported having received all required adult immunizations and 93% (144/154) reported receipt of the annual influenza vaccine. Of those that responded "yes"; most stated that they received the influenza vaccine to protect their patients, themselves and society. Reasons for responding "no" included personal choice, lack of accessibility, and that they were healthy.

Approximately 93% of respondents indicated that they had completed an injection training program with over 90% of those who completed a program responding that they felt "confident" or "very confident" in providing immunizations based on the training they acquired. When respondents were asked to provide suggestions for additional content that should be included in the online modules and the live

Table 1. Comparison of survey sample demographics to Canadian Institute for Health Information (CIHI) human resources data for pharmacists in New Brunswick in 2013.³⁵

Characteristic	Study result	NB Pharmacist population
Number of Pharmacists	168 evaluable	813 (635 members of NBPA at the time of the survey)
Gender		
Male	34.7%	33.7%
Female	65.3%	66.3%
Age ^a		
<30	17.3%	18.6%
30-39	28.6%	28.5%
40-49	28.6%	27.6%
50-59	19.6%	20%
60+	5.9%	5.4%
Years Practicing ^b		
0-9	35.2%	37%
10-19	20.8%	26.3%
>20	44%	36.6%
Primary Position		
Staff pharmacist	52.8%	65.4%
Owner/Manager	39.6%	28%
Practice Setting (community)	89.9%	75.1%

^aCIHI data provided in bands
^bNote, slight differences in ranges of years, CIHI data provided 0 to 10 years and 11 to 20, and <20, this survey was survey was 0 to 9 years and 10 to 19 years, and 20 years or more

day training, the most common responses were for more information on the management of adverse events following immunization, as well as additional information on providing immunizations to special populations (e.g. immunocompromised individuals and travelers), and further reinforcement of general administration practices, such as selecting needle gauge and length for patients of various sizes and ages.

Over 93% of respondents indicated that they currently administer vaccines in their practice with nearly 80% of them providing immunizations “often” or “always”. Most patients immunized by pharmacists were adults 18 years of age and older with respondents indicating less than 20% (on average) of vaccines administered were to those less than 18 years of age. Approximately 27% of respondents were immunizing for 1 year or less, 49% for 1 to 3 years and 25% for over 3 years. The number and type of vaccines administered in the last year varied between respondents (Table 2 and Table 3). Of the estimated 15,000 vaccines administered based on self-reporting by respondents since they began immunizing, seven adverse events were reported, 6 were vasovagal and 1 was suspected anaphylaxis. All were managed appropriately based on the written responses.

The majority of respondents (>80%) were comfortable or very comfortable initiating conversations with patients about receiving influenza, herpes zoster, hepatitis A or hepatitis B vaccines but less comfortable discussing other vaccines, including pneumococcal, tetanus and meningococcal. The reasons most often cited for why they were uncomfortable were: lack of knowledge of the vaccine, reimbursement concerns, being unsure if it is a

Table 2. Cumulative number of vaccines provided per pharmacist in the last year

Number of vaccines	%
<50	11%
50-100	25%
101-150	22%
151-200	9%
>200	33%

required vaccine, and being unsure about safety in different patient populations.

Most respondents felt fully accepted as immunization providers by patients, with about 97% reporting agreement or strong agreement, as well as most reporting frequent request for vaccine information or advice (Table 4). Seventy percent or more agreed or strongly agreed that they had been fully accepted as an immunization provider by local physicians and health departments. Referrals from other providers were reported by many respondents, with 85% indicating referrals from physicians, 43% reported referrals from nurses, and 32% indicated referrals from public health.

Survey respondents were asked to identify barriers they perceived to providing immunization services from a list of possible barriers, in which they could check all that they felt applied, as well as the option to write-in additional barriers, which are presented in Table 5. Four key barriers identified through quantitative (Figure 4) and qualitative responses (not shown) were: 1) concern about reimbursement, 2) lack of a universal influenza program (reimbursement concerns), 3) insufficient staffing and 4) lack of space for vaccine administrations within the pharmacy.

Comparisons of immunizers versus non-immunizers were not possible due to very few respondents identifying as non-immunizers. Comparisons were made between respondents in practice less than 10 years versus those

Table 3. Number of respondents currently administering various vaccines

Vaccine	Num. Administering / respondents
Hepatitis A	115 / 117
Influenza	117 / 120
Hepatitis B	114 / 117
Herpes zoster	91 / 120
Human papillomavirus	62 / 120
Travel vaccines	43 / 116
Pneumococcal	31 / 117
Tetanus (Td, Tdap)	21 / 113
Meningococcal	16 / 116

Table 4. Frequency of patient/parent requests for vaccine information or advice

Frequency	%
Daily	18%
Weekly	19%
Monthly	23%
Rarely	10%
30% did not respond to this question?	

greater than 10 years. Those practicing less than 10 years were less likely to have concerns about staffing as a barrier (27% versus 45%, $p=0.03$) and were also more likely to have been immunizing for longer than 24 months (78% versus 49%, $p=0.003$).

When asked what was needed to expand immunization services in their practice, respondents' answers were classified according to four categories: scope of practice; logistics; promotion; and training. Regarding scope of practice, many open-ended responses related to the issue that pharmacists should be able to administer all vaccines that are recommended in the publicly funded programs, not just influenza (at least for those individuals 5 years of age and older) and that they should be able to provide them through provincial funding like physicians, who administer most vaccines within the publicly funded systems, and public health, who focus their immunization services to areas where there is a shortage of primary care providers. Some also conveyed that travel vaccines, including yellow fever should also be provided in pharmacies. When discussing logistics, many spoke of the need to have adequate staffing, space, refrigerators and other supplies and equipment, and access to health and vaccine records. Adequate reimbursement was also a major issue raised by respondents. This included providing publicly funded vaccines free of charge and providing an administration fee for those vaccines so that the cost to the consumer would be no different in a pharmacy than in a physician's office. Lack of public awareness was considered an issue with the suggestion that more promotion to the public about the availability of vaccines in pharmacies and the capabilities of the pharmacists be a priority. Promotion to physicians of the benefits of pharmacists providing vaccines and the likelihood that this would not compete with physicians' practices was also considered to be valuable. Continued and ongoing training of pharmacists was felt to be important including both vaccine information, but also practical issues including needle size, gauge, and landmarking. A centrally maintained information website by pharmacists for pharmacists was also thought to be useful. Training of pharmacy technicians was also seen by many as an essential step since they are critical to the proper patient flow and they are not currently involved in vaccine training.

DISCUSSION

This study explored immunization-related activities and perceived barriers to providing immunization services of pharmacists in New Brunswick, Canada within the first five years of legislative changes allowing them to immunize. Most respondents were administering immunizations, providing a variety of vaccines, with the most common being influenza, hepatitis A and hepatitis B, mainly to adults

Table 5. Reported barriers to providing immunizations in respondents' practices

Barrier	%
Reimbursement concerns	66
Lack of universal influenza vaccination	44
Insufficient staffing	42
Lack of space for administration	23
Record keeping	11
Lack of support from physicians	11
Lack of space for vaccination storage	10
Time for certification	10
Managing adverse effects	9
Liability concerns	9
Cost of certification	7
Unable to recognize adverse effects	6
Lack of support from management	5
Note: total number of responses greater than N, as respondents could choose all that applied	

18 years of age and older. Most felt accepted as immunizers by patients and other providers, but identified several barriers, with reimbursement concerns, lack of staff and space restrictions as the most frequently cited obstacles to providing or expanding immunization services. Reported barriers were similar between survey responses and open-ended questions. These data are consistent with those reported by others, where lack of reimbursement by third party payers for vaccines administered in the pharmacy setting was identified as an important challenge in the provision of immunization services.^{26,36-38} This includes the lack of a publicly funded universal influenza immunization program and lack of access to other publicly funded vaccines for adults, such as pneumococcal polysaccharide vaccine. Likewise, lack of staff or time and space restrictions were found to be common concerns.^{26,36-38}

Seasonal influenza vaccine for high risk individuals is the only vaccine for which NB pharmacists are reimbursed within the publicly funded immunization program, so it is not surprising that this was the most frequently administered vaccine.³⁹ Respondents also reported frequent administration of vaccines outside of the publicly funded program (Hepatitis A and B, either as a single vaccine or in combination), likely administered for travel and would be paid out of pocket or by private insurance. Likewise, herpes zoster, also privately funded, was common. Unlike many US jurisdictions, pneumococcal vaccine was not a commonly administered vaccine, probably due to lack of reimbursement through the publicly funded system.³⁷

Like another Canadian study, we found that the majority of respondents have received all required adult immunizations and the annual influenza vaccine.⁴⁰ High immunization coverage in pharmacists offers protection to patients and if they are supporters of immunization for themselves, it is more likely that they will be strong advocates for immunizing their patients.⁴¹⁻⁴³

The majority of respondents felt that they have been fully accepted as immunizers by patients and other providers, which was further supported by how often they indicated they received referrals from other providers. Similar results were seen in a national survey of the public and healthcare providers on the potential role of pharmacists as

immunizers.^{44,45} Despite these positive responses, several concerns were identified around the lack of awareness of the role pharmacists can take in provision of immunizations by various groups, including the public and physicians. Despite some successes, a public relations campaign and targeted efforts with other healthcare providers may be required for full acceptance of pharmacists as immunizers.

Interestingly those practicing less than 10 years, had less concerns about staffing and were immunizing longer than their counterparts in practice greater than 10 years. It is not known whether newer practitioners were more interested in embracing expanded scope of practice or if they felt more pressure to obtain immunization training to obtain and maintain professional employment. This was observed in a recent qualitative study, in which respondents felt compelled to become certified and provide immunizations for employment.⁴⁶

Many concerns have been raised by other providers about the potential issues around pharmacist management of adverse events following immunization.^{47,48} The responses to this study offer further support for the capabilities of pharmacists in this area, as very few identified management of adverse events as a potential barrier, although many did note interest in having more training provided around management of adverse events, and for those that had a patient experience a reaction following immunization, managed it appropriately.

The barriers most frequently identified to providing immunizations were concerns around reimbursement (including, lack of a universally funded influenza vaccination program), insufficient staff and lack of space in the pharmacy. Unfortunately, due to current funding models and limitations within healthcare budgets, these barriers are unlikely to be resolved quickly. Of note, these barriers were also identified in other jurisdictions, adding further support to the barriers identified in this study having applicability across jurisdictions.^{28,49}

Strengths of this study included the development and testing of the questionnaire, which included permitted use of questions from a previously used questionnaire that were adapted for the jurisdiction, discussion with stakeholders on information that would be valuable, and content validity testing, and test-retest reliability prior to deployment. In addition, this study provides the perspective of pharmacists who were newly immunizing in a country with universal health coverage that may provide insight to other similar jurisdictions looking to add this to pharmacist scope of practice.

Although the response rate was lower than anticipated, it was over 20% and our sample appears representative of the pharmacist population in NB with respect to gender and age distribution at the time of the survey.³⁵ The distribution of number of years practicing is similar between our respondents and CIHI data, despite differences in the ranges available (e.g. 0 to 9 years versus 0 to 10 years).³⁵ Differences were seen in the primary position with our study having more respondents who identified as owners or managers compared to the CIHI data for the province. We also had more respondents indicate a community practice setting than the CIHI results. This may be due to the fax reminder sent to pharmacies about the survey from the New Brunswick Pharmacists'

Association. The reminders were focused on community pharmacies and it is possible that more managers and owners were responsible for reviewing faxes received and subsequently more likely to respond. In addition, staff pharmacists may not have had time to fill out the questionnaire during their shift and may not have been willing to do it during off hours. We also anticipated more responses from community pharmacists, as immunizing by pharmacists is primarily completed in the community setting in NB. It is possible that managers and owners may perform different immunizing behaviours and have different concerns (such as reimbursement) than staff pharmacists; however, we are unable to determine what these differences may be. Our response rate however was higher than others recently completed (~18-19%) with pharmacists in Canada around scope of practice or immunization status.^{29,40} An additional limitation was the number of surveys without sufficient responses to be evaluable. As this was the first study of its kind in Canada, it was long, to ensure it captured the breadth and depth of pertinent areas of immunization practice. Despite the length and number of incomplete questionnaires, a sufficient number were evaluable to allow a response rate greater than 25%.

CONCLUSIONS

Pharmacists in New Brunswick, Canada are actively participating in the provision of a variety of immunizations, beyond influenza vaccines, including hepatitis A and B, and herpes zoster. They felt strongly supported by patients and other healthcare providers. The main barriers identified included the lack of a universally funded influenza immunization program, insufficient staffing and space, and concerns around reimbursement for services. The results of this study may provide insight to other jurisdictions considering expanding the role of pharmacists as immunizers. Future work will include development of strategies to overcome identified barriers, in consultation with stakeholders, and evaluation of implementation of strategies. Additionally a replication study may be completed to assess changes in practice over time.

ACKNOWLEDGEMENTS

The authors would like to thank Nicholas Edwards and Tania Alia for their assistance with survey development and administration, Emma Murray for her assistance with manuscript preparation, and the New Brunswick Pharmacists' Association for their support and assistance with administration of the questionnaire. The authors would also like to thank the American Pharmacists' Association (APhA) for sharing their previous survey instrument, which we adapted for our study.

CONFLICT OF INTEREST

All authors declare that they have no competing interests in relation to this project.

FUNDING

Dalhousie Pharmacy Endowment Fund.

References

1. World Health Organization (WHO). Immunization. 2018; Available at: <http://www.who.int/topics/immunization/en/> (accessed February 15, 2018).
2. Plotkin SL, Plotkin SA. 1 - A Short History of Vaccination. In: Plotkin SA, Orenstein WA, Offit PA, Edwards KM, ed. *Plotkin's Vaccines*, Seventh Edition. Amsterdam: Elsevier; 2018.
3. World Health Organization. 10 facts on immunization. 2017; Available at: <http://www.who.int/features/factfiles/immunization/en/> (accessed March 15, 2018).
4. Canadian Public Health Association. The value of immunization in the future of Canada's health system. Ottawa (ON): Canadian Public Health association. 2001; Available at: <http://publications.gc.ca/collections/Collection/CP32-80-4-2001E.pdf> (accessed February 15, 2018).
5. Adult Immunization: Shots to Save Lives. 2010; Available at: <http://healthyamericans.org/assets/files/TFAH2010AdultImmnzBrief13.pdf> (accessed February 15, 2018).
6. World Health Organization (WHO). Immunization coverage fact sheet. 2018; Available at: <http://www.who.int/mediacentre/factsheets/fs378/en/> (accessed March 12, 2018).
7. Jorgensen P, Mereckiene J, Cotter S, Johansen K, Tsolova S, Brown C. How close are countries of the WHO European Region to achieving the goal of vaccinating 75% of key risk groups against influenza? Results from national surveys on seasonal influenza vaccination programmes, 2008/2009 to 2014/2015. *Vaccine*. 2018;36(4):442-452. doi: [10.1016/j.vaccine.2017.12.019](https://doi.org/10.1016/j.vaccine.2017.12.019)
8. Prosser LA, O'Brien MA, Molinari NM, Hohman KH, Nichol KL, Messonnier ML, Lieu TA. Non-Traditional Settings for Influenza Vaccination of Adults: Costs and Cost Effectiveness. *Pharmacoeconomics* 2008 01/15;26(2):163-178. Doi: [10.2165/00019053-200826020-00006](https://doi.org/10.2165/00019053-200826020-00006)
9. Singleton JA, Poel AJ, Lu P, Nichol KL, Iwane MK. Where adults reported receiving influenza vaccination in the United States. *Am J Infect Control*. 2005;33(10):563-570. doi: [10.1016/j.ajic.2005.03.016](https://doi.org/10.1016/j.ajic.2005.03.016)
10. American Pharmacists Association. Guidelines for Pharmacy-Based Immunization Advocacy. Available at: <http://www.pharmacist.com/guidelines-pharmacy-based-immunization-advocacy> (accessed March 15, 2018).
11. Canadian Pharmacists Association. Influenza Immunization Guide for Pharmacists 2015. Available at: [https://www.pharmacists.ca/cpha-ca/assets/File/education-practice-resources/InfluenzaGuide_English_2015\(1\).pdf](https://www.pharmacists.ca/cpha-ca/assets/File/education-practice-resources/InfluenzaGuide_English_2015(1).pdf) (accessed March 15, 2018).
12. Grabenstein JD, Hartzema AG, Guess HA, Johnston WP. Community pharmacists as immunisation advocates: A pharmacoepidemiologic experiment. *Int J Pharm Pract*. 1993;2(1):5-10.
13. Hogue MD, Grabenstein JD, Foster SL, Rothholz MC. Pharmacist involvement with immunizations: a decade of professional advancement. *J Am Pharm Assoc* (2003). 2006;46(2):168-179. doi: [10.1331/154434506776180621](https://doi.org/10.1331/154434506776180621)
14. Alberta College of Pharmacists. Alberta Influenza Immunization Program Resource Guide for Pharmacists. Available at: <https://pharmacists.ab.ca/sites/default/files/InfluenzaImmunizationResourceDoc.pdf> (accessed March 18, 2018).
15. Secretariat for Pharmacy National Coordinating Office. Environmental scan: Pharmacy practice legislation and policy changes across Canada. Ottawa Ontario: Canadian Pharmacists Association; 2014.
16. Blanchard P. New Brunswick Pharmacists Association. Flu shots at Pharmacies Gaining in popularity. Available at: <https://nbpharma.ca/news/9/page-4> (accessed February 15, 2018).
17. Pharmacists and publicly Funded Vaccines in B.C. General information. Available at: <https://www2.gov.bc.ca/assets/gov/health/health-drug-coverage/pharmacare/vaccine-guide.pdf> (accessed February 15, 2018).
18. Isenor JE, Edwards NT, Alia TA, Slayter KL, MacDougall DM, McNeil SA, Bowles SK. Impact of pharmacists as immunizers on vaccination rates: A systematic review and meta-analysis. *Vaccine*. 2016;34(47):5708-5723. doi: [10.1016/j.vaccine.2016.08.085](https://doi.org/10.1016/j.vaccine.2016.08.085)
19. Higginbotham S, Stewart A, Pfalzgraf A. Impact of a pharmacist immunizer on adult immunization rates. *J Am Pharm Assoc* (2003). 2012;52(3):367-371. doi: [10.1331/JAPhA.2012.10083](https://doi.org/10.1331/JAPhA.2012.10083)
20. Taitel MS, Fensterheim LE, Cannon AE, Cohen ES. Improving pneumococcal and herpes zoster vaccination uptake: Expanding pharmacist privileges. *Am J Manag Care*. 2013;19(9):e309-e313.
21. Grabenstein JD, Guess HA, Hartzema AG, Koch GG, Konrad TR. Effect of vaccination by community pharmacists among adult prescription recipients. *Med Care*. 2001;39(4):340-348.
22. Steyer TE, Ragucci KR, Pearson WS, Mainous AG. The role of pharmacists in the delivery of influenza vaccinations. *Vaccine*. 2004;22(8):1001-1006. doi: [10.1016/j.vaccine.2003.08.045](https://doi.org/10.1016/j.vaccine.2003.08.045)
23. Kummer GL, Foushee LL. Description of the characteristics of pharmacist-based immunization services in North Carolina: results of a pharmacist survey. *J Am Pharm Assoc* (2003). 2008;48(6):744-751. doi: [10.1331/JAPhA.2008.07080](https://doi.org/10.1331/JAPhA.2008.07080)
24. Neuhauser MM, Wiley D, Simpson L, Garey KW. Involvement of immunization-certified pharmacists with immunization activities. *Ann Pharmacother*. 2004;38(2):226-231. doi: [10.1345/aph.1D257](https://doi.org/10.1345/aph.1D257)
25. Pace AC, Flowers SK, Hastings JK. Arkansas community pharmacists' opinions on providing immunizations. *J Pharm Pract*. 2010;23(5):496-501. doi: [10.1177/0897190010362105](https://doi.org/10.1177/0897190010362105)
26. Srivastav A, Black CL, Lutz CS, Fiebelkorn AP, Ball SW, Devlin R, Pabst LJ, Williams WW, Kim DK. U.S. clinicians' and pharmacists' reported barriers to implementation of the Standards for Adult Immunization Practice. *Vaccine*. 2018;36(45):6772-6781. doi: [10.1016/j.vaccine.2018.09.024](https://doi.org/10.1016/j.vaccine.2018.09.024)
27. Westrick SC, Mount JK. Impact of perceived innovation characteristics on adoption of pharmacy-based in-house immunization services. *Int J Pharm Pract*. 2009;17(1):39-46. doi: [10.1211/ijpp.17.1.0006](https://doi.org/10.1211/ijpp.17.1.0006)

28. Foong EA, Edwards DJ, Houle S, Grindrod KA. Ready or not? Pharmacist perceptions of a changing injection scope of practice before it happens. *Can Pharm J (Ott)*. 2017;150(6):387-396. doi: [10.1177/1715163517732089](https://doi.org/10.1177/1715163517732089)
29. Rosenthal M, Tsao NW, Tsuyuki RT, Marra CA. Identifying relationships between the professional culture of pharmacy, pharmacists' personality traits, and the provision of advanced pharmacy services. *Res Social Adm Pharm*. 2016;12(1):56-67. doi: [10.1016/j.sapharm.2015.05.003](https://doi.org/10.1016/j.sapharm.2015.05.003)
30. Smith C. Finding family doctor the 'ultimate challenge' says immigrant. Available at: <http://www.cbc.ca/news/canada/new-brunswick/family-medicine-doctor-shortage-new-brunswick-population-immigrants-1.4559721> (accessed April 3, 2018).
31. Munroe I. Wait list for family doctors in Nova Scotia hits 33,216. Available at: <http://www.cbc.ca/news/canada/nova-scotia/nova-scotia-health-authority-wait-list-family-doctor-patients-1.4190077> (accessed April 3, 2018).
32. Dillman DA. Mail and internet surveys: the tailored design method. 2nd ed. New York: John Wiley & Sons; 2000.
33. American Pharmacist Association. Annual pharmacy-based influenza and adult immunization survey 2013. Washington DC 2013.
34. Objectplanet. Opinio. Available at: <http://www.webcitation.org/6pCnfzr7l> (accessed June 15, 2015).
35. Canadian Institute for Health Information. Pharmacists 2016: Data Tables. Available at: https://secure.cihi.ca/free_products/PHARM-2016-data-tables-en-web.xlsx (accessed March 15, 2018).
36. Kummer GL, Foushee LL. Description of the characteristics of pharmacist-based immunization services in North Carolina: results of a pharmacist survey. *J Am Pharm Assoc (2003)*. 2008;48(6):744-751. doi: [10.1331/JAPhA.2008.07080](https://doi.org/10.1331/JAPhA.2008.07080)
37. Islam JY, Gruber JF, Lockhart A, Kunwar M, Wilson S, Smith SB, Brewer NT, Smith JS. Opportunities and Challenges of Adolescent and Adult Vaccination Administration Within Pharmacies in the United States. *Biomed Inform Insights*. 2017;9:1178222617692538. doi: [10.1177/1178222617692538](https://doi.org/10.1177/1178222617692538)
38. Pace AC, Flowers SK, Hastings JK. Arkansas Community Pharmacists Opinions on Providing Immunizations. *J Pharm Pract*. 2010;23(5):496-501. doi: [10.1177/0897190010362105](https://doi.org/10.1177/0897190010362105)
39. Government of Canada. Public Funding for Influenza Vaccination by Province/Territory (as of September 2017). 2017; Available at: <https://www.canada.ca/en/public-health/services/provincial-territorial-immunization-information/public-funding-influenza-vaccination-province-territory.html> (accessed March 15, 2018).
40. Ziegler B, Alsabbagh W, Houle S, Wenger L, Church D, Waite N. Protecting our patients by protecting ourselves. *Can Pharm J (Ott)*. 2016;149(4):246-255. doi: [10.1177/1715163516651630](https://doi.org/10.1177/1715163516651630)
41. Dolan SM, Cox S, Tepper N, Ruddy D, Rasmussen SA, MacFarlane K. Pharmacists' knowledge, attitudes, and practices regarding influenza vaccination and treatment of pregnant women. *J Am Pharm Assoc (2003)*. 2012;52(1):43-51. doi: [10.1331/JAPhA.2012.10141](https://doi.org/10.1331/JAPhA.2012.10141)
42. Douville LE, Myers A, Jackson MA, Lantos JD. Health care worker knowledge, attitudes, and beliefs regarding mandatory influenza vaccination. *Arch Pediatr Adolesc Med*. 2010;164(1):33-37. doi: [10.1001/archpediatrics.2009.252](https://doi.org/10.1001/archpediatrics.2009.252)
43. Mytton OT, O'Moore EM, Sparkes T, Baxi R, Abid M. Knowledge, attitudes and beliefs of health care workers towards influenza vaccination. *Occup Med (Lond)*. 2013;63(3):189-195. doi: [10.1093/occmed/kqt002](https://doi.org/10.1093/occmed/kqt002)
44. MacDougall D, Halperin BA, Isenor J, MacKinnon-Cameron D, Li L, McNeil SA, Langley JM, Halperin SA. Routine immunization of adults by pharmacists: Attitudes and beliefs of the Canadian public and health care providers. *Hum Vaccin Immunother*. 2016;12(3):623-31. doi: [10.1080/21645515.2015.1093714](https://doi.org/10.1080/21645515.2015.1093714)
45. Welch AC, Ferreri SP, Blalock SJ, Caiola SM. North Carolina Family Practice Physicians' Perceptions of Pharmacists as Vaccinators. *J Am Pharm Assoc (2003)*. 2005;45(4):486-491. doi: [10.1331/1544345054475414](https://doi.org/10.1331/1544345054475414)
46. Gerges S, Peter E, Bowles SK, Diamond S, Bucci LM, Resnick A, Taddio A. Pharmacists as vaccinators: An analysis of their experiences and perceptions of their new role. *Hum Vaccin Immunother*. 2018;14(2):471-477. doi: [10.1080/21645515.2017.1403695](https://doi.org/10.1080/21645515.2017.1403695)
47. Houle SKD. Canadian pharmacists as immunizers: Addressing questions related to this new scope of practice. *Can J Public Health*. 2017;108(4):e418-e420. doi: [10.17269/cjph.108.6119](https://doi.org/10.17269/cjph.108.6119)
48. Bazzell B, Kelling S, Diez H, Klein K. Identifying opportunities for improvement in safety and efficacy of community pharmacy immunization programs. *J Pharm Pract*. 2018 [Epub ahead of print]. doi: [10.1177/0897190018761410](https://doi.org/10.1177/0897190018761410)
49. Kelling SE, Pattin A, Salim A, Kilgore P, Erickson SR. Cross-sectional survey of perceived barriers among community pharmacists who do not immunize, in Wayne County, Michigan. *Infect Dis Ther*. 2016;5(4):525-533. doi: [10.1007/s40121-016-0129-7](https://doi.org/10.1007/s40121-016-0129-7)