Pharmacist-administered immunizations in British Columbia

An exploration of current practices and perspectives

Alexandra Fletcher, MSc Candidate

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Department of Family Medicine, Division of Experimental Medicine
McGill University, Montreal

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Abstract

Introduction: With the increasing burden being placed on the health care system by an aging population and the rise of chronic disease, healthcare professionals other than physicians are being called upon to take on more clinical duties. In line with this, in recent years, Canadian pharmacists in some provinces have been given the right to provide a wide range of expanded patient services, including immunization. British Columbia was the first province to grant pharmacist immunization rights in 2009. As such, as Canadian leaders in this practice, it is important to examine the practices and perspectives of pharmacists in the province to better understand what can be expected in the Canadian context.

Objectives: 1) Describe current and expected immunization practices in community pharmacies; 2) Examine pharmacist- and pharmacy- level characteristics associated with certification and the identification of barriers to providing in-pharmacy immunization; 3) Describe pharmacist reasons for not being certified to vaccinate.

Methods: The 42 item questionnaire was emailed to all pharmacists registered with the BCPhA in 2012 by Ipsos Reid. Frequency counts and descriptive statistics were generated to describe respondents' demographic information, pharmacy characteristics, barriers to vaccination and reasons for not being certified to immunize. Multivariate logistic regression was used to examine pharmacist and pharmacy characteristics associated with being certified to administer vaccines. It was also used to examine how the identification of barriers was associated with various pharmacist and pharmacy characteristics.

Results: The overall survey response rate was 17.2% (663/3,847). The current analysis was restricted to the community pharmacists only (n=551). Overall, 71.3% (393/551) of respondents were certified to administer vaccines. Pharmacists provided a wide variety of vaccines, the most common ones being influenza, hepatitis A and hepatitis B. The vast majority of pharmacists were also interested in

administering non-vaccine injectables. Pharmacist-level characteristics associated with being certified to immunize were younger age, and being a pharmacy manager or owner, as compared to staff. With respect to pharmacy characteristics, chain pharmacies and foodstores were more likely to have certified pharmacists than independent pharmacies. Regarding barriers to immunization, the two most commonly identified barriers to providing vaccinations in the pharmacy setting were remuneration and time. Barrier identification differed by pharmacist- and pharmacy- level factors. Compared to non-certified pharmacists, certified pharmacists were less likely to identify space barriers. With respect to pharmacist position, among certified pharmacists, staff and managers were twice as likely as owners to identify time as a barrier. Regarding pharmacy type, foodstore pharmacists much more likely to identify space barriers than independents or chain pharmacies. Foodstores were more likely than chains to identify time barriers, but less likely to identify remuneration barriers.

Conclusions: Over 70% of the surveyed community pharmacists are involved in immunizations in BC. Several pharmacist and pharmacy characteristics, including years in practice, pharmacist position and type of pharmacy, are associated with certification status. Pharmacist position and pharmacy type were also shown to influence the identification of barriers.

Résumé

Introduction: Le vieillissement de la population et l'impact croissant des maladies chroniques placent un fardeau sur les services de santé, ce qui encourage les professionnels de la santé à prendre en charge de plus en plus de responsabilités cliniques. Dans ce contexte, les pharmaciens de certaines provinces canadiennes ont été autorisés à étendre leur gamme de services aux patients, y compris dans le domaine des vaccinations. La Colombie-Britannique fut la première province à autoriser les pharmaciens à vacciner, en 2009. En conséquence, en tant que chefs de file du Canada en matière de vaccinations, il est important d'examiner les pratiques et perspectives de ces pharmaciens afin de mieux comprendre ce qui peut être attendu de ces pratiques dans le contexte canadien.

Objectifs : 1) Décrire les pratiques courantes et anticipées dans les pharmacies de proximité; 2) Examiner les caractéristiques de pharmaciens et de pharmacies associées à la certification et identifier les barrières affectant les vaccinations dans les pharmacies; 3) Décrire les raisons expliquant pourquoi certains pharmaciens ne sont pas certifiés pour vacciner.

Méthodes : Un sondage comprenant 42 questions fut envoyé par Ipsos Reid à tous les pharmaciens membres de la BCPhA (British Colombia Pharmacy Association) en 2012. Des comptes de fréquence et des statistiques descriptives furent générées afin de décrire les données démographiques des répondants, les caractéristiques des pharmacies, les barrières à la vaccination et les raisons pour lesquelles certains pharmaciens ne sont pas certifiés pour vacciner. La régression logistique multivariée fut utilisée afin d'examiner les caractéristiques des pharmaciens et des pharmacies associées à la certification pour vacciner. Cette méthodologie fut aussi utilisée afin d'examiner l'association entre la perception des barrières à la vaccination et diverses caractéristiques des pharmacies et des pharmaciens.

Résultats : Le taux de réponse du sondage fut de 17,2% (663/3,847). L'analyse présentée dans ce document porte uniquement sur les pharmaciens de communauté (n=551). Globalement, 71.3% (393/551) des répondants étaient certifiés pour vacciner. Les pharmaciens offraient une vaste gamme de vaccins, les plus communs étant la grippe, l'hépatite A et l'hépatite B. La vaste majorité des pharmaciens étaient intéressés à l'idée d'administrer d'autres injections que des vaccins. Les caractéristiques des pharmaciens associées à la certification pour vacciner incluaient l'âge (les plus jeunes étant les plus à même d'être certifiés) et la fonction de propriétaire ou directeur (comparés aux employés). Quant aux caractéristiques des pharmacies, les chaînes et pharmacies de magasins généraux étaient plus à même d'avoir des pharmaciens certifiés que les pharmacies indépendantes. Les deux facteurs identifiés le plus souvent comme étant des barrières à la vaccination étaient la rémunération et le temps requis. L'identification des barrières variait en fonction des facteurs concernant les pharmaciens et les pharmacies. Comparés aux pharmaciens non-certifiés, les pharmaciens certifiés identifiaient moins de barrières quant à l'espace requis. Parmi les pharmaciens certifiés, les employés et directeurs étaient deux fois plus susceptibles que les propriétaires de considérer le temps requis comme une barrière. Les pharmacies de magasins généraux étaient beaucoup plus susceptibles que les chaînes ou les pharmacies indépendantes d'identifier l'espace requis comme une barrière. Les pharmacies de magasins généraux étaient plus à même que les chaînes d'identifier le temps requis comme une barrière, mais moins susceptibles de considérer la rémunération comme une barrière.

Conclusions: Plus de 70% des pharmaciens de communauté ayant participé au sondage offraient des vaccinations en Colombie-Britannique. De nombreuses caractéristiques de pharmaciens et de pharmacies sont associées à la certification pour vacciner, incluant le nombre d'années de pratique, la position hiérarchique (employé, directeur, propriétaire) et le type de pharmacie. Il est aussi démontré que la position hiérarchique et le type de pharmacie influencent l'identification de barrières à la vaccination.

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The completion of my thesis would not have been possible without the continuous and available support of my supervisor Dr. Janusz Kaczorowski. Through his guidance, Dr. Kaczorowski has provided me with the necessary tools to properly complete a thorough research project. He also encouraged me to produce a manuscript-based thesis, which will allow me to graduate with two publications (hopefully!) under my belt, providing me with a strong start in research. I would also like to thank Dr. Fawziah Marra, a pharmacist based in BC who has provided very pertinent information regarding the situation on the ground with respect to pharmacist immunizers and has been a continuous source of important feedback during the conception and writing of my thesis. Finally, I would like to thank the third member of my thesis committee, Dr. Gillian Bartlett, for providing such a positive introduction to family medicine over the course of the first year of my master's degree. Her passion for the discipline has inspired me to start envisaging my own future as a clinician researcher. These individuals have been an integral part of my training as a family medicine researcher, and the experience I have gained through my discussions with them have not only introduced m to research, but have also allowed me to gain valuable collaboration and real-world problem-solving skills.

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Finally, I would like to thank my friends and family for their constant support, and the friendly staff at the 24-hour Second Cup on McGill College.

Preface and contribution of authors

A survey was conducted in 2012 among pharmacists in British Columbia, which was the first province to allow pharmacists to immunize. Some of the results from this survey have been explored in the two manuscripts presented within this thesis. The first manuscript is entitled: "Pharmacist and pharmacy characteristics associated with being certified to immunize in British Columbia, Canada." Its objective is to determine current and expected pharmacist involvement in immunization activities and identify pharmacist and pharmacy characteristics associated with being certified to immunize. The second, entitled: "Community pharmacist-identified barriers to providing vaccinations in British Columbia, Canada" will use salient findings from the first in order to provide a deeper understanding of how barriers to in-pharmacy vaccination differ based on certain pharmacist and pharmacy characteristics. It will examine the relationship between the identification of barriers to in-pharmacy vaccination and certification status, pharmacist-position and pharmacy type. It will also identify pharmacists' reasons for not being certified to immunize.

The co-authors on both manuscripts are Janusz Kaczorowski and Fawziah Marra. Dr. Kaczorowski is my supervisor. He is the holder of the Docteur Sadok Besrour Endowed Chair in Family Medicine, and the holder of the GSK-CIHR Chair in Optimal Management of Chronic Disease. He is associated with the department of Family and Emergency Medicine at the University of Montreal. Dr. Marra is one of my thesis committee members. She has a doctorate in pharmacy, and she is a professor in the Faculty of Pharmaceutical Sciences at the University of British Columbia, as well as an associate member with the Department of Family Medicine. They were responsible for organizing the creation and dissemination of the survey. They have also provided guidance for the appropriate methodology to be used in my analysis, and have read through many drafts of the manuscript to improve its' coherence. With help from the co-authors, I was responsible for creating the research objectives, conducting the analyzing and writing the vast majority of the article.

Introduction

In the history of infectious diseases, vaccination is a recent intervention; even by the beginning of the 20th century, few measures to control the spread of infectious disease existed.[1] Despite its recent origins, vaccination has been hailed as one of the most important achievements in medicine for controlling and eliminating endemic diseases in the 20th century because of its impact on death, illness, and disability.[2] Apart from access to clean water, no other medical intervention, including the use of antibiotics, has had a great an impact on reducing population morbidity and mortality.[1]

The first vaccine was developed by the Englishman Edward Jenner against smallpox in 1976.[3] Prior to Jenner, attempts to control smallpox were limited to *variolation*, a potentially dangerous procedure which involved exposing a healthy individual to scabs or pus extracted from the pock of an infected individual.[1] Over the course of the next century, significant advances were made in the scientific understanding of micro-organisms which allowed for the successful development of a wider variety of vaccines. However, it was only with the advent of stationary cell cultures in the mid-twentieth century that viruses for vaccination production could be grown in vitro in a relatively easy and safe manner, which lead to an enormous increase in creativity and productivity in the field of vaccinology.[1]

Although the science of vaccines was advancing, childhood vaccination was mostly limited to industrialized countries until the 1970s. Even with the polio campaign initiated in 1955 that resulted in millions of school-age children being vaccinated and protected against devastating paralysis, the World Health Organization (WHO), in its 1958 publication *The First Ten Years of WHO,* concluded that although successful, "a massive program of vaccination with the inactivated vaccine is very expensive and can hardly be justified in areas where poliomyelitis is, relative to other diseases, a minor problem".[4] In the early 1970s, the attitude towards mass

vaccination shifted when the success of the smallpox eradication campaign proved that universal access to vaccines was feasible.[5] Bolstered by this success, in 1974 the WHO decided to take advantage of the international network already established for the smallpox campaign to push forward an even bolder agenda.[5] This resulted in the creation of the *Expanded Immunization Programme* (EIP) which promoted global initiatives to target six common childhood diseases for which cost-effective vaccines existed: diphtheria, pertussis, tetanus, measles, poliomyelitis, and tuberculosis.[4] Within the structure of the program, there was a gradual shift from using mobile health personnel support units to deliver the program to implementing it in regular healthcare settings, setting the scene for what we see today in pediatric care.[5] An indicator of the stunning success of the program is the percentage of children who now receive three doses of DTP3 (diphtheria, tetanus and pertussis). In 1980, the global average was approximately 20%; it is now 85%.[5]

Childhood vaccine schedules have been so successful that the burden of morbidity and mortality for vaccine-preventable diseases is increasingly being shouldered by the adult population.[6] Lessons learned from the development of this highly effective pediatric vaccination program can be used towards strengthening adult vaccination coverage.[7] A policy statement produced by the Infectious Diseases Society of America referred to the childhood vaccination structure to outline the following actions that should be taken to improve under-immunization in adolescents and adults: 1) increase demand for adult and adolescent immunization by improving public and provider awareness; 2) strengthen the health care system's capacity to deliver vaccines to adults and adolescents; 3) expand provision of vaccines to adults and adolescents in public and private health insurance programs; 4) promote adult and adolescent immunization as an important measure of health care quality in managed care and other health care organizations; 5) monitor and improve the performance of the nation's vaccine delivery and safety monitoring systems for adults and adolescents; 6) assure adequate support for research regarding adult and adolescent vaccine-preventable diseases and vaccines.[7] As will be discussed in this literature review, pharmacists are well equipped to address many aspects of this

model, especially with regards to improving public and provider awareness, increasing the system's capacity to deliver vaccines and promoting immunization as an important element of overall care. Although the delivery of vaccines by pharmacists is a relatively recent intervention, pharmacists have been involved with vaccination since its discovery.

The history of pharmacist involvement in immunization has been well documented, although much of the available literature is from the United States. Following Jenner's discovery, pharmacists became involved in the distribution of smallpox vaccines, and during the diphtheria outbreaks of the late 19th and early 20th centuries, pharmacists were recruited to supply diphtheria antitoxin.[8] They also played a pivotal role in the mass distribution of polio vaccine in the late 1950s and early 1960s internationally.[8] However, it was only in 1970 that an American task force convened to discuss the emerging roles of the pharmacist, which included administering medication by injection.[8] Nevertheless, another quarter century passed before the American Pharmacists Association (APhA) commenced its training program for vaccine administration in November 1996.[8] The immunizing role of pharmacists initially stemmed from a need to improve coverage in pediatric populations, however, adult populations have emerged as a greater priority for pharmacists.[8] In the following decade, most of the groundwork research establishing the important impact pharmacists could have on immunization rates was produced, providing the impetus to gradually change legislation governing the role of pharmacists across the country. By 2009, all fifty states had granted pharmacists the right to vaccinate, although regulation varied by state.[9]

In comparison to the US, Canada has made incremental but slow progress; currently five out of thirteen regions allow pharmacists to vaccinate. This progress has been guided and promoted by the Blueprint for Pharmacy, a collaborative initiative spearheaded by the Canadian Pharmacy Association (CPhA) to 'define a vision and clear action plan for the future of pharmacy'.[10] The need for a task force to define the future of pharmacy in Canada was identified upon recognition that the major

health care problems in society today require a stronger emphasis on health promotion, disease prevention and self-management of chronic disease, delivered by inter-professional teams.[10] Immunization by pharmacists is just one element of this vision to better align pharmacy services with the needs of Canadians. It is an important element though, which is why this literature review seeks to respond to four main questions:

1) Why is adult vaccination an important issue in Canada?
2) What are the major patient-identified barriers to immunization, including Canadian-specific barriers?
3) What evidence exists to show that pharmacists can overcome these barriers?
4) What are the patient, physician and pharmacist perspectives on pharmacist-administered immunizations?

Literature review

The importance of immunization

Vaccine recommendations for adults in Canada

Vaccines have been overwhelmingly effective at preventing disease in Canadian children. [6] However, the vaccine coverage and adherence seen in pediatric populations has not been carried over to adults, which has resulted in a shift in classically pediatric diseases being seen more frequently in adults.[6] This shift can be explained by two phenomena: the cohort effect and herd immunity, which are addressed in more detail in the section on vaccine mechanism of action. This shift is occurring despite the fact that provincial and national associations (in Canada, the main responsible association is the National Advisory Committee on Immunization [NACI]) have released recommendations that clearly indicate adults be immunized or receive booster vaccines against measles, mumps, rubella, tetanus, diphtheria, pertussis and varicella, all of which are vaccines received during childhood.[11] Other vaccines recommended for adults, such as those against HPV, meningococcus and hepatitis A and B, are targeted to high-risk populations.[11] Travel vaccines are recommended to travellers intending to visit regions prone to breakouts for specific diseases. Additionally, the pneumococcal and zoster vaccination is recommended to all adults over 65, as well as to younger adults with significant medical co-morbidities.[11] Finally, and most importantly, the bodies responsible for immunization in Canada and the US recommend universal vaccination against influenza for all individuals over six months of age, with an emphasis on individuals who are more likely to suffer severe complications from the flu, namely older adults and individuals with certain medical conditions including pregnancy, and those who interact with them, such as their health care professionals.[12,13]

The cost of vaccine preventable disease in Canada

Influenza is a common, highly contagious respiratory disease that is best prevented through annual immunization.[14] In Canada, it continues to be a significant cause of morbidity and mortality, and therefore an important target for immunization

campaigns.[12] Additionally, annual administration is required because genetic changes to the virus's makeup necessitate the constant reformulation of the vaccine.[15] There are several types of vaccines against influenza, including the unadjunvated trivalent influenza vaccine (TIV), the adjunvated trivalent influenza vaccine (ATIV) and the live attenuated influenza vaccine (LAIV).[6,16] Although the comparative efficacy of these are still being determined and seem to depend on the patient population and the strain used, the most common vaccine administered is still, by far, the TIV. [6,16] Unless stated explicitly, all references to the influenza vaccine refer to the TIV. Other vaccines recommended to adults are important as well, but for the sake of brevity, only influenza will be considered in the following in terms of its cost, both in lives and in healthcare expenditures. This will be done in order to demonstrate that even tackling one of the many vaccine-preventable diseases that afflict adults can have a substantial impact on health outcomes.

Influenza is the eighth leading cause of death in Canada, so concerns over effective prevention are warranted.[17] The number of laboratory-reported influenza cases in Canada has varied anywhere between 4,000 to 30,000 cases per year over the last decade, with more cases sometimes being reported during pandemic years. [18] However, the symptoms, and therefore reporting, of influenza vary widely, and it has been estimated that in any given year, between 10-20% of the population may be affected. [19] It should be noted that, like influenza estimates themselves, many vaccine preventable disease burden estimates are actually under-representations of the problem, due to reporting issues and confounding factors.[6] Deaths attributable to influenza in Canada have been estimated to be between 2000 and 8000 per year, with most of the mortality burden being shouldered by individuals over 65 years of age.[20] Despite the impact of influenza, immunization rates have hovered around 30% for the Canadian population between 2008 and 2012, although significantly more individuals over the age of 65 were vaccinated (an average of 62%) during the same timeframe. This stands in contrast to desired coverage targets, which include 100% coverage of vaccinators, 95% coverage of residents of long-term care facilities and staff who have extensive contact with residents and 80% coverage of persons

aged over 65 years of age, persons under 65 years of age with high risk conditions, persons with household contacts of people at high risk and health care workers.[21]

The significant loss of life aside, these numbers suggest that the financial toll of influenza is also important, and that cost-effective interventions to increase coverage should be sought. Although economic studies on the impact of targeted influenza immunization programs in Canada are dated,[22] a review of the literature by Nichol et al found that many studies, mainly from the US, support the view that the vaccine is cost saving in both healthy elderly individuals and those with chronic conditions.[23] Studies published internationally, including a Canadian study by Helliwell et al,[22] have found the vaccine to always be cost-effective and often cost saving.[23] In addition to the targeted publicly funded immunization programs that are common internationally, Canada is the site of a unique experiment in universal, publicly funded influenza vaccination. In 2000, the government of Ontario implemented a free universal influenza immunization program (UIIP), the first of its kind in the world. When comparing vaccinations rates before and after UIIP, it was shown that the mean vaccination rate for individuals over 12 years old increased 20% (18%–38%) for Ontario, compared to 11% (13%–24%) for other provinces during the same time period ($p<0.001$).[24] Deaths attributable to the disease decreased 61% and influenza-associated health care use, determined through calculating hospitalizations, emergency department use and doctor's visits, decreased by at least 40% compared with other provinces.[24] A cost-benefit analysis of this program compared it to targeted influenza immunization campaigns, which are common in the rest of Canada.[15] Although program costs were nearly double, the program reduced health care spending by 52%, and was therefore cost-effective at $10,797/QALY gained.[15] Most interventions in Canada are deemed as cost effective when a quality-adjusted life-year (QALY) is less than $50,000. [15]

Although the Ontario case of universal free access to the vaccine is still the exception, the vaccine is generally either cost-effective or even cost-saving because of how effective it is at reducing the transmission of the virus. These estimates

generally range between 70-90%, provided there is a good match between the circulating strain and the vaccine.[19] Among the non-institutionalized elderly, the main sufferers of influenza, vaccination may reduce the number of hospitalizations by 25–39% and has also been shown to reduce overall mortality by 39–75% during influenza seasons. [19] The efficacy differences between influenza vaccines is still subject to some debate. For example, it is possible that the ATIV might be increasingly recommended to older adults, who have waning immune responses, and younger children, in whom the vaccine is more effective and safer.[25] There is strong evidence that any influenza vaccine is more effective and safer than no immunization, and that it is cost-effective to implement a universal publicly funded vaccination program when the budget silos are removed and the healthcare systems approach is taken.

Vaccine mechanism of action

Vaccines work by stimulating the body's defense system, known as the immune system, to recognize an infection so that it can launch an appropriate response upon subsequent exposure.[26] Exposing a person to a small amount of killed or live germ contained in a vaccine allows it to build up antibodies, which function to recognize and destroy similar germs in the future.[26] Antibody memory can exist for years, enabling some vaccines to be given as a single dose; others wane with time, which necessitates booster shots.[26]A vaccine is a safer way to build immunity than being exposed to an active pathogen, which can be lethal. Without vaccines, an individual's first exposure to the infectious agent could be their last, because immunity had not been built up against the invader.[26,27]

Vaccines not only prevent infection at the individual level, but they also confer population-level protection, via 'herd immunity'. With many infectious diseases, approximately 90% of the susceptible population must be immunized in order to achieve eradication, assuming roughly homogeneous rates of transmission.[28] This is premised on the fact that in order for an infection to spread, a critical mass of individuals must be susceptible to the infection.[28] Therefore, by vaccinating a

significant proportion of a population, it becomes increasingly unlikely that an infection can find a new host. This of course is the main rationale behind universal immunization programs. The exact immunization coverage target is dependent on the infectivity of a disease, the course of infection within an individual and the social and demographic makeup of the population.[29] In addition to stemming the flow of infection, 'herd immunity' confers protection onto individuals who cannot (due to contraindications to vaccination, such as being immuno-compromised) or choose not get vaccinated.[30]

The dynamics of immunity explain why adults are increasingly shouldering the burden of vaccine preventable disease. The first reason is 'herd-immunity', as described above, which suggests that as the proportion of vaccinated individuals in a population increases, more time is required before the disease is passed on to an immunologically-naïve individual, which results in an increase in the average age of infected individuals.[28,31]. The other reason is the 'cohort-effect', in which "immunization results in a decrease in the incidence of disease in pediatric populations (who are adequately vaccinated); however, it has no impact on the incidence of disease in unvaccinated or under-vaccinated adult populations. Therefore, it results in an overall increase in the proportion of affected adults."[6]

The efficacy of vaccines is still a point of contention for some individuals. Typical arguments against vaccinations include the belief that they cause idiopathic diseases, are used to profit pharmaceutical industries, only provide temporary immunity, and are alternatives to healthy lifestyles.[32] While this is an alarming trend, it suffices to say that all recommended vaccines on the Canadian National Advisory Committee on Immunization's (NACI) list are supported by a significant body of international evidence.[33] It should be noted that some resistance does come from a more scientific source, especially with regards to the surrogate end points that are used to measure vaccine-efficacy. In 2012, Osterholm et al questioned previous meta-analyses [34,34,35] that included studies using diagnostic endpoints for identifying influenza infections, which have been shown to overestimate effect

sizes.[36] Instead, their meta-analysis only included studies which used RT-PCR or viral culture, both of which are direct virus detection methods, and found a lower efficacy than the 70-90% typically reported in the previous studies indicated.[16] Nevertheless, even this highly critical study concluded that the influenza vaccine is useful and safe, although less effective than originally believed. Furthermore, surrogate end points are an important part of the accelerated process to make vaccines, and medication generally, with the potential to significantly reduce the risk of morbidity or mortality available more quickly.[37] However, Osterholm does raise the important issue of using better-validated endpoints to determine realistic efficacy values for vaccines.

Barriers to immunization

What are the barriers to immunization?

There are both individual and organizational level barriers to immunization (see Appendix 1 a) for a summary table of articles identified). The individual-level social and psychological factors modulating the decision to get the influenza vaccine were identified through a 2013 systematic review of studies from the US and the UK by Wheelock et al.[38] Their findings have been summarized below, in order of publication frequency. The impact of each factor was not weighted or quantified. Social influence was a vaccination determinant that could either encourage or discourage individuals from getting vaccinated. A recommendation, or lack of, from a health care professional could play an important role in the decision to vaccinate, although experiences, especially negative ones, of family members or friends could also influence one's decision to vaccinate. Disease related factors were also identified. Perceived susceptibility to influenza was an important determinant in the decision to vaccinate, as was the belief that influenza is a serious disease. Vaccine-related factors could often dissuade individuals from vaccinating as well; the fear of vaccine side-effects, concerns regarding safety and effectiveness, as well as needle-fear and injection pain have been associated with non-vaccinators. An individual's belief in prevention was associated with vaccinating, and lack of consideration or

simple forgetfulness tended to decrease vaccination likelihood. A revealing, important factor in the decision to vaccinate is awareness of both the need to vaccinate, as well as where to get it. Interestingly, in this review, it was only a factor that was identified in studies based in the US and not in the UK. This reveals fundamental differences in the way the influenza vaccine is promoted in these two countries. Finally, the above factors influence decisions of individuals who have received the flu shot in the past to get it again.

These themes have been reflected in Canadian studies, such as the 2010 survey by Kiberd et al.[39] In this survey, some vaccine-preventable diseases were identified as having more important health impacts than others. For instance, respondents considered getting vaccinated against influenza (62%) and hepatitis (20%) as more important than all other current immunization recommendations. Less than 2% knew that pertussis, HPV, pneumonia, and shingles could be prevented by immunization. A similarly small minority of respondents could remember having been offered a tetanus or pertussis shot. These findings indicate that Canadians are poorly informed on vaccine importance, with the exception of influenza and possibly hepatitis. Similarly, an older (2003) Canadian study on perceptions of vaccines reported that, on average, respondents replied with 'uncertain' to three of the 20 survey questions, with up to 45% responding with uncertainty when asked about vaccine safety, a factor that is strongly related to vaccination likelihood.[40] On the other hand, despite these uncertainties, the survey identified a generalized support for the efficacy of vaccines, despite respondents being sometimes unwilling to renounce concurrent anti-vaccine opinions. Another study on reasons why Canadians chose not to receive the influenza vaccine summarizes the two above beliefs; among those who had not received it within the last year, 71.3% of respondents simply "did not think it was necessary", with the second most common answer, chosen by 17.6% of respondents, was "did not get around to it".[41] What emerges from these types of studies is that Canadians need more knowledge on the importance of vaccines in order to make informed decisions and to dispel conflicting views on vaccination. Remedying this knowledge gap will go a long way towards

improving vaccination rates, as the studies mentioned above have shown important associations between attitudinal and knowledge factors and a willingness to vaccinate.

Although many of the discussed barriers were individual factors associated with immunization, these barriers are often influenced by the larger context. The larger context influencing vaccination can be broken down into provider and system-level barriers. At the provider level, only between one third and one-half of health care workers are immunized against influenza.[42] This is much lower than the Canadian target of 80%. Furthermore, unvaccinated providers are less likely to recommend the vaccine to their patients.[43,44] Moreover, structures to monitor immunization are both lacking and when in place, they are not always systematically used.[45,46] Additionally, providers are often unaware of whether a patient is at high risk or not, or whether they have already been vaccinated.[45] It has been shown that physicians in tertiary settings, where there is generally a concentration of high-risk patients, are not always up to date with the latest vaccine recommendations.[47] Finally, the biggest challenge at the systems level is balancing supply and demand and the logistical demands of vaccine distribution and administration.[45,48]

How can pharmacists assist in overcoming the barriers to immunization?

The fundamental change to be made that would allow pharmacists to substantially influence vaccination rates is at the system-level, which would require the implementation of policies that allow for the transfer of responsibilities to non-physician staff.[46,49,50] There is much evidence that indicates that this would be a good strategy to follow (see Appendix 1 b) for a summary table of articles identified). .

At the individual level, numerous community-based programs have been successful at delivering tailored, culturally-sensitive immunization programs, which have emphasized partnerships with community-leaders.[51,52] On example of pharmacists adapting in-house immunization programs to suit the needs of their population is in

an assisted living facility (ALF) in Seattle, where pharmacists worked with the site's health care workers and directors to produce culturally sensitive, translated materials to the site's multi-ethnic Asian population for an immunization program.[53] Pharmacists have also successfully been employed to target health disparities in Latino populations.[54] Still, pharmacist-provided immunization services have not yet been able to completely overcome ethno-cultural disparities. It was shown that among community pharmacy clients, both Caucasian and Afro-American individuals are more likely to be vaccinated than their counterparts who did not visit pharmacies, yet inequalities still persist between the two groups even when socio-demographic variables are accounted for.[55] This gap illustrates a continued need for targeted immunization campaigns.

There are also many individual-level barriers related to a need for education on many aspects of vaccines; safety, efficacy, side-effects, susceptibility to a disease and so on, as identified in the previous section. Several studies have shown that pharmacists are well suited to tackling education gaps. As trusted sources of health information,[56] pharmacists are potent vaccine advocates; a randomized placebo controlled study in three pharmacies showed that unvaccinated individuals receiving mailed advice from a pharmacist were 1.74 times more likely to go get vaccinated.[57] Pharmacists have also successfully employed personal selling (personalized letter and/or consultation with patient) to encourage patients to receive their Herpes Zoster vaccine.[58] Patients in this group were less likely to identify a lack of physician referral as a reason for not getting vaccinated, and were more likely to have a positive attitude towards receiving the vaccine even if they chose to remain unvaccinated after consultation with the pharmacist. Pharmacies in Germany which offered intensive vaccination education and consultation services during a five-week period significantly increased rates for all the vaccines that were targeted (from between 10% to about double), despite the fact that the patients had to return to the physician with the vaccine recommendations in order to physically receive their shots.[59]

These educational needs on the consumer-side are tied to provider-level solutions to improving coverage rates; there is evidence suggesting that patient reminders, provider education and prompting and physician incentives are effective ways to increase adult immunization coverage [60,61] Many of these strategies are already in use by doctors; family physicians and general internists from across the US who were surveyed regarding measures taken to improve seasonal influenza vaccination reported to use the following strategies: posters and pamphlets (84%); vaccinations given without an appointment (79%); extra staff for vaccine-only visits during regular office hours (47%); weekend/after-hours vaccination clinics (35%); written, telephone or email reminders to patients to get vaccinated (30%); computerized method to identify patients needing a vaccine (30%); actively planning and collaborating with public health departments to vaccinate patients (14%); and actively planning and collaborating with pharmacies to vaccinate patients (5%). Although these initiatives are important, the results indicate that as of yet, physicians tend to prefer strategies that do not involve active collaboration with community pharmacists. Although a similar survey has not been conducted among pharmacists, this survey suggests why pharmacists are already in an excellent position to provide shots; they already have extended opening hours on evenings and weekends, they are in a position to screen patients for shots whenever they conduct medication reviews, and most studies on pharmacist-implemented vaccination programs involved raising awareness through both impersonal (poster and pamphlet) and personalized recommendations.

Pharmacists might be in an even better position than physicians to improve coverage. One of the reasons why pharmacists are so effective at improving vaccination rates is because they are also in an excellent position to screen clients for pneumococcal vaccine eligibility while offering the influenza vaccine (the two shots can be administered simultaneously).[62] In comparison, physicians often miss opportunities to suggest additional vaccines during routine visits.[63] Using a sample of clients who had received their influenza vaccine at Walgreen's Pharmacy between August and November 2010, Taitel et al compared their immunization rates for

pneumococcal vaccine with a baseline rate derived from national medical and pharmacy claims database of commercial and Medicare health plan members. [64] Pharmacy users who had also received the flu shot had a pneumococcal vaccination rate that was significantly higher than baseline (4.9% vs 2.9%, p<.001). Although this study cannot establish causality, the evidence suggests that clients who rely on the pharmacy to receive their flu shots are more likely to receive other shots for which they are eligible, such as PPSV.

The impact of pharmacist immunizers on immunization rates

Many studies, on both small and large scales, have shown that pharmacist-provided immunizations can improve rates for a wide variety of vaccines, although the most commonly studied was influenza. This is due to the fact that it is widely recommended, recorded and delivered on an annual basis, which allows for yearly comparisons. Below are the major studies which have provided the evidence for allowing pharmacists to vaccinate in all fifty states, and have also influenced Canadian decision-makers. It is important to stress that these studies have been conducted in a variety of settings and at different points in the last fifteen years, providing rigorous evidence that pharmacist-immunizers can improve vaccination rates (see Appendix 1 c) for a summary table of articles identified). .

Foundational studies on pharmacist-immunizers

By performing a secondary analysis of the Behavioral Risk Factor Surveillance System (BRFSS) survey between 1995 and 1999, Steyer et al were able to show that there was a significant difference in influenza vaccination (the only vaccination recorded by the US-wide survey) in states where pharmacists could immunize. This result applied to individuals between 18 and 65 years of age, and by 1999, to those over 65 years old. This difference held true even after controlling for socio-demographic factors.[65] Important state-wide research in Oregon illustrated that pharmacies and their clients embraced this practice; research conducted during the first three years of allowing pharmacists to immunize in Oregon indicated that both the number of participating pharmacies, as well as the absolute number of influenza

vaccinations provided by pharmacists, increased over the period in question.[66] Importantly, the pharmacy attrition rate was low.[66]

This statewide research was conducted to support previous exploratory studies that all suggested pharmacists could improve vaccination rates. A 1997 study by Ernst et al conducted in a single rural pharmacy practice in Iowa studied the impact of having pharmacists screen patients for and administer the flu shot.[67] It found that patients who had not received the flu shot the previous year were significantly younger on average, and among them, 45.3% indicated that they would not have gone elsewhere to receive the vaccination. Another study conducted by Rosenbluth et al in rural community pharmacies in five West Virginian counties concluded that having pharmacists partner with nurses was an acceptable way to offer year-long immunization services to both adults and infants.[68] Only one of the participating pharmacies discontinued the practice in the fourth of five years that the project ran for because the site had few infant patients. The service was well-received by the community and no major issues arose with local health care providers. In this case, various methods (direct mailing, flyers, etc) were used to promote the service. A different study conducted in Virginia in 2000, this time in 19 supermarket pharmacy locations, showed that influenza and pneumococcal vaccine provision increased between the first and second years of the study, and concomitant advertising efforts for the service raised awareness of pharmacy-provided enhanced patient services among the public and local physicians alike.[69] Additional benefits included increased pharmacist enthusiasm for delivering enhanced patient services and generated additional revenue. Further evaluation of immunization delivery in these supermarkets in 2007 revealed that since its inception, the percentage of pharmacists administering vaccines increased yearly, as did the number and types offered (except during years of short supply).[70] The chain started by offering only influenza and pneumococcal vaccines but has grown to encompass all routine adolescent and adult immunizations, including hepatitis A, hepatitis B, measles, mumps, rubella, varicella, meningococcal, and tetanus–diphtheria.[70]

Increasing the accessibility of immunization services

Many of these early studies focused on rural areas, as the need for immunization there was most acute. The need to vaccinate underserved populations is still an issue that can be fittingly addressed by pharmacists. A study conducted on the ability of pharmacies to immunize medically underserved areas (MUA) during the 2009-2010 influenza season in Walgreen's across the United States revealed that in the two states with the highest percentage of population residing in MUAs, pharmacies located in MUAs administered 68.6% and 54.0%, respectively, of all influenza immunizations administered by Walgreens in those states. [71] On a more local scale, a 2012 study by Higginbotham et al, a pharmacist-immunizer embedded within a primary health care clinic for the medically underserved was able to significantly improve rates for influenza and tdap, with the help of an immunization needs assessment (INA) to identify high-risk patients.[72] What is especially interesting regarding this study is that in one of the control groups, patients were encouraged by the pharmacist to give the INA form to their physician, instead of receiving the shot directly from the dedicated pharmacist-immunizer. The additional task of bringing the results to the physician reduced the effectiveness of the INA form as an educational tool to promote vaccination five-fold. Through conversation with physicians at the primary health care clinic, it was determined that although they valued the use of the INA by others (pharmacists) to improve rates, they were not supportive of adding it to their workload.

Besides serving populations living in MUAs, the evidence also points to pharmacists being effective immunization providers for high-risk patients in settings beyond the community pharmacy. It is quite apparent that one of the most effective ways to improve vaccination rates is simply to bring the service closer to patients. For example, pharmacists working in an assisted living facility (ALF) were shown to improve vaccination rates for influenza from 64% in the previous year to 83% (equivalent to 58 ALF residents) by conducting two two-hour on-site vaccination sessions.[53] Although the efforts involved in implementing this service were labor intensive, providing the service on-site freed up time workers would have spent

transporting the ALF residents to a local clinic, overcoming a significant barrier to vaccination in this high-risk population. Overall, satisfaction with the service was high among clients and staff and the processes used in the study would be applicable in similar long-term residency settings. Another population at high-risk are those who with cardiovascular disorders.[73] Targeted approaches especially need to be employed for individuals under 65 with chronic disease, who are less likely than their older counterparts to be vaccinated despite recommendations.[13] One potential solution is to provide vaccinations at a site these patients visit on a regular basis, such as a secondary prevention lipid clinic.[73] In this context, clinical pharmacists working with cardiologists to optimize treatments for patients with pre-existing cardiovascular disease, and the follow-up patients receive on a regular basis, provides an excellent opportunity to also screen whether they have received their influenza vaccination or not. Implementing screening as part of usual activities resulted in almost doubling the number of patients getting up to date with their vaccines, and the age disparity in vaccination rates was eliminated. The success of this operation was explained by the fact that the immunization was offered as part of a routine check-up, and that no additional visits were required. This type of screening protocol can be well adapted to tertiary care settings as well. Standing orders programs which allow both nurses and pharmacists to screen patients for eligibility, administer the vaccine and watch for adverse events can be applied safely and effectively in hospital settings.[74] A pharmacist-administered standing orders program resulted in a increase from a 15% to an 87% pneumococcal vaccination rate for inpatients between 2003 and 2005, although in this case nurses were responsible for the actual administration.[62] This research, conducted at the University of Pittsburg Medical Center, illustrated that pharmacists can be trained to identify high-risk patients.[62] This latter point is an important consideration because in other similar research, in-hospital physicians have noted that they are sometimes unsure of current vaccine recommendations, so having a designated pharmacist responsible for identifying patients can be crucial.[75] The success of these various measures is due mostly to the fact that some of the steps that would have had to be

taken by patients in order to get vaccinated are reduced. Another key rate-limiting step, obtaining a physician's time and/or consent, is also eliminated.

One objection that has been raised to pharmacy-provided vaccinations is that the service simply shifts the site where individuals are vaccinated instead of increasing absolute coverage. To determine whether this was in fact the case, a study by Grabenstein etal that compared rates between Washington and Oregon (at a point when Washington allowed pharmacist-immunization and Oregon did not) showed that increased rates were seen in Washington as compared to Oregon, even though the percentage of individuals vaccinated at traditional sites remained unchanged.[76] This evidence, in conjunction with the statewide studies conducted by Steyer et al and Bearden and Holt proves conclusively that pharmacist immunizers can improve absolute immunization rates.

Perceptions of pharmacists as immunizers

Patients and physician perspectives

Although in its early stages pharmacists did encounter issues related to the acceptability of their role as vaccinators, these barriers have been shown to diminish with time and familiarization. (see Appendix 1 d) for a summary table of articles identified). Their role has gradually been accepted by the public for a variety of reasons, one of which is simply because as shown, pharmacists can overcome the barriers associated with accessibility and awareness. Patients have been overwhelmingly positive about the competency of pharmacists as immunizers; when rating whether the time spent during the consultation was adequate, satisfaction with the immunization service their pharmacist provided and communication level with the pharmacists, satisfaction levels were mostly well above 85%, according to a survey conducted in Iowa.[77] In Canada, a recent Ipos Reid poll that asked patients to identify what type of services they hoped their pharmacy could provide, nine out of ten Canadians strongly agreed that trained pharmacists should be able to administer doctor-prescribed vaccines.[78] On the other hand,

support for pharmacists is lower when survey participants are asked to consider childhood vaccines, indicating that the public has yet to see the pharmacist as a vaccine provider equal to the physician.[79]

With respect to physicians, there are various ways in which they can collaborate with pharmacists to improve immunization rates. Physicians and pharmacists can work together to set up mass-vaccination clinics, physicians can choose to refer patients to third parties (such as pharmacists) to receive their vaccinations, and vaccines can be bought and sold between public health departments and practices.[80] However, in a recent survey on physician attitudes towards collaboration with pharmacists, 21% of physicians were either very unwilling or somewhat unwilling to refer patients to other sites for vaccination, and 36% of physicians either strongly agreed or somewhat agreed with the statement that they were not comfortable with pharmacies administering vaccines to their patients.[80] The main concern physicians had with collaboration with other groups was related to documentation; half of the physicians surveyed identified transfer of vaccination records as either a significant (24%) or moderate (31%) barrier to collaboration. The second most frequently identified barrier was the time it would take to collaborate. Willingness to refer patients to community vaccination resources was positively associated with agreeing that it would be more convenient for patients to get vaccinated in the community and that it would increase coverage rates, and negatively associated with concerns over lost income and fear that referring patients would be a lost opportunity for providing medical services to patients with chronic diseases.

The physicians' perspective, although valid, suggest a potential misunderstanding of the types of patients pharmacists are most likely to vaccinate. Pharmacists can make most impact on populations who are otherwise much less likely to be vaccinated. For instance, pharmacists can positively affect vaccination rates in populations who have difficult access to the health care system because they live in medically underserved areas[71] or because of mobility issues.[53] There is also the segment of the population, in general healthier, younger, working age adults, that

value convenience and proximity over experience and trust.[81] This accessibility consideration is reflected in the fact that 30% of vaccinations provided by pharmacists are during off-hours and on weekends or even holidays.[82] People appreciate the fact that they can get vaccinated at the pharmacy at their convenience, and they often choose to go at a time when they needed to visit the pharmacy for another reason.[83]

Pharmacist perspective

For the most part, pharmacists themselves have viewed their role as immunizer favourably; a 2009 survey of community pharmacists in Arkansas reported that professional advancement was one factor that encouraged pharmacists to get certified.[84] Other research has shown that concerns for public health and personal satisfaction are more potent motivators for providing vaccines than either economic interests or continuing education credits.[85] There are also specific pharmacist and pharmacy level characteristics associated with being certified to administer vaccinations. Certain characteristics seem to consistently be more common in pharmacists who are certified to immunize, compared with those who are not. In general, pharmacists who have been in practice for fewer years are more open to administering.[86] Position seems to be related as well; owners and managers are more likely to be certified than staff.[87] In contrast, the type of pharmacy most likely to administer vaccines seems to vary. In 2003, a national survey by Kamal et al reported that independent and chains were just as likely as the other types of pharmacies to provide immunizations. In contrast, Pace et al reported that independents and chains were more likely than grocery store pharmacies to immunize,[88] and Westrick found that independent pharmacies were most likely to provide immunizations.[89] The main reservations pharmacists have are more pragmatic in nature; lack of time and space, as well as reporting requirements and liability issues were reported as barriers in a 2003 study by Neuhauser et al.[90] In Alberta, where pharmacists have been authorized to vaccinate since 2006, similar barriers were identified, with insufficient remuneration being an additional barrier

identified.[91] There are also pharmacists who are just not interested in providing immunizations.[90]

As with other expanded patient services in pharmacies, the response from pharmacists about adding vaccination services is similar. A review of in-house pharmacy services by Eades et al found that in general, pharmacists are positive about their role as health promoter, but it is still considered to be secondary to more traditional activities, namely medication dispensing.[92] Depending on the public health problem being addressed (smoking cessation, sexual health, etc), the perception of pharmacists is mixed.[92] Some programs are viewed more favorably than others, such as smoking cessation as compared to the provision of injection equipment, which was considered by some to be objectionable.[92] Opinions varied depending on both the location of the pharmacy (eg. The UK vs. Estonia) and experience providing these services (as experience increased, there was less objection).[92] Attitudes towards providing a given public health service are also affected by the type of intervention involved. For instance, a Canadian study indicated that pharmacists would be more interested in providing medical services for smoking cessation rather than assessing nicotine dependence, an opinion that was also seen in a Scottish study that indicated pharmacists would forego some salary benefits to provide minor illness recommendations instead of health promotion advice.[93] In general, pharmacists are more clinically oriented and prefer to tackle less controversial issues, and training can lower hesitations to implementing any type of intervention. Although this review did not discuss immunization practices, evidence from both Canada and the US has indicated that pharmacists are very willing to vaccinate,[86,94] and this review suggests it could be because immunization is a relatively non-controversial, clinically-oriented activity.

The issues that still need to be addressed are mainly pragmatic in nature. First of all, in order to provide these services, pharmacists need to feel competent to do so. It has been well-documented that confidence in engaging in a behavior is a predictor of whether an individual will actually perform said behavior.[95] This holds true for

pharmacists; in a 2003 systematic review looking at pharmacist acceptance of public health roles, training has consistently been shown to have a positive effect on attitudes.[96] Given this, it becomes evident that in order for pharmacists to provide public health services confidently, training and practice is required. There are several ways to provide training. Currently in Canada, pharmacists who are interested in providing immunizations must complete an immunization-training program and possess valid CPR and First Aid certificates. Depending on the province, this training might or might not have to be renewed every few years. Another alternative would be to provide immunization training in pharmacy schools, which is currently the case in 38% of pharmacy schools in the US.[97] This has already become part of the pharmacy curriculum in Alberta, where students are trained in their third year.[98] Following the training, students were then responsible for running a vaccination clinic for students and staff against influenza, where 99% of respondents were either satisfied or very satisfied with this experience.[99] There are different options being used in Canada and elsewhere to certify pharmacists, although it could be argued that as pharmacist immunization becomes a more common practice, pharmacists that attended a school that included certification training could be at an advantage when it comes to finding a job following graduation.[97]

There are also practical aspects that make immunization more or less feasible in a community practice setting. A 2009 study by Westrick et al identified two mechanisms to enhance compatibility between the service and the practice setting.[100] The first is more conducive to the average setting: it involves implementing mechanisms for evaluating the program in order to actively identify trouble spots and modify them. The second is unique in that it requires the involvement of 'champions' to implement the service in a way that is already compatible with the setting. These approaches could be used to overcome the barriers to vaccination that were previously identified, the most important of which are time, space and remuneration. They will also result in solutions that are specific to a given pharmacist population and pharmacy setting, which is important as the

acceptance of in-pharmacy immunization practices often differs between these contexts.

Conclusion

Pharmacists are well-positioned to improve vaccination rates by overcoming barriers associated with both education and accessibility. However, much of the current research in the field of pharmacist immunizers is based in the US, so it will be important to determine whether we can expect the same or even greater success with pharmacist immunizers in Canada.

The original research component of this thesis is based on a survey conducted in BC. Given that BC was the first province in Canada to allow pharmacists to vaccinate, the experiences of pharmacists in the province can provide valuable insight into how the program can be best adjusted to the Canadian context. The survey results will enable the BCPhA to identify opportunities and barriers currently affecting pharmacists' ability to offer vaccines at the pharmacy. The information will assist the BCPhA in addressing the needs of BC pharmacists and in designing relevant training initiatives. The specific objectives of the survey can be summarized as follows:

- Determine patient services provided at the pharmacy;
- Identify types of vaccines stocked and administered at the pharmacy;
- Identify barriers and benefits of offering vaccines at the pharmacy;
- Identify training initiatives that would impact vaccine management/ adoption;
- Investigate experience with the Herpes Zoster vaccine;
- Obtain reactions to a potential public immunization program for the Herpes Zoster vaccine;
- Explore interest in administration of non-vaccination injections at the pharmacy.

Some results of this survey have been explored in the two manuscripts presented within this thesis. The first manuscript is entitled: "Pharmacist and pharmacy characteristics associated with being certified to immunize in British Columbia, Canada." Its objective is to determine current and expected pharmacist involvement in immunization activities and identify pharmacist and pharmacy characteristics associated with being certified to immunize. The second, entitled: "Community pharmacist-identified barriers to providing vaccinations in British Columbia, Canada" will use salient findings from the first in order to provide a deeper understanding of how barriers to in-pharmacy vaccination differ based on certain pharmacist and pharmacy characteristics. It will examine the relationship between the identification of barriers to in-pharmacy vaccination and certification status, pharmacist-position and pharmacy type. It will also identify pharmacists' reasons for not being certified to immunize.

One of the first steps to be taken is to gain a better understanding of current and expected pharmacist-immunization practices and perspectives. As such, the specific objectives of the two manuscripts are to:

1) Describe current and expected immunization practices in community pharmacies;
2) Examine pharmacist- and pharmacy- level characteristics associated with certification and the identification of barriers to providing in-pharmacy immunization;
3) Describe pharmacist reasons for not being certified to vaccinate.

Bridging document

The following manuscript, entitled “Pharmacist and pharmacy characteristics associated with being certified in British Columbia, Canada”, will explore current and expected pharmacist involvement in immunization activities and identify pharmacist and pharmacy characteristics associated with being certified to immunize. It provides the reader with an overview of the situation in BC, compared with the second manuscript, which is more specific. Given that both this first manuscript and the second were both based on the same survey, there is overlap in the description of methods and pharmacist- and pharmacy- related demographics, as well as the limitations.

Title Page

Pharmacist and pharmacy characteristics associated with being certified to immunize in British Columbia, Canada.

Alexandra Fletcher, MSc; Fawziah Marra, BSc (Pharm), PharmD; Janusz Kaczorowski, PhD

Pharmacist and pharmacy characteristics associated with being certified to immunize in British Columbia, Canada.

Abstract

Background: In 2009, the government of British Columbia implemented policies to increase vaccination coverage in the province by allowing pharmacists to administer vaccines upon receiving appropriate training and certification. In order to describe current immunization practices across the province, a survey of all pharmacists registered with the British Columbia Pharmacy Association (BCPhA) was conducted in 2012.

Objectives: To determine current and expected pharmacist involvement in immunization activities and identify pharmacist and pharmacy characteristics associated with being certified to immunize.

Methods: The 42 item questionnaire was emailed to all pharmacists registered with the BCPhA in 2012 by Ipsos Reid. Frequency counts and descriptive statistics were generated for respondents' demographic and practice site characteristics. Multivariate logistic regression was used to examine pharmacist and pharmacy characteristics associated with being certified to administer vaccines.

Results: The overall survey response rate was 17.2% (663/3,847). The current analysis was restricted to the community pharmacists only (n=551). Overall, 71.3% (393/551) of respondents were certified to administer vaccines. Pharmacists provided a wide variety of vaccines, the most common ones being influenza (464 [84.4%]), hepatitis A (395 [71.7%]) and hepatitis B (397 [72.1%]. The vast majority (445 [80.8%]) were also interested in administering non-vaccine injectables. Compared to pharmacists who had been in practice for 5 years, pharmacists who had been in practice for over 20 years were less likely to be certified (OR: 0.18; 95% CI: 0.09-0.36). Position was also associated with certification; pharmacy managers (OR; 2.30; 95% CI: 1.43-3.67) and pharmacy owners (OR: 2.49; 95% CI: 1.23-5.05)

were more likely to be certified than staff. With respect to pharmacy characteristics, chain pharmacies (OR: 1.89; 95% CI: 1.07-3.42) and foodstores (OR: 6.89; 95% CI: 3.22-14.76) were also more likely to have certified pharmacists than independent pharmacies.

Conclusions: Over 70% of community pharmacists are involved in immunizations in BC. Several pharmacist and pharmacy characteristics, including years in practice, pharmacist position and type of pharmacy, are associated with certification status.

Introduction

With the rise of chronic disease, an aging population and proliferation of clinical practice guidelines, the Canadian primary care system is increasingly challenged to cope with escalating patient demands while controlling costs.[101,102] The gap between limited resources and demand can be at least partially reconciled by turning to other highly trained primary health care professionals, including community pharmacists. One area in which pharmacists can potentially have an important impact is adult immunization.[103] Canadian adults consistently fail to meet immunization targets for most recommended vaccines, despite the merits of vaccination and endorsements by the National Advisory Committee on Immunization (NACI) and other health organizations.[6] Furthermore, vaccination demands will only continue to grow as society ages and chronic disease becomes more prevalent. Given the regularity with which most individuals visit their pharmacy, pharmacists are well-positioned to address the most pressing barriers to vaccination among Canadians, such as a lack of awareness of the benefit of vaccinations and the necessity for a highly accessible venue to administer vaccinations.[41] In-pharmacy services can raise awareness through advertising and counseling at the time of medication dispensing and they can facilitate easier access. This idea was put into practice in British Columbia (BC) in 2009.

With the pressure created by the need for widespread immunization against the H1N1 virus, the BC Ministry of Health Services changed the regulations governing the scope of practice for pharmacists to include administering

certain injections, including vaccinations.[86] By November 2013, nearly half (~2700) of all pharmacists had received certification to administer injections in the province.[104] Initially, pharmacists only had access to the public supply of pandemic H1N1, seasonal influenza and polysaccharide pneumococcal vaccines. The success of these initial programs, however, led the BC Immunization Committee to further expand pharmacists' access to publicly funded vaccines in February 2013. Prior to this date, pharmacists were required to order vaccines from private suppliers and charge patients or third party payers for the cost of the vaccine and its administration. Pharmacists now have access to, and are remunerated for, the administration of additional publicly funded vaccines, including Td (tetanus diphtheria), MMR (measles, mumps, and rubella) and HPV-Cervarix.[104] Pharmacists also have the authority to administer some other publicly funded vaccines by special request.[104]

The objective of this study was to describe current and expected pharmacist involvement in immunization activities and to identify pharmacist and pharmacy characteristics associated with being certified to immunize.

Methods

The University of British Columbia partnered with the BCPhA and Ipsos Reid to conduct a survey of BC pharmacists in order to describe and better understand pharmacist-administered immunization practices in the province. Ipsos sent an email to all pharmacists registered with the BCPhA, inviting them to participate in the online survey. The BCPhA's contact list contained valid email addresses

for 3,910 pharmacists out of a total of 4,197 in the province at the time the survey was administered. Among them, 51 were on Ipsos Reid's 'do not contact list' and 12 opted out of the survey, for a final denominator of 3,847. Additionally, pharmacy owners and managers were sent an endorsement letter from the BCPhA highlighting the importance of obtaining feedback from the pharmacists in their stores. Finally, efforts were made to contact pharmacists who started but did not complete the online survey. Only the results from completed surveys were used. The electronic format required all questions to be answered in order for a survey to be considered complete, so there was no missing data.

The survey took approximately 15 minutes to complete. It comprised of 42 questions and was open from July 6 to November 21, 2012. The content was based on previous surveys conducted in BC and elsewhere.[86,94] It contained questions pertaining to demographics, certification status, types of vaccines being provided, barriers to in-pharmacy immunization, available pharmacy and fridge space, thoughts on non-immunization related injections and travel vaccines and the future of immunization in BC.

Frequency counts and descriptive statistics were generated for respondents' demographic information and pharmacy characteristics. A two-sided significance level of 0.05 was used in all statistical tests. Multivariate logistic regression was used to examine pharmacist and pharmacy characteristics associated with being

certified to administer vaccinations. Collinearity was assessed using the Pearson correlations and variance inflation factors. The model included relevant pharmacist- and pharmacy-level variables. At the pharmacist-level, gender, years in practice, position and decision-making influence were included in the model. Pharmacy-level variables included location of the pharmacy (health authority and rural or urban setting), pharmacy-type, number of patient services provided and number of registered patients over 65. It should be noted that the analysis of pharmacy-related demographics were conducted at the individual pharmacist level. Examination of the postal codes of respondents showed that most of the responding pharmacists came from different pharmacies. Only a small number of pharmacies were represented by more than one pharmacist (with a maximum of four pharmacists per pharmacy). All analysis were conducted using SPSS 21.0 software. *). Ethics approval for the study was obtained from the UBC Behavioural Ethics Committee.*

Results

Response rate:

Of the 3,847 pharmacists that received the survey, a total of 663 pharmacists responded (response rate of 17.2%). This analysis included only the community pharmacists (551 [83.1%]). The remaining respondents (112 [20.3%]) were excluded because they have self-identified as hospital pharmacists or 'other', or because they worked at a non-community pharmacy site (head office position, hospital, other.

1.0 Demographics

1.1 Pharmacist-related demographics

Among the respondents, 50.6% (279) were women. Over half (302 [55%]) of the pharmacists were between 31 and 50 years old, and almost half (263 [48%]) had been practicing for more than 19 years. Forty five percent (250) of the pharmacists self-identified as staff, 40% (217) as managers and 15% (84) as owners. More than three-quarters (427 [77.5%]) indicated that they influence decisions made at their site of practice. Finally, of all the community pharmacists surveyed, 71.3% (393) were authorized to administer injections at the time of the survey.

1.2 Pharmacy-related demographics

Pharmacies were located in all 5 of the province's health authorities, including Fraser (121 [28.5%]), Vancouver (87 [23.1%]), Vancouver Island (74 [22.1%]), Interior (80 [20.6%]) and Northern (21 [5.7%]) health authorities. Using the second digit from the postal codes (0 = rural) that the pharmacists provided, it was determined that 11.4% (63) of the pharmacies were located in rural, and 88.6% (488) were in urban settings. The pharmacies were of various sizes, with 43.4% (239) serving between 1000-5000 patients over the age of 65. Pharmacies were classified as either independent, banner/franchise/chain (referred to in the rest of the text as 'chain'), foodstore or mass merchandiser. About half of the pharmacies (292 [53%]) were chain pharmacies and 31% were foodstore pharmacies (171). Almost half (256) of pharmacies provided six or more patient services from a list of nine on the survey (chronic disease management, emergency refills, prescription renewals, prescription dose or

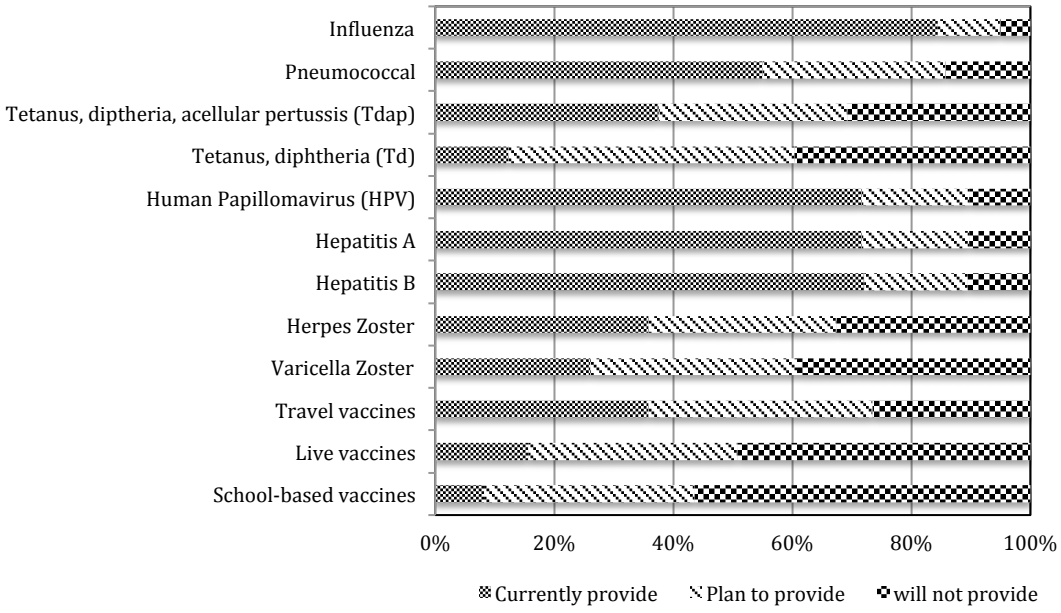
regimen changes, prescription therapeutic substitutions, influenza clinic staffed with nurses, medication review services, travel clinics and therapeutic drug monitoring). The vast majority of pharmacies (471 [85.5%]) provided pharmacist-administered vaccinations.

2.0 Current and expected involvement in immunization

2.1 Currently available immunizations

Pharmacists were asked to identify which vaccines are currently being provided at the pharmacy at which they work. The most commonly provided vaccines were influenza (464 [84.4%]), hepatitis B (397 [72.1%]), hepatitis A and HPV (both 395 [71.7%]). Far fewer pharmacists currently offered live vaccines (86 [15.6%]) and school-based vaccines (45 [8.2%]). The majority of pharmacists (365 [77.5%]) provided these vaccines on either an appointment and/or walk-in basis, with a fifth (90 [19%]) offering services on evenings and/or weekends. When asked their preferences, 82.3% (428) of pharmacists would like to provide appointment-based vaccinations, while only 39.4% (205) want to provide walk-in appointments. Similarly, fewer pharmacists (60 [11%]) would provide vaccination on the evenings and/or weekends. About 60% of pharmacists used a combination of the Canadian Immunization Guide, the BCCDC Immunization Manual and local public health notices to stay informed about immunization schedules.

Figure 1. Vaccine provision in pharmacies



Among pharmacists who were either very or somewhat willing to administer medications by injection, 94.6% (402) are willing to vaccinate patients 18 years of age or older. This percentage changed as patient-age decreased; only 10.2% (45) of pharmacists would be willing to vaccinate children under 5 years of age. Only 19.3% (85) of pharmacists were comfortable with providing vaccination services to special populations (renal transplant, immuno-compromised, HIV patients, etc.).

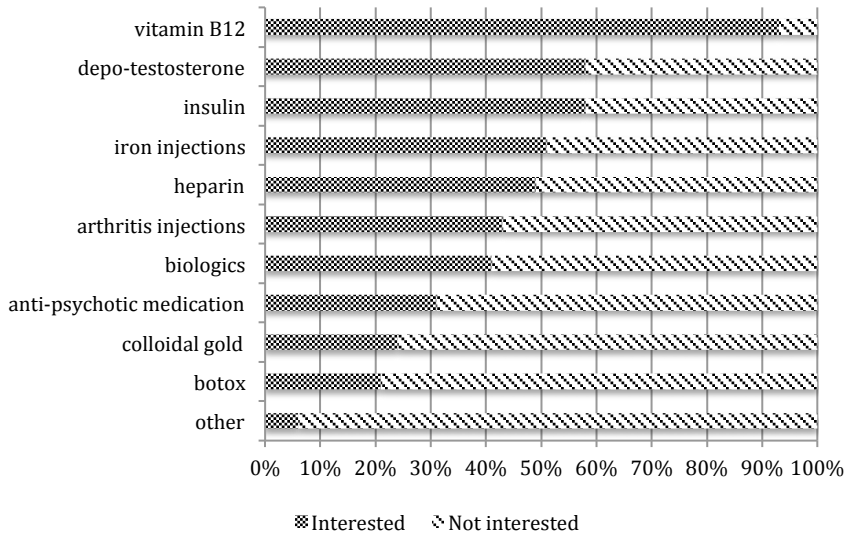
2.2 Non-vaccine injectables and travel vaccines

The majority of pharmacists (517 [93.8%]) did not use the option of employing nurses to administer non-vaccine injectables in their pharmacy but 80.8% (445) of pharmacists were either very interested or somewhat interested in

administering non-vaccine injectables themselves (Figure 2). Among those that were very interested or somewhat interested, there was most interest in administering B12 (413 [92.8%]) followed by insulin and depo-testosterone (~60%). There was less interest (<30%) in administering anti-psychotic medication, botox and colloidal gold.

The pharmacists were also asked about travel vaccines. Currently, 37.7% of pharmacists provide travel vaccines. Although only 8.7% of pharmacists currently held travel clinics, 41.4% expect to do so in the future. Additionally,

Figure 2. Interest in non-vaccine injectables



compared with other pharmacy-provided services, for which an average of 30.1% of pharmacists charge fees, 70.8% of pharmacists charge fees for travel clinics. Of those pharmacists who were interested in administering non-vaccine injectables, 88.3% thought that further training on travel vaccine topics would be beneficial.

3.0 Pharmacist and pharmacy characteristics associated with being certified to immunize

3.1 Pharmacist characteristics associated with being certified to immunize

Several pharmacist characteristics were associated with being certified to administer vaccines in multivariate logistic regression models (Table 1) at the conventional statistical significance levels. As length of time spent as a pharmacist increased, the likelihood of being certified to immunize decreased. Pharmacist position was also significantly associated with certification; managers and owners were both more likely to be certified than staff. Being in a position to influence decisions made at the pharmacy was also significantly associated with being certified to administer. Collinearity was not a factor.

Table 1: Binary logistic regression analysis of pharmacist characteristics significantly and association with being certified to administer vaccines				
Variable	**Total Sample% (n=551)**	**Certified to administer % (n=393)**	**Crude OR (and 95% CI)**	**Adjusted OR (and 95% CI)**
Gender				
Male	49.3 (272)	70.3 (196)	-	-
Female	50.7 (279)	72.4 (197)	0.90 (0.6201.30)	0.98 (0.62-1.52)
Length of time as pharmacist*				
Less than 5 years	14.9 (82)	81.7 (67)	1.0	1.0
5-9 years	16.9 (93)	82.8 (77)	1.08 (0.50-2.34)	0.75 (0.32-1.74)
10-19 years	20.5 (113)	78.8 (89)	0.83 (0.41-1.70)	0.68 (0.31-1.48)
20-30 years*	28.1 (155)	67.7 (105)	0.47 0.25-0.90)	0.29 (0.14-0.60)
Greater than 30 years*	19.6 (108)	50.9 (55)	0.23 (0.12-0.46)	0.19 (0.09-0.40)
Title/position*				
Community pharmacist (staff)	45.4 (250)	64 (160)	1.00	1.00
Community pharmacy* manager	39.4 (217)	80.7 (174)	2.28 (1.49-3.47)	2.40 (1.39-4.14)
Community pharmacy	15.2 (84)	70.2 (59)	1.33 (0.78-2.27)	2.45 (1.22-4.92)

owner*				
Influence*				
Does not influence decisions at practice site	77.5 (427)	58.1 (72)	1.00	1.00
Influences decisions*	22.5 (124)	75.2 (321)	2.19 (1.44-3.33)	1.91 (1.10-3.28)

*Significant results ($p<.05$) have been indicated with an asterisk

3.2 Pharmacy characteristics associated with being certified to immunize

Table 2 summarizes the pharmacy characteristics that were assessed.

Pharmacy type influenced the likelihood of having certified- pharmacists; compared to independent pharmacies, chain pharmacies and foodstores were both more likely to have certified pharmacists. The number of registered patients over 65 years old was a significant factor as well; larger pharmacies (> 10,000 patients over 65) were more likely than their smaller counterparts to employ certified pharmacists. Collinearity was not a factor.

Table 2: Binary logistic regression analysis of pharmacy characteristics and association with being certified to administer vaccines				
Variable	**Total Sample % (n=551)**	**Certified % (n=393)**	**Crude OR (and 95% CI)**	**Adjusted OR (and 95% CI)**
Health Authority				
Interior	21.4 (115)	69.6 (80)	1.00	1.00
Fraser	30.5 (164)	73.8 (121)	1.23 (0.73-2.09)	1.23 (0.67-2.27)
Northern	6 (32)	65.6 (21)	0.84 (0.36-1.92)	0.53 (0.21-1.39)
Vancouver	22.2 (119)	73.1 (87)	1.19 (0.67-2.10)	1.43 (0.74-2.76)
Vancouver Island	19.9 (107)	69.2 (74)	0.98 (0.55-1.74)	0.99 (0.52-1.91)
Community type				
Rural	11.4 (63)	45 (71.4)	1.00	1.00
Urban	88.6 (488)	348 (71.3)	1.01 (0.56-1.80)	1.11 (0.55-2.23)
Pharmacy-type*				
Independent	11.6 (64)	54.7 (35)	1.00	1.00
Banner, franchise and chain*	53 (292)	66.8 (195)	1.67 (0.96-2.88)	1.89 (1.02-3.50)
Foodstores *	31 (171)	87.1 (149)	5.61 (2.88-10.92)	6.72 (3.16-14.29)
Mass merchandisers	4.4 (24)	58.3 (14)	1.16 (0.45-2.99)	0.92 (0.52-1.91)

# services (excludes immunization)				
Less than or equal to 5	53.5 (295)	53.9 (212)	1.00	1.00
More than 5	46.5 (256)	46.1 (181)	0.95 0.66-1.37)	0.93 (0.61-1.44)
Registered patients >= 65*				
Less than 1,000	28.3 (156)	71.8 (112)	1.00	1.00
1,000 to 5,000	43.4 (239)	70.3 (168)	1.36 (0.74-2.52)	1.13 (0.55-2.32)
5,000 to 10,000	16.3 (90)	72.4 (113)	1.27 (0.71-2.25)	1.64 (0.84-3.20)
More than 10,000*	12 (66)	65.2 (43)	1.87 (0.92-3.81)	2.36 (1.06-5.27)

*Significant results ($p<.05$) have been indicated with an asterisk.

Discussion

This is the first study that has looked at the delivery of immunization services being provided by pharmacists in Canada. The results of our study show that community pharmacists in BC are involved in the delivery of immunization services and have indicated that they intend to increase the types of vaccines provided. There was also significant interest in administering non-vaccine injectables. Our findings agree with research from the US that found high acceptability of in-pharmacy immunization services,[103] and that pharmacies that have successfully implemented these services often expand the number and type of immunizations offered.[70,89] The certification rate of 71.3% for the survey respondents still leaves room for improvement. A 2009 survey indicated 81.5% of pharmacists in BC would be willing to administer any type of vaccine.[86] Additionally, the percent of certified pharmacists reported among survey respondents is higher than the province's actual certification rate that is estimated at 50%. This suggests that pharmacists who were certified were more likely to participate in the current study and their views might not be representative of other pharmacists in the province.

According to our study, certified pharmacists tended to be have been in practice for fewer years on average, and they were also more likely to be managers and owners than staff. Previous research indicates that pharmacists who have been in practice for fewer years have consistently been more likely to be certified or to be more supportive of administering vaccines.[86,105,106] In contrast, results regarding the influence of position (staff, manager, owner) vary somewhat. While Kamal et al found that

managers and owners were more likely than staff to provide immunizations,[94] a study by Crawford et al found no such associations.[107] The trend for younger pharmacists to be certified contrasts with the influence of position as the managers or owners tend to be older. One explanation could be that although younger pharmacists were more likely to be certified than older pharmacists in general, pharmacy owners and managers are exceptions because they were more motivated than the average pharmacist to be certified. In the case of our results, there were more certified managers and owners than expected who had been practicing for 10 to 19 years, supporting this hypothesis. Another explanation could be that managers and owners feel they need to be certified so that they can be available as a clinical resource if staff members decide to get certified.

With regards to pharmacy characteristics, our results indicated that chain and foodstore pharmacies were more likely to employ certified pharmacists than independents and mass merchandisers. This is in contrast to previous studies which have shown that independent pharmacies tended to be most likely to offer immunization services.[89,94,106] One possible explanation is the 'early adopter' effect. Research by Doucette et al theorized that implementing interventions in independent pharmacies is more manageable and independent owners are more interested in expanding practices.[108] This could be because independent pharmacy owners, in order to compete with larger chains, are more entrepreneurial and thus more willing to offer 'innovative' patient services.[109] These factors indicate that independents are more likely to be early adopters. Westrick et al has previously described the 'earlier

(sustainer) and later (new) adopter' effect with respect to immunization services.[89] In the previous studies, immunization by pharmacists might still have been considered 'innovative'. The BC government, however, only implemented the policy in 2009, once significant amounts of research supporting the practice had already been produced in the US. As such, it is possible that there were not as many perceived 'risks' associated with the service. This might very well be the case in BC, given that the first group to step forward and adopt the practice was Safeway, a large foodstore pharmacy. As soon as the legislation was passed, Safeway implemented their US training program in BC. London Drugs, a big chain pharmacy, also produced their own training session soon after. Pharmacies with between 5,000 to 10,000 registered patients over 65 years of age were most likely to provide immunizations. Other categories within number of registered patients over 65 revealed no trends, so this finding is still speculative.

Another frontier for pharmacists is travel medicine. Although the practice is not yet widely engaged in, according to our results, many pharmacists in BC expect to hold travel clinics and provide travel vaccines in the future, and they are very interested by the prospect of receiving further training on the topic. Comprehensive pre-travel clinics have operated successfully in the US for years now.[110,111] In the US cases, pharmacists were responsible for providing necessary travel information and administering the vaccine, and the process was coupled to close communication with the patients' physicians. With international travel on the rise, travel medicine provided in collaboration with physicians may be an important avenue for evolving pharmacy practice.

In addition to immunization, we also found a significant interest in the delivery of non-vaccine injectables, an activity pharmacists are already engaged in in Alberta.[112] Technically, the legislation enacted in 2009 that allowed pharmacists to inject includes all intramuscular and intradermal injections, which encompasses non-vaccines. Despite this, the College of Pharmacists of BC has limited the activity to "injections for the purpose of preventing disease, disorders or conditions such as immunizations and travel clinics" under the Standards Limits and Conditions. [113] Nevertheless, this study indicates that BC pharmacists are ready to take the next step.

This study has many of the limitations associated with cross-sectional surveys. As is typical of surveys among health care professionals, the response rate was low, which could compromise representativeness. Despite the low response rate, when our respondents were compared to the population of pharmacists in BC, both the gender and age distribution of our sample was approximately equivalent to the population distribution.[114] Urban and rural pharmacist representation was also similar to the provincial average.[114] Pharmacist staff were under-represented (39.8% compared to a provincial average of 64.2%) and managers and owners were over-represented (50.4%), as together they represent only 29.8% of the community pharmacist workforce.[114] Most importantly, our sample was significantly more likely to be authorized to administer injections (71.3%) than the provincial average of around 40% at the time of the survey.[115] This last point could have resulted in an over-

estimation of immunization activities currently being conducted in pharmacies, as well as pharmacist interest in expanding the scope of immunization practices.

In conclusion, pharmacists are very involved in immunization in BC. Several pharmacist and pharmacy characteristics are associated with certification status. This information can be used to develop targeted programs to encourage more pharmacists to become certified or to help with the planning of public health immunization strategies. Further, pharmacists have expressed a clear interest in expanding their role as immunizers and this should provide impetus to the BC College of Pharmacists to review the limitations set and allow pharmacists to provide non-immunization injections, as set out by the legislation. An important next step will be to determine the impact of this strategy on public health outcomes in the population.

Bridging document

The first manuscript provided the reader with a more general overview of current and expected immunization practices in BC. It also familiarized the reader with characteristics that are associated with being certified to immunize. Two important characteristics that emerged were the role that pharmacist position and pharmacy type. These characteristics are especially important to understand because, unlike 'years in practice' or 'influence' (which were both also associated with certification), there is more potential to design targeted awareness and training programs based on position or pharmacy type. Of course, in order to influence an individual's decision to get certified, it is important to understand the barriers that they associate with the practice. As such, the following manuscript, entitled: "Community pharmacist-identified barriers to providing vaccinations in British Columbia, Canada", will look at barriers to in-pharmacy immunization, and how they differ based on what job title a pharmacist has, and where they practice. Given that both the first manuscript and this second were both based on the same survey, there is overlap in the description of methods and pharmacist- and pharmacy- related demographics, as well as the limitations.

Title Page

Community pharmacist-identified barriers to providing vaccinations in British Columbia, Canada

Alexandra Fletcher, MSc; Fawziah Marra, BSc (Pharm), PharmD; Janusz Kaczorowski, PhD

Community pharmacist-identified barriers to providing vaccinations in British Columbia, Canada

Abstract

Background: In 2009, the government of British Columbia implemented policies to increase vaccination coverage in the province by allowing pharmacists to administer vaccines upon receiving appropriate training and certification. In order to better understand pharmacist attitudes towards immunization, a survey of all pharmacists registered with the British Columbia Pharmacy Association (BCPhA) was conducted in 2012.

Objectives: 1) To examine the relationship between the identification of barriers to in-pharmacy vaccination and certification status, pharmacist-position and pharmacy type. 2) To identify pharmacists' reasons for not obtaining certification to immunize.

Methods: The 42 item questionnaire was emailed to all pharmacists registered with the BCPhA in 2012 by Ipsos Reid. Frequency counts and descriptive statistics were generated to describe respondents' demographic information, pharmacy characteristics, barriers to vaccination and reasons for not being certified to immunize. Multivariate logistic regression was used to examine associations between barriers to in-pharmacy vaccination and various pharmacist- and pharmacy-level characteristics.

Results: The overall survey response rate was 17.2% (663/3,847). The current analysis was restricted to the community pharmacists only (n=551). Overall, 71.3% (393/551) of respondents were certified to administer vaccines. The two most commonly identified barriers to providing vaccinations in the pharmacy setting were insufficient staffing levels (46.3%; 255/551) and inadequate reimbursement (45.4%; 250/551). Barrier identification differed by pharmacist- and pharmacy- level factors. Compared to non-certified pharmacists, certified pharmacists were 44% less likely to identify space issues as a barrier (OR: 0.56; 95% CI: 0.36-0.87). With respect to pharmacist position, among certified pharmacists, staff and managers were twice as likely as owners to identify time as a barrier (OR: 0.47; 95% CI: 0.23-0.96 and OR: 2.02; 95% CI: 1.06-3.86; owner vs. staff and

manager vs. owner respectively). Managers were 1.8 and owners were 3 times more likely than staff to identify remuneration barriers (OR: 1.84; 95% CI: 1.10-3.08 and OR: 3.06; 95% CI: 1.49-6.30 respectively). Regarding pharmacy type, foodstore pharmacists were 5.7 times more likely to identify space barriers (OR: 5.67; 95% CI: 2.02-15.93) than independents. Compared to foodstores, chain pharmacists were 61% less likely to identify space barriers (OR: .039; 95% CI: 0.21-0.57) and 42% less likely to identify time barriers (OR: 0.58; 95% CI: 0.36-0.93). They were also 2 times more likely to identify remuneration barriers (OR: 1.96; 95% CI: 1.21-3.17) than chains.

Conclusion: Barriers to providing in-pharmacy vaccinations were similar to those already identified in the literature. However, pharmacist- and pharmacy-level factors are also important and have not been described in this level of detail before. These factors play an important role in how vaccination is perceived by community pharmacists.

Introduction

Vaccine preventable diseases are a significant public health issue in Canada and worldwide. Despite the undisputed merits of vaccination and the very clear statements released by the National Advisory Committee on Immunization (NACI) and other health organizations, Canadian adults consistently fail to meet immunization targets for most recommended vaccines.[6] According to the CDC classification of interventions, methods to improve immunization rates include increasing consumer demand, improving access and implementing provider- and system-level interventions.[116] One solution that includes aspects of all these intervention strategies is to allow pharmacists to immunize. A significant body of research has shown that pharmacist-immunizers can help to improve immunization rates,[117] especially in medically underserved areas.[118] This is at least partially due to the fact that in-pharmacy immunization services raise awareness through advertising and counselling at the time of medication dispensing, and overcome barriers related to accessibility.

In this context, on July 21, 2009, the BC Ministry of Health Services announced proposed changes to regulations governing the scope of practice for pharmacists. These changes allowing pharmacists to vaccinate were prompted by the potential need to provide the pandemic influenza (H1N1) vaccine to all residents of BC over a short period of time.[119] Initially, pharmacists only had access to the public supply of pandemic H1N1, seasonal influenza and polysaccharide pneumococcal vaccines. Due to the success of this program, as of February 2013, they now have access to, and are remunerated for, the administration of additional publicly funded vaccines, including Td (tetanus diphtheria), MMR (measles, mumps, and rubella) and HPV-Cervarix.[104] Pharmacists also have the authority to administer some other publicly funded vaccines by special request.[104] To become certified, pharmacists have to complete a training program and obtain valid CPR and first aid certificates.[104]

It is important to understand and address barriers to the administration of vaccines in the pharmacy setting because programs that do this are more likely to be successful in

the long run.[100] The main barriers to in-pharmacy vaccination have already been identified, and include time constraints, concern over legal liability, level of reimbursement, staff support, space availability in the pharmacy, pharmacist's level of training and physician support.[94,106] This research will take the analysis of barriers a step further in order to examine associations between barriers to in-pharmacy vaccination and various pharmacist- and pharmacy-level characteristics. As such, the objective of this study is to examine the relationship between the identification of barriers to in-pharmacy vaccination and certification status, pharmacist-position and pharmacy type. We also examined the reasons pharmacists provided for not being certified to immunize.

Methods

The University of British Columbia partnered with the BCPhA and Ipsos Reid to conduct a survey of BC pharmacists. Ethics approval was obtained from the UBC Behavioural Ethics Committee (See appendix).

Ipsos Reid sent an email to all pharmacists registered with the BCPhA, inviting them to participate in the online survey. The BCPhA's contact list contained valid email addresses for 3,910 pharmacists out of a total of 4,197 in the province at the time the survey was sent out. Among them, 51 were on Ipsos Reid's 'do not contact list' and 12 opted out of the survey, for a denominator of 3,847. Additionally, pharmacy owners and managers were sent an endorsement letter from the BCPhA highlighting the importance of obtaining feedback from the pharmacists in their stores. Finally, efforts were made to contact pharmacists who started but did not complete the online survey. Only the results from completed surveys were used. The electronic format required all questions to be answered in order for a survey to be considered complete, so there was no missing data.

The survey took approximately 15 minutes to complete. It comprised of 42 questions and was open from July 6th to November 21st, 2012. The content was based on

previous surveys conducted in BC and elsewhere.[86,94] It contained questions pertaining to demographics, certification status, types of vaccines being provided, barriers to in-pharmacy immunization, available pharmacy and fridge space, thoughts on non-immunization related injections and travel vaccines and the future of immunization in BC. (See appendix)

Analysis was conducted with SPSS version 21.0 software. A two-sided significance level of .05 was used in all statistical tests. Frequency counts and descriptive statistics were generated for respondents' demographic information and pharmacy characteristics, the classification of barriers to in-pharmacy immunization and reasons for not being certified to immunize. Multivariate logistic regression was used to examine whether different barriers were associated with being certified to administer vaccinations, pharmacist position and pharmacy type. The models were adjusted for relevant pharmacist- and pharmacy-level variables. Some variables were recoded for the purposes of these analysis as described in the relevant sections. At the pharmacist-level, gender, years in practice and position were included in the model. Pharmacy-level variables included location of the pharmacy (health authority and rural or urban setting), pharmacy-type, number of patient services provided and number of registered patients over 65.

Results

1.0 Demographics

1.1 Pharmacist-related demographics

Of the 3,847 pharmacists that received the survey, a total of 663 pharmacists responded, for a response rate of 17.2%. This analysis included only the community pharmacists (551). The remaining respondents (112) were excluded because they identified themselves as hospital pharmacists or 'other', or because they worked at a non-community pharmacy site (head office position, hospital, other). Table 1 shows selected socio-demographic characteristics of respondents. Among the respondents, 50.6% (279) were women, over half (302 [55%]) of the pharmacists were between 31 and 50 years old, and almost half

(263 [48%]) had been practicing for more than 19 years. With respect to the position, 45% (250) of the pharmacists identified as staff, 40% (217) as managers and 15% (84) as owners. Finally, of all the community pharmacists surveyed, 71.3% (393) were certified to administer injections.

1.2 Pharmacy-related demographics

The analysis of pharmacy-related demographics was done at the level of individual pharmacist responses. When postal codes of respondents were analyzed, it was shown that most of the responding pharmacists came from different pharmacies. Only a handful of pharmacies were represented by more than one pharmacist (with a maximum of four pharmacists per pharmacy). Table 1 shows selected pharmacy characteristics. Pharmacies were located in all 5 of the province's health authorities, including Fraser (121 [28.5%]), Vancouver (87 [23.1%]), Vancouver Island (74 [22.1%]), Interior (80 [20.6%]) and Northern (21 [5.7%]) health authorities. Using the second digit from the postal codes (0 = rural) that the pharmacists provided, it was determined that 11.4% (63) of the pharmacies were rural, and 88.6% (488) were in urban settings. The pharmacies were of various sizes, with 43.4% (239) serving between 1000-5000 patients over the age of 65. Pharmacies were classified as either independent, banner/franchise/chain (referred to in the rest of the text as 'chain'), or foodstore/mass merchandiser (referred to in the rest of the text as 'foodstore'). About half of the pharmacies (292 [53%]) were chain pharmacies. With respect to services provided, 46.5% (256) of pharmacies provided six or more patient services from a list of nine on the survey (chronic disease management, emergency refills, prescription renewals, prescription dose or regimen changes, prescription therapeutic substitutions, influenza clinic staffed with nurses, medication review services, travel clinics and therapeutic drug monitoring). The vast majority of pharmacies (471 [85.5%]) provided pharmacist-administered vaccinations.

Table 1. Pharmacist and pharmacy demographics	
	Total Sample % (n=551)
Pharmacist characteristics	
Gender	
Male	49.3 (272)
Female	50.7 (279)
Length of time as pharmacist	
Less than 5 years	14.9 (82)
5-9 years	16.9 (93)
10-19 years	20.5 (113)
20-30 years	28.1 (155)
Greater than 30 years	19.6 (108)
Title/position	
Community pharmacist staff	45.4 (250)
Community pharmacy manager	39.4 (217)
Community pharmacy owner	15.2 (84)
Pharmacy-characteristics	
Region	
Interior	20.9 (115)
Fraser	29.8 (164)
Northern	5.8 (32)
Vancouver	21.6 (119)
Vancouver Island	19.4 (107)
Community type	
Rural	11.4 (63)
Urban	88.6 (488)
Pharmacy-type	
Independent	11.6 (64)
Chain	53 (292)
Foodstore	35.4 (195)
Number of patient-services (excluding immunization)	
Less than or equal to 5	53.5 (295)
More than 5	46.5 (256)
Registered patients >= 65	
Less than 5,000	71.7 (395)
More than 5,000	28.3 (156)

2.0 Pharmacist-identified barriers to immunization

2.1 Categorization of barriers

Pharmacists were asked to choose among thirteen possible barriers to providing immunizations in their pharmacy. The barriers were then classified into 5 categories: time, space, remuneration, and vaccine-handling and communication/support (referred to in the rest of the text as 'communication'). The category 'remuneration' contained one barrier only (see Table 2 for how the barriers were classified into categories). The barriers were subsequently dichotomized into having identified one or more barriers vs. no barriers within each of the 5 categories for the purposes of conducting the multivariate analyses. Overall, the majority of pharmacists (357 [64.8%]) identified between one to three barriers.

Table 2: List of barriers to providing in-pharmacy vaccinations	
	Identified barrier % (n=551)
Time	
It takes too much time to provide the service	25.4 (140)
Insufficient staffing levels	46.3 (255)
Documentation requirements excessive	18.5 (102)
Remuneration	
Payment of $10 does not reflect the time to provide the service	45.4 (250)
Space	
Lack of private area to confidentially obtain appropriate patient medical history	23.4 (129)
Lack of adequate space to confidentially provide vaccinations	29.9 (165)
Lack of sufficient waiting area space for vaccine recipients to sit 15 minutes post injection	24.5 (135)
Vaccine-handling	
Insufficient storage space for vaccine related supplies	12.5 (69)
Unable to meet refrigeration cold chain requirements	28.5 (157)
Unable to meet freezer cold chain requirements	4.2 (23)
Communication	
Communication with physicians with respect to vaccinating their patients	12.9 (71)
Communication with public health nursing with respect to vaccinating their patients	11.4 (63)
Lack of physician support towards your involvement in immunizing patients	13.8 (76)
Total number of barriers identified	
1 to 3	64.8 (357)
4 to 6	27.6 (152)
More than 6	7.6 (42)

2.2 Barrier-identification and certification status

In order to examine how pharmacist identification of barriers was associated with being certified to immunize, multivariate logistic regression was conducted, adjusted for relevant pharmacist- and pharmacy-level variables (see methods). Certified pharmacists were 44% less likely to identify space barriers (OR: 0.56; 95% CI: 0.36-0.87). There were no statistically significant associations between certification and time, remuneration, vaccine-handling or communication. Overall, non-certified pharmacists were more likely to identify barriers than certified pharmacists (results not included in table).

Table 3: Binary logistic regression analysis of barriers significantly and association with being certified to administer vaccines					
	Identified at least one barrier within category Total Sample % (n=551)	**Identified at least one barrier within category Certified pharmacists % (n=393)**	**Identified at least one barrier within category Non-certified pharmacists % (n-158)**	**Crude OR**	**Adjusted OR (and 95% CI)**
Time	57.9 (319)	58.3 (229)	57 (90)	1.06 (0.84-1.56)	0.92 (0.60-1.43)
Remuneration	45.4 (250)	46.1 (181)	43.7 (69)	0.61 (0.23-1.07)	0.97 (0.64-1.48)
*In-pharmacy space**	37.9 (209)	36.1 (142)	42.4 (67)	0.77 (0.54-0.97)	0.56 (0.36-0.87)
Vaccine-handling	34.1 (188)	31.8 (125)	39.9 (63)	0.70 (0.50-1.34)	0.69 (0.45-1.68)
Communication	22.1 (122)	23.4 (92)	19 (30)	1.30 (0.82-2.0)	1.26 (0.75-2.14)

*Significant results (p<.05) have been indicated with an asterisk.

2.3 Barrier-identification and pharmacist position

Multivariate logistic regression was used to determine how pharmacist position (staff, manager and owner) was associated with the identification of barriers. Certified pharmacists were analysed separately from non-certified pharmacists in order to determine whether the identification of barriers was different between the two groups. The model was adjusted for the same pharmacist- and pharmacy- level variables as in the previous section except pharmacy-type was collapsed into independent and chain/foodstore because the number of respondents in some categories would have been too small to provide reliable estimates.

Among certified pharmacists, staff and managers were more likely than owners to identify time as a barrier. Managers and owners were more likely than staff to identify remuneration barriers. Compared to owners, managers were significantly more likely to identify space as a barrier. Finally, managers were more likely than staff to identify communication as a barrier. Pharmacist-position was less important as a factor in explaining identification of barriers among non-certified pharmacists. There were no statistically significant differences between positions for all barriers.

Table 4: Multivariate logistic regression analysis of barriers significantly and association with pharmacist position

	Certified pharmacists (n=393) Adjusted OR (and 95% CI)			**Non-certified pharmacists (n=158)** Adjusted OR (and 95% CI)		
	Manager vs. staff	**Owner vs. staff**	**Manager vs. Owner**	**Manager vs. staff**	**Owner vs. staff**	**Manager vs. owner**
Time	0.95 (0.57-1.60)	0.47 (0.23-0.96)*	2.02 (1.06-3.86)*	1.00 (0.39-2.55)	0.48 (0.15-1.51)	2.08 (0.66-6.57)
Remuneration	1.84 (1.10-3.08)*	3.06 (1.49-6.30)*	0.60 (0.31-1.15)	1.36 (0.57-3.32)	2.42 (0.81-7.26)	0.56 (0.18-1.80)
In-pharmacy space	1.31 (0.79-2.19)	0.46 (0.20-1.04)	2.87 (1.34-6.14)*	1.63 (0.67-3.97)	1.33 (0.43-4.05)	1.23 (0.38-4.00)
Vaccine-handling	1.01 (.060-1.69)	0.70 (0.33-1.52)	1.44 (0.70-2.93)	0.97 (0.425-4.14)	1.33 (0.43-4.14)	1.62 (0.78-3.38)
Communication	2.77 (1.48-4.18)*	2.36 (0.99-5.66)	1.17 (0.55-2.48)	0.60 (0.17-1.99)	2.51 (0.72-8.77)	0.24 (0.06-1.03)

Model adjusted for: gender, years in practice and pharmacist position, location of the pharmacy (health authority and rural or urban setting), pharmacy-type, number of patient services provided and number of registered patients over 65.
*Significant results ($p<.05$) have been indicated with an asterisk.

2.4 Barrier-identification and pharmacy type

Multivariate logistic regression was used to determine how pharmacy-type (independent, chain and foodstore) was associated with the identification of barriers. Certified pharmacists were analysed separately from non-certified pharmacists in order to determine whether the identification of barriers was different between the two groups. As seen previously, the model was adjusted for pharmacist- and pharmacy- level variables. Pharmacist-type was collapsed into staff and manager/owner because otherwise the number of respondents in each category would have been too small to provide reliable estimates.

Among certified pharmacists, there where no differences in the identification of barriers between independent and chain pharmacists. Foodstore pharmacists were more likely to identify space barriers than independents. Chain pharmacists were also less likely to identify space barriers than foodstores. They were less likely to identify time barriers compared to foodstores as well, but more likely to identify remuneration barriers. Among non-certified pharmacists, the effect of pharmacy-type on the identification of barriers was less pronounced. There were no significant differences between the three pharmacy types.

Table 5: Multivariate logistic regression analysis of barriers significantly and association with pharmacy type

	Certified pharmacists (n=398) Adjusted OR (and 95% CI)			**Non-certified pharmacists (n=158)** Adjusted OR (and 95% CI)		
	Chain vs. independent	**Foodstore vs. independent**	**Chain vs foodstore**	**Chain vs. independent**	**Foodstore vs. independent**	**Chain vs foodstore**
Time	1.03 (.048-2.25)	1.78 (0.79-4.01)	0.58 (0.36-0.93)*	2.00 (0.71-5.66)	2.22 (0.63-7.80)	0.90 (0.33-2.44)
Remuneration	0.92 (0.43-2.00)	0.47 (0.21-1.05)	1.96 (1.21-3.17)*	2.06 (0.79-5.42)	0.94 (0.22-4.12)	2.12 (0.82-5.47)
In-pharmacy space	1.97 (0.71-5.49)	5.67 (2.02-15.93)*	0.39 (0.21-0.57)*	0.67 (0.25-1.76)	2.94 (0.87-9.94)	0.23 (0.09-0.61)
Vaccine-handling	1.18 (0.51-2.69)	0.98 (0.42-2.31)	1.20 (0.73-1.95)	2.46 (0.84-7.21)	4.09 (1.12-14.96)	0.60 (0.23-1.59)
Communication	0.78 (0.33-1.85)	0.56 (0.23-1.38)	1.40 (0.78-2.47)	0.62 (0.21-1.85)	0.20 (0.03-1.20)	3.11 (0.58-16.56)

Model adjusted for: gender, years in practice and pharmacist position, location of the pharmacy (health authority and rural or urban setting), pharmacy-type, number of patient services provided and number of registered patients over 65.

*Significant results (p<.05) have been indicated with an asterisk.

3.0 Reasons for not being certified

Pharmacists who were not certified to administer vaccines were asked to identify the main reasons for their lack of certification from a list of five possible reasons, including: “did not have time to get certified this year”, “certification sessions were not available near my community”, “employer unwilling to cover training costs”, “not interested in administering injections” and “other” (in which case they were asked to

specify). Pharmacists were allowed to choose more than one answer. In descending order, the reasons for not being certified were: no interest (43.7%), other (29.1%), no time (29.1%), no session available (10.8%), and employer unwilling to cover costs (8.9%). Among the 'other' reasons identified by pharmacists, the majority were actually interested in or in the process of getting certified, but had not registered yet, had not recertified in CPR or were waiting to take a course. The second most common reason was that there were already other pharmacists or nurses who provided immunizations at the pharmacy where they worked. Finally, there were a few respondents who either did not have the space, did not believe it was financially viable, did not work many hours per week (for reasons such as maternity leave or retirement), did not believe it was within a pharmacist's scope of practice, or had a fear of needles.

Table 6: Reasons for not being certified

	Not certified to administer % (n=158)
No interest in getting certified	43.7 (69)
Other reason	29.1 (46)
No time this year	29.1 (46)
Certification session not available in my community	10.8 (17)
Employer unwilling to cover costs	8.9 (14)

Discussion

This study is unique in its use of multivariate analysis to provide an in-depth understanding of factors that influence the identification of barriers by pharmacists. It is also the first to identify differences based on both certification status and pharmacist-position and pharmacy-type. In fact, previous research that did examine the differences between job title, pharmacy-type and barrier identification might have had more statistically significant results had the researchers looked at certified and non-certified pharmacists separately.[94,106]

In decreasing order of importance, the barriers to vaccination were remuneration, time, space, vaccine-handling and communication. Similar barriers have been identified elsewhere, although previous studies have communication barriers to be a bigger problem than what was identified here.[94,106,107] The identified barriers also differed based on certain pharmacist- and pharmacy-level characteristics. First of all, certified pharmacists

identified fewer barriers on average than their non-certified peers. Further examination revealed that the difference between the two groups was mostly due to the physical barriers of space. Essentially, it would appear that the physical environment of the pharmacy, which is relatively fixed, is the most important limiting factor.

Pharmacist position also shaped perspectives towards vaccination. Among certified pharmacists at least, staff and managers seemed to have more practical concerns about vaccination provision; they were both more likely than owners to identify time as a barrier. In contrast, managers and owners had greater concerns over remuneration, which makes sense given that they have a greater stake in the economic success of the pharmacy. Differences in perspective based on position were insignificant between non-certified pharmacists, which suggests that differences in perspectives become apparent only once pharmacists have experience with providing vaccinations. Previous research by Kamal et al found no effect for job title on barrier identification, but they did not account for certification, as was done in this study.[94]

With respect to pharmacy type, the reasons for differences in the identification of barriers are more complex. A proper analysis would require looking not just at pharmacy type, but also at the specific company's policies, which is beyond the scope of this research. Despite this, some trends were identified. Among certified pharmacists, those working at foodstores were least concerned with remuneration, although the difference between independents and foodstores was only non-significant ($p=0.055$). Given that foodstore pharmacies include giants such as Costco, Safeway and Walmart, it makes sense that pharmacists would have less of a stake in the company's bottom line. This conclusion is somewhat supported by a previous study by Pace et al that found independents were most likely to be concerned with remuneration.[106] Our study differed in that it also found a significant difference between chains and foodstores, which could be because that the category 'chain' included smaller branch and franchise stores. Foodstore pharmacists were also most likely to identify space as a barrier, which might be due to the fact that pharmacies at these sites were often built into existing locations, not established as stand-alones. In the same study by Pace et al as cited previously, space was more of an issue for

foodstore and chain pharmacies than independents, although significant differences were not reported. In contrast, among non-certified pharmacists, there were no significant differences between pharmacists who worked at the different pharmacies, which might once again indicate that changes in perspective towards immunization only occur once pharmacists have experience with it.

This study has many of the limitations associated with cross-sectional surveys. As is typical of surveys among health care professionals, the response rate was low, which could compromise representativeness. With respect to how our survey compared to the population of pharmacists in BC, both the gender and age distribution of our sample were approximately equivalent to the population distribution.[120] Urban and rural pharmacist representation was similar to the provincial average.[120] Pharmacist staff were under-represented (39.8% compared to a provincial average of 64.2%).[120] Similarly, managers and owners were over-represented (50.4%), as together they should represent only 29.8% of the community pharmacist workforce.[120]. Most importantly, our sample was significantly more likely to be authorized to administer injections (71.3%) than the provincial average of around 50%. For this study, the small population size could have resulted in small differences not being detected because of lack of statistical power. Importantly, understanding various perspectives is a complex subject that can never be fully understood through survey methodology alone; further qualitative analysis is required.

Conclusion

Barriers to providing in-pharmacy vaccinations are relatively well studied. However, this analysis is one of few that determined how pharmacist- and pharmacy-level factors influenced the identification of barriers. One of the most interesting points that emerges from these results is that regardless of pharmacist-position or pharmacy type, pharmacists without experience immunizing, as indicated by not being certified, have similar perceptions of the barriers to immunization. In order to encourage the service, pharmacists require a more nuanced picture of how it will affect their practice, and a

better understanding of what they can expect depending on what position they have and where they work. Additionally, information regarding how barriers are perceived can be used to modify the service and better ensure its long term sustainability and acceptance.

Conclusion

Discussion of results

The challenges faced by the primary care system today require us to reconsider the roles played by different healthcare professionals, including pharmacists. The rise of chronic disease and an aging population necessitate a renewed focus on health awareness and chronic disease prevention and management in order to promote a better quality of life for aging individuals and to rein in escalating healthcare costs. At the same time, new technologies have the potential to facilitate self-care and promote a greater degree of collaboration between patient, care provider and health care provider than ever seen before. In order to address these challenges and make the most of technological advances, it is important to define the roles and responsibilities of various professionals, both from within the discipline and with respect to other disciplines. Through their training, pharmacists have specialized knowledge in drug therapy that is unique in its breadth and depth. Until recently, this knowledge has remained relatively untapped, as the role of pharmacists has been limited to dispensing only. Additionally, pharmacists are the most accessible point of access to the health care system, as anyone who has visited a pharmacy knows. Nowhere else is it as easy to communicate directly with a health care professional. This positions pharmacists as a potentially important source for dispensing more than just medication; pharmacists can use the frequent interactions they have with patients to provide targeted counseling and education based on the specific patient profile and screen for important treatments patients might be lacking, such as immunization. Furthermore, as trusted health care professionals, pharmacists can use their close relationship with patients to encourage compliance with recommended treatments, as prescribed by either the physician, nurse or pharmacist him/herself. Of course, in order to minimize fragmentation of care, collaborative care provided by a variety of professionals will only be truly possible with the introduction of standardized electronic health records nationally. Until then, measures to ensure the transfer of information between providers exist, such as paper records documenting the receipt of a vaccine to be added to a patient's vaccination booklet.

In order to chart the course of development of pharmacy services in Canada, the CPhA has collaborated with national and provincial representatives from pharmacy stakeholders groups to develop a vision for pharmacy, as well as a vision implementation guide. These documents were produced as part of a project, Blueprint For Pharmacy, which provides oversight for changing pharmacy practices across Canada. The group has outlined the various services pharmacists are starting to provide, including: providing emergency prescription refills, renewing and extending prescriptions, changing drug dosage and formulation, making therapeutic substitutions, prescribing for minor ailments, initiating prescription drug therapy, ordering and interpreting lab tests and administering drugs by injections (see Table 1). As seen in this table, these services are above and beyond the roles that have traditionally been attributed to pharmacists, and they represent an exciting prospect for streamlining some aspects of health care delivery.

Table 1: Summary of Pharmacists' expanded scope of practice across Canada

	BC	***AB***	***SK***	***MB***	***ON***	***QC***	***NB***	***NS***	***PEI***	***NL***	***NWT***	***YU***	***NT***
Provide emergency prescription refills	Y	Y	Y	Y	Y	P[6,7]	Y	Y	N	Y	Y	N	N
Renew and extend prescriptions	Y	Y	Y	Y[3]	Y	P[6]	Y	Y	Y	Y	Y	N	N
Change drug dosage/formulation	Y	Y	Y	Y	Y	P[6,7]	Y	Y	Y	Y	N	N	N
Make therapeutic substitutions	Y	Y	Y	N	N	P[6,7]	Y	Y	Y	Y[10]	N	N	N
Prescribe for minor ailments	N	Y[1]	Y	Y	N	P[6,7]	P	Y	N	N	N	N	N
Initiate prescription drug therapy	N	Y	Y[2]	Y	Y[4]	P[6,7]	Y[9]	Y[2]	N	N	N	N	N
Order and interpret lab tests	N	Y	N	Y	P	P[6]	Y	Y	N	N	N	N	N
Administer drugs by injection	Y	Y	N	Y	Y[5]	P[6,8]	Y	Y	P	P	N	N	N

Table adapted from Blueprint for Pharmacy: http://blueprintforpharmacy.ca/docs/resource-items/pharmacists'-expanded-scope-of-practice_summary-chart---cpha---january-2014-from-graphicsDF4DC970F6835A01BE1C1989.pdf

1. AB: pharmacists in Alberta who have "additional prescribing authority" can prescribe a Schedule I drug (prescription-only) for the treatment of minor ailments
2. SK & NS: only as part of assessment and prescribing for minor ailments
3. MB: as Continued Care Prescriptions under section 122 of the Regulations to the Pharmaceutical Act
4. ON: restricted to prescribing specified drug products for the purpose of smoking cessation
5. ON: administration of influenza vaccination to patients five years of age and older; administration of all other injections and inhalations for demonstration and educational purposes
6. QC: pending Orders in Council (activity enabled by passage of Bill 41, an Act to amend the Pharmacy Act, December 8, 2011; regulation for this activity was planned for September 3, 2013, however it was postponed by Orders in Council on August 22, 2013)
7. QC: when authorized by a physician by means of a "collective prescription" (i.e., collaborative practice agreement)
8. QC: for demonstration purposes only
9. NB: prescribing constitutes adapting, emergency prescribing or within a collaborative practice; independent prescribing or as part of minor ailments prescribing is pending
10. NL: limited to non-formulary generic substitution

With regards to immunization specifically, the analysis of the survey conducted in BC make it clear that immunization by pharmacists is a widely accepted activity that is not going to disappear soon. Overall, 71.3% of respondents in the survey were certified to immunize, although this is significantly lower than the actual provincial average of around 50%.[104] Even this number of immunizers is impressive, given that the right to immunize was only legislated in 2009. Another important outcome of this analysis is that pharmacists expect to increase the diversity of vaccine types offered to their clients in the coming years, which will increasingly place pharmacists in the position of designated vaccinators as the practice becomes more widely recognized and accepted by consumers and physicians. The results of a recent two-year community cluster-randomized control trial to assess the impact of pharmacy-based influenza vaccination clinics on vaccination rates held in small, rural communities in northern and interior BC targeting at-risk and older adults indicate that Canadian patients are very supportive of the practice.[121] When patients were asked about reasons for choosing to attend a pharmacy session to be vaccinated, the most important reason was the pharmacy's expanded hours of operation. The second most common reason is also one of accessibility; patients appreciated the liberty of being able to get a flu shot at their convenience, at a time when they expected to come to the pharmacy anyway to pick up medication. The accessibility of pharmacies has also been identified in other Canadian[122] and American[123] studies. In fact, one Canadian study on nurse-administered influenza vaccinations in the pharmacy setting found that 80% of patients identified the pharmacy as their preferred site for receiving the vaccine, and local physicians were not only supportive, but frequently referred their patients to the clinic.[122] On the other hand, physician support is not absolute; several studies have indicated barriers such as fragmentation of care and time required for collaboration are main issues physicians have with pharmacist-immunizers.[80] Physician support also varies by vaccine; more physicians are likely to support pharmacist administration of the influenza vaccine, compared to other vaccines.[124]

In the survey, it was found that certain pharmacist- and pharmacy-level characteristics are associated with being certified to immunize. In this case, there were three findings which stood out in the first analysis, the first of which was number of years in practice.

Pharmacists who had been in practice for fewer years were much more likely to be certified to immunize, a result which has been seen consistently in previous surveys.[94,106] Because of changes to pharmacy student education and training, younger pharmacists are more likely to have been trained in competencies that their older counterparts were not, providing them with an increased capacity to take on expanded responsibilities.[125] This does not mean that 'older' pharmacists are necessarily unwilling to move away from dispensing and take on more patient services, among pharmacists who are mostly involved in dispensing and are not planning on retiring soon, there is a strong interest in being retrained and redeployed as the opportunities arise.[125] This phenomenon was the second salient characteristic identified in the first study; despite younger pharmacists being more likely to be certified in general, pharmacist managers and owners, who were older than average, were more likely to be certified than staff. This difference in engagement between staff and manager/owners was also identified in a 2009 Canadian study on the perspective of pharmacists on their role in the primary care team.[126] In this survey, staff were less likely to identify pharmacy leadership as being important for the delivery of some clinical and managerial activities than managers, and sometimes owners. The final characteristic that stood out between certified and non-certified pharmacists was their place of work. Certified pharmacists were more likely to work at chain or foodstore pharmacies than independent or mass merchandiser sites. This difference can be explained by the specific history of pharmacist-immunizations in BC. In BC, Safeway, a large foodstore pharmacy, was the first to embark by quickly training their pharmacists using a training program that had already been developed by the company in the US. London Drugs, a large pharmacy chain, was second to follow with their own training program. Pharmacies have an interest in promoting expanded patient services in order to distinguish themselves from the competition. Promotion of wellness services like immunization in pharmacies is a method that can be employed by companies to modify customer engagement behavior in order to encourage customer commitment to the brand.[127] Historically, it was two innovative leaders at large pharmacy chains in the US that were the major drivers of the movement to allow pharmacists to immunize.[8] In contrast, the innovative characteristics of larger companies is often moderated by risk reduction strategies, resulting in independent pharmacies often being among the first to actively promote 'new' patient services.[108] Given

that the first pharmacies on board in our survey were large chains, our results might indicate that offering vaccination services is no longer perceived as being 'as risky'.

Barriers to immunization in pharmacies are important to examine in order to discover how best to provide the service. These results show that one of the main barriers to in-pharmacy vaccination seems to be space, as it was the only barrier that was identified by significantly fewer certified pharmacists, compared to non-certified pharmacists. In comparison, time and remuneration were the barriers most commonly identified by all pharmacists, regardless of whether they were certified or not. This suggests that pharmacists might still implement the service even if they perceive time and/or remuneration barriers, but some pharmacies just do not have the space required to administer vaccines. The design of future pharmacies should take the provision of expanded patient services, which often require additional confidential space, into consideration. A committee in Saskatchewan undertook a detailed look at the physical barriers to the provision of vaccines in pharmacies in 2007, and came up with interesting design suggestions, including determining whether certain areas of the pharmacy can be made smaller to provide more space for pharmacy services, creating counseling booths or alcoves for confidential spaces, and ensuring pharmacies have a comfortable waiting area, especially as patient services tend to take longer than dispensing.[128]

Some salient differences between pharmacist position, pharmacy type and identification of barriers emerged. There were only significant differences among certified pharmacists however. With respect to pharmacist position, managers and owners were more likely than staff to identify remuneration as a barrier. Given that these individuals have a greater stake in the economic success of the pharmacy, this should not come as a surprise. Owners were also less likely than both staff and managers to identify time as a barrier, which highlights the fact that owners are probably more detached from the everyday affairs of the pharmacy. Foodstores stood out as identifying more barriers in general than either independents or chains, although the results are more statistically significant between foodstores and chains partially due to the fact that there were so few independent pharmacies in the sample. The exception to this is remuneration; foodstores were

significantly less likely than chains and almost significantly less likely than independents to identify this as a barrier.

Limitations

There are several limitations associated with both the data collection method and the analysis methods used. First and foremost, the response rate for this survey was rather low, at 17.3%. Additionally, the survey was not sent to all members of the BCPhA, only those for which the BCPhA had a valid email. Even at optimal response rates, this survey would not have captured the entire population of BC pharmacists. Thirdly, this was a cross-sectional survey, so there could be no pre-post analysis to measure the effect of giving pharmacists the right to vaccinate on pharmacist perspectives and practices. There are also limitations to the analysis. Despite the low response rate, this analysis did not weigh the results in order to correct for under or over-representation. Although the survey population did seem to roughly match the actual pharmacist population in age, sex and rural status, there were important differences in pharmacist position and certification status. Another limitation is related to the method used to analyze the data. An analysis of factors associated with certification, or barrier identification, as was performed in these two manuscripts, is not complete without accounting for interaction effects. However, as a master's thesis, this analysis remained relatively simple and only explored main effects between variables.

Summary and future directions

This analysis contains convincing evidence that immunization is an activity that pharmacists are interested by and expect to continue. This is indicated by their intent on offering a wider variety of vaccines and their interest in non-vaccine injectables. This survey also revealed that certain pharmacists are more likely to be certified to administer, a characteristic strongly related to age, pharmacist position and pharmacy type. However, there are still barriers to contend with, especially time, remuneration and space. Further discussions with pharmacists need to be had in order to optimize the provision of

vaccination in order to encourage more pharmacists and pharmacies to engage in the activity.

Immunization is a practice that has been adopted by some, but not all, provinces across Canada. Evidence like this indicates its' a feasible activity for pharmacists. Nevertheless, it remains to be shown whether pharmacist immunizers are successful at actually increasing immunization rates in Canada, and what physician and patient perspectives regarding the service are. Future research should also determine whether it is best for pharmacists to provide some or all vaccines, publicly funded or not, and whether they should be available to entire populations or limited to individuals of a certain age and/or health status. There are additional questions remaining regarding the best way to implement and sustain the service in Canadian pharmacies, which will require further analysis of barriers faced by pharmacists in different contexts.

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Appendices

Appendix 1: a) Factors influencing the decision to vaccinate in adults

Factors influencing the decision to vaccinate in adults				
First Author, Year, Country	**Study aim**	**Design, timeframe**	**Study population/setting,**	**Relevant outcomes**
Individual level factors				
Wheelock, 2013, England[38]	Up-to-date overview of factors associated with influenza vaccination uptake	Systematic review or qualitative and quantitative research articles, database start point until December 2012	Articles looking at adults from the US and the UK	Factors associated with the decision to vaccinate: social and psychological, disease and vaccine related, habit, general attitudes towards health and vaccines, awareness and knowledge, practical barriers and motivations and altruism.
Ritvo, 2003, Canada[40]	Determine Canadian adult attitudes and knowledge about vaccines	Cross-sectional telephone survey, January 4th to February 4th 2002	1330 Canadians adults	Despite being supportive of vaccine efficacy and research, Canadians still seem misinformed on several vaccine characteristics (safety and perceived knowledge)
Kiberd, 2010, Canada[39] bar	Explore attitudes and behaviours of Canadian adults regarding recommended vaccines	Cross-sectional web-based survey	4,067 Canadian adults	Influenza and hepatitis were most highly ranked by respondents as diseases with important health impacts; < 2% considered all other current immunization targets to be important.
Chen, 2012, Canada[41]	Examine the reasons for not having received an influenza vaccination in the past year	Retrospective urvey data from the 2007-2008 Canadian Community Health Survey	127,297 Canadians 12 years of age and older	The most common reasons reported for not having received influenza vaccination included “Respondent did not think it necessary” (71.3%), “Have not gotten around to it” (17.6%)
Provider and systems level factors				

	receipt among healthcare workers (HCWs) caring for patients with spinal cord injuries.			
Takayanagi, 2007, Brazil[44]	Evaluate the reasons for compliance with a campaign to encourage HCW vaccination and the impact of these measures.	Cross-sectional survey during 1rst year of campaign and analysis of documented vaccination records. 2004-2006	258 HCW with the University of Sao Paulo Medical School, Brazil.	Older age, peer-support and having cared for influenza patients was significantly associated with compliance with influenza vaccination. The main reason given for being vaccinated was ''individual protection'' then ''protection for the patient.'' Vaccination compliance decreased in years following the campaign as compared to the first year.
Silverman, 2005, United States[45]	Describe the culture of medical practices by identifying key features that facilitate or deter the immunization process	Direct observation of different medical practices. Observation data was collected during on-site visits between October 1999 and March 2000	Eight medical practices, chosen to reflect variety in the geographic location (i.e., urban/rural) and support base (i.e., public/private).	Physician attitude and belief influence immunization decisions in primary care practices. A strong pro-immunization stance on the part of providers may be overridden by constraints, such as time. Solutions include having a better structure, such as a standing-orders program.
Nichol, 1998, United States[46]	Examine the durability and success of institution-wide influenza and pneumococcal vaccination program.	10-year time-series survey between 1987-1997	Patients from the Minneapolis Department of Veterans Affairs (VA) Medical Center	A systems approach that emphasizes administrative and organizational changes to clinical practice enhances influenza and pneumococcal vaccination rates for adults.
Robke, 2010, Unites States[129]	Describe a hospital's experience with an inpatient pneumococcal vaccination program.	Measured changes in vaccination rates and qualitative assessment of strategies used to change rates. Rates recorded between 2001-2008	Saint Luke's Hospital, a 625-bed, tertiary care, referral hospital in Kansas City, Missouri.	Only a strategy of establishing a consistent, systematic process for vaccination assessment and vaccine administration was successful. This strategy relied on giving pharmacist additional immunization responsibilities.
Systems level				
Gust, 2001[130]	Describe previous pandemics in order to properly handle future pandemics	Review article, search strategy undefined	Expert WHO review and description of pandemic preparedness plan	Because of time limiting steps in the production of influenza vaccines, demand will always exceed supply. This requires national health authorities to make politically sensitive decisions on priorities for use.

Appendix 1: b) Pharmacist-lead vaccination strategies

Pharmacist-lead vaccination initiatives (non-vaccine administration strategies)				
First Author, Year, Country	**Study aim**	**Design, timeframe**	**Study population/setting**	**Relevant outcomes**
Culturally-sensitive immunization programs				
Zimmerman, 2003, United States[51]	Evaluate interventions to increase adult immunizations within inner-city health centers	Interventions included reminders, standing orders, and walk-in "flu shot clinics." Patients were surveyed and vaccination records evaluated during influenza seasons 2001 and 2002	Faith-based neighborhood health centers that serve the disadvantaged in inner-city neighborhoods in Pittsburgh.	Immunization rates increased for patients over 50 years old. The strongest predictor of vaccination among patients aged 50 to 64 years was the belief that unvaccinated persons will contract influenza. Among those 65 years and older, the strongest predictor of vaccination was the belief that friends/relatives thought that they should be vaccinated.
Weatherill, 2004, Canada[52]	Describe the process and lessons learned from a project to reduce the risk of vaccine preventable disease in Downtown Eastside (DTES).	Vaccines were offered in community settings by teams of public health nurses and volunteers. Vaccine uptake and hospitalizations were recorded. Several immunization waves between 1999-2002	Persons living in, working in, or visiting the DTES	During the immunization periods, which included vaccines against influenza/pneumococcal infection and hepatitis A and B, vaccination rates increased and hospitalizations decreased.
Jiang, 2012, United States	This study compared national immunization rates to immunization rates of Hispanic patients receiving clinical pharmacist interventions in a community health center (CHC).	The pharmacist documented whether or not the patient met criteria for Hepatitis A, Hepatitis B, Tdap, Pneumococal, Zoster and Influenza vaccines.. Program ran from January 1, 2010 to December 31, 2010.	El Paso CHC Latino patients who were referred to a clinical pharmacist for diabetes and met immunization criteria. N=336	Pharmacist's immunization rates among Latino patients were higher when compared to Hispanic national rates for HepA, Zoster, and pneumococal and influenza.
Wang, 2014, United States	Examine racial and ethnic disparities in receipt of influenza vaccinations between community pharmacy patients and non-community pharmacy	The 2009 Medical Expenditure Panel Survey was analyzed	The sample consisted of respondents aged 50 years or older. There were 71,135,249 (weighted) community pharmacy users and 20,565,253 (weighted) non-users.	Although influenza vaccination rates were higher among community pharmacy patients, there were racial disparities in receiving influenza vaccinations among both community pharmacy patients and non-community pharmacy respondents.

	respondents.			
Overcoming education gaps				
Grabenstein, 1993, United States	Determine if advocacy of influenza immunization by community pharmacists affected vaccine acceptance among patients	Randomised, placebo-controlled trial was conducted which were randomly assigned to receive either messages explaining the risk of influenza and availability of vaccine or recommending household poison prevention measures.	Patients receiving certain medications for heart or lung disease or diabetes, or receiving non-steroidal anti-inflammatory drugs and who were at least 65 years old in three pharmacies. N=125 (experimental) and n=134 (control).	Unvaccinated patients were 1.74 times more likely to be vaccinated after receiving vaccine recommendations and information than were control patients.
Bryan, 2013, United States[131]	To evaluate whether the use of personal selling, in combination with other promotional techniques, could improve patient commitment to receive herpes zoster vaccine	Primary measures included comparison of the number committing to receive vaccine. Strategies in place between December 2010 through February 2011	Two locally owned grocery store chain pharmacies in the Kansas City, MO, metropolitan area. N=745 (experimental) and n=614 (control).	Personal selling increased patient commitment to receiving a targeted intervention significantly. By using personal selling, pharmacists resolved barriers to immunization.
Fuchs, 2006, Germany	To increase vaccination rates in the wealthy industrial nation of Germany.	In Autumn 2003, a regional vaccination consultation was initiated over a five-week period.	Patients would receive intensive vaccination education based on their accompanying vaccination documentation. 312 of 2500 patients agreed to be educated.	Well structured vaccination consultations help to raise vaccination rates. Older individuals, who are known for having the largest vaccination gap in Germany, represented the highest percentage of people who used this service.
Pharmacists as effective immunizers				
Taitel, 2011, United States	Evaluate the impact of pharmacists educating at-risk patients on the importance of receiving a pneumococcal vaccination.	A PPSV vaccination rate typical of traditional care delivery to was derived and compared to pharmacy-based vaccination.	Patients who had received an influenza vaccination between August 1, 2010 and November 14, 2010 at the participating national pharmacy and who were eligible for PPSV were identified for the analysis.	Pharmacists were successful at identifying at-risk patients and providing additional immunization services. Concurrent immunization of PPSV with influenza vaccination by pharmacists has potential to improve PPSV coverage.
Sokos, 2007, United States	An inpatient pneumococcal polysaccharide vaccine (PPV) vaccination program was designed and implemented to	A standing order form was designed, and it was determined that the SOP should be pharmacy driven. PPV vaccine rates were compared before (2003) and	Vaccinations provided at the University of Pittsburgh Medical Center-Presbyterian (UPMC-P).	The cooperative effort of a multidisciplinary work group led to the creation of a successful inpatient PPV SOP. Analysis of the previous vaccination program and careful planning were instrumental in designing the SOP. Defined

	meet federal and state regulatory requirements and national vaccination goals.	after (2005) its' implementation.		responsibilities for daily performance and user-friendly tools with clear instructions were also crucial to the success of the program.

Appendix 1: c) Pharmacist-lead vaccination initiatives (vaccine administration strategy)

Pharmacist-lead vaccination initiatives (vaccine administration strategy)				
First Author, Year, Country	**Study aim**	**Design, timeframe**	**Study population/setting**	**Relevant outcomes**
Steyer, 2004, United States[65]	Determine whether influenza vaccine rates have increased in states where pharmacists can give vaccines.	Secondary analysis of the Behavioral Risk Factor Surveillance System (BRFSS), an annual telephone survey, 1995-1999	Matched pair design using US citizens from sixteen states, half of which allowed pharmacists to immunize	Individuals aged 65 years and older who lived in states where pharmacists could provide vaccines had significantly higher ($P < 0.01$) influenza vaccine rates than individuals of this age who resided in states where pharmacists could not provide vaccines.
Bearden, 2005, United States[103]	Measure pharmacist involvement in adult immunizations in Oregon counties (number of participating pharmacies, type and quantity of vaccinations, counties involved)	Analysis of changes in the Oregon BRFSS, compared to Oregon Board of Pharmacy data on licensed pharmacies and pharmacists in the state, 2000-2003	Data from US citizens and pharmacies	The number of participating pharmacies increased during the first three years since legislation, as did the number of vaccines provided overall. Additionally, few pharmacies dropped out of the program.
Ernst, 1997, United States[132]	To determine whether accessibility of influenza vaccine in the community was increased through pharmacist administration	Practice innovation: vaccine administered by the pharmacist after screening for contraindications and counseling. Weekly vaccination records were forwarded to the collaborating physician. October 15th 1996 to December 6th 1996.	An independent pharmacy in a rural eastern Iowa community of 5,000 people.	Pharmacist administration of influenza vaccination in a rural community pharmacy increases access and, possibly, immunization rates. This may be especially true among high-risk younger adults who are often overlooked.
Rosenbluth, 2001, United States[68]	To describe the Pharmacy Immunization Project, and to develop service procedures and disseminate lessons learned for adapting the model to different settings.	Description of pharmacy/county health department (CHD) partnership model for immunizing infants and adults in rural areas.	Independent community pharmacies in five contiguous rural counties in West Virginia.	All sites except one continued their participation through the life of the project. Remaining sites were used and well accepted by the community. No problems arose with local health care providers.
Weitzel, 2001, United States[69]	To describe procedures for implementing a	Number of adult influenza and pneumococcal vaccinations	Ukrop's supermarket chain with 27 stores in Virginia, 19	Vaccination rates increased, the program increased awareness of in the

	pharmacy-based immunization program in a supermarket chain.	administered by pharmacists. Influenza season September to December 1998, and September 1999 to January 2000	of which have pharmacies.	community and among local physicians of advanced pharmacy services. Administration of vaccines increased pharmacists' involvement/enthusiasm with enhanced services and generated a revenue stream.
Goode, 2007, United States[133]	Assess the growth, expansion and impact of a pharmacy-based immunization program in a supermarket chain	Analysis of pharmacy-collected data on the number of patients immunized since 1998, number of pharmacists who participated in the program, number and type of immunizations offered since 1998, and percentage of patients with Medicare who received covered immunizations.	Ukrop's supermarket chain with 29 stores in Virginia, 19 of which have pharmacies.	The program has grown due to the increase in number of trained pharmacists, collaboration with physicians, both resulting in increased awareness. The pharmacy also engaged in continuous program monitoring to make improvements.
Murphy, 2003, United States[134]	Demonstrate the extent to which a community pharmacy can provide influenza immunizations in communities designated as medically underserved.	This retrospective study examined the number of influenza immunizations administered and populations served in areas with limited access to health care during the 2009–10 influenza season.	All Walgreens pharmacies in the US	More than 43% of the U.S. population resides in medically underserved areas (MUAs), and our results show that Walgreens pharmacies served nearly one-half of this population. Community pharmacies are well-positioned throughout the country, improving accessibility in MUAs.
Higginbotham, 2012, United States[72]	Evaluate impact of pharmacist immunizer on vaccination rates of adults presenting for care at a clinic for the medically underserved	Prospective, controlled parallel study using an immunization needs assessment form (INA). The intervention group received an offer to be immunized by a pharmacist. INA handed out on randomized schedule between November 2009 and February 2010.	Patients aged 18 to 79 years presenting for a medical appointment at a primary health care center	The availability of a pharmacist immunizer increased the number of patients who were current on all immunizations at the completion of the study. The combination of the INA by a pharmacist demonstrated a significant effect on influenza and Tdap vaccination rates.
Lam, 2008, United States[53]	To describe the establishment, implementation, and economic outcomes of a pharmacist-conducted on-site influenza vaccination service in an	Retrospective descriptive report. Patient charts were reviewed for contraindications, vaccines were administered, and post-vaccination satisfaction surveys were conducted. 2004 Influenza season.	58 indigent, multiethnic, older Asian adult patients, of whom 44 were ALF residents and 14 were adult day health at the senior housing complex in the International District of Seattle, WA.	The immunization rate in the population improved from 64% in the previous year to 83% with the on-site service. Both the clients and the facility staff rated the service highly.

	assisted-living facility (ALF).			
Loughlin, 2007, United States[73]	To determine whether a vaccination program in a pharmacist-managed secondary prevention lipid clinic increased influenza immunization rates in a high-risk population	Retrospective chart review comparing immunization rates between the 2003–2004 and 2004–2005 influenza seasons	Total 476 and 266 patients at a large, multispecialty, group practice seen at clinic visits respectively.	Vaccination rates increased significantly from 39% to 76% (after program implementation. Age disparity in vaccination rates was eliminated after initiation of the program.
Grabenstein[135]	T o measure association between availability of pharmacist-immunizers and immunization delivery to adult prescription recipients	Mailed survey in spring 1999, contrasting adults in urban Washington State, where pharmacists administer vaccines, to adults in urban Oregon, where pharmacists did not. Measures were vaccination status and choice of vaccine provider.	Cluster sample based on October 1998 prescription records suggesting need for influenza vaccine, derived from 24 community pharmacies belonging to one pharmacy chain	Vaccine delivery by pharmacists is associated with higher rates of vaccination among those younger than 65 taking indicator medications medications for chronic diseases, as well as prescription recipients unvaccinated against influenza in the previous year.

Appendix 1: d) Perspectives on pharmacist-provided vaccinations

Perspectives on pharmacist-provided vaccinations				
First Author, Year, Country	**Study aim**	**Design, timeframe**	**Study population/setting**	**Relevant outcomes**
Patient perspectives				
Bounthavong, 2010, United States[136]	The aim was to measure patient satisfaction with the Pharmacy Specialty Immunization Clinic (PSIC), a pharmacist-run vaccination clinic.	Patient satisfaction was measured using a non-validated instrument containing 10 items with a five-point Likert scale. A total of 188 (55.1%) out of 341 patients who received at least one vaccine in the PSIC completed the survey.	Patients who were seen at the PSIC and who received at least one vaccination were eligible to take part in the patient satisfaction survey (n=341). This study was conducted at the Veterans Affairs San Diego Healthcare System (VASDHS).	Patients perceived good overall satisfaction with the pharmacist-run immunization clinic in terms of professionalism and access to vaccination. Priority index identified access to vaccination as a focus for future quality improvement.
Ipsos Reid, 2012, Canada	To determine Canadian perspectives towards private sector pharmacies extending healthcare services offered, and determine individual province support	Cross-sectional survey, poll open from April 26th to 30th, 2012.	A sample of 1,030 adults from Ipsos' Canadian online panel was interviewed online.	At first blush, most Canadians would be open to supporting private sector pharmacies extending their products and services into new avenues of healthcare, including immunizations.
Ernst, 2001, United States[132]	Increase accessibility of influenza vaccine in a rural community by establishing a community pharmacy-based influenza vaccination program.	Compare proportion of patients immunized in the pharmacy who were not vaccinated the previous year to those who were. Administration of vaccine began October 15, 1996, and was completed on December 6, 1996	An independent pharmacy in a rural eastern Iowa community of 5,000 people.	The pharmacist administered 343 doses of vaccine. 60.8% of the patients not immunized the previous year reported either they would not have gone elsewhere for the immunization (45.3%), or were unsure (25.5%).
Grabenstein, 2002, United States[137]	Evaluate adult prescription recipients' choices among vaccine providers.	Vaccination status, choice of vaccine provider, and opinions regarding vaccine providers were retrospectively surveyed by mail in spring 1999.	The study setting was a cluster sample from 24 community pharmacies based on prescription records that suggested need for pneumococcal and influenza vaccines.	Convenience was a strong factor for people younger than 65 taking chronic medications and those not vaccinated in the previous year. Most adult recipients of influenza vaccine returned to sites where they were vaccinated the previous year.
Grabenstein, 2001, United	To determine if advocacy of influenza immunisation by	a randomised, placebo-controlled trial was conducted	Patients receiving certain medications for heart or lung	Unvaccinated patients were 1.74 times more likely to be vaccinated

States[57]	community pharmacists would affect vaccine acceptance among patients at risk of influenza	in three pharmacies. Patients were either mailed reminders on influenza immunization or more generic public health notices. Letters mailed November 5th to 15th, 1990	disease or diabetes, or receiving non-steroidal anti-inflammatory drugs and who were at least 65 years old in Durham County, North Carolina.	after receiving vaccine recommendations and information than were control patients.
Physician perspectives				
Hurley, 2011[80]	To assess among general internists and family medicine physicians: willingness to collaborate with community vaccinators, barriers to collaboration, and characteristics associated with unwillingness to refer patients to community sites	Mail and Internet-based survey. Setting: National survey conducted during July-October 2009.	General internists and family medicine physicians.	The majority of physicians report willingness to collaborate with other community vaccinators to increase influenza vaccination rates although some will need assurance that collaboration will be financially feasible and will not compromise care. Successful collaboration will require reliable record transfer and must not be time consuming.
Pharmacist perspectives				
Pace, 2010, United States[106]	To determine community pharmacists' attitudes and knowledge on providing immunizations including perceived barriers to immunizing.	Mailed survey measuring Perceived barriers to providing immunizations, pharmacists' attitudes regarding immunizations, number of immunization-certified pharmacists, immunization administration rates within the last year	Arkansas community pharmacies from February to March 2009.	In all, 79% of the respondents believed administering immunizations has advanced or significantly advanced the profession. Commonly reported barriers included time, reimbursement and legal liability.
Neuhauser, 2004, United States [138]	To document the demographics, professional activities, and job satisfaction of immunization-certified pharmacists compared with pharmacists not certified for immunization.	In a cross-sectional pilot study, immunization-certified pharmacists were compared with noncertified pharmacists via a postal-mailed questionnaire. The questionnaire consisted of demographic and practice site characteristics, involvement in immunization services, and a job satisfaction survey.	189 pharmacists who had completed the immunization certification course were identified by the Tenessee Pharmacy Association. Controls were obtained from the Texas State Board of Pharmacy registrar database.	Desire to improve the health care of the public and personal satisfaction were important factors that encouraged pharmacists to become certified to administer vaccines. Adequate training, time, support from management and staff, and liability coverage were important factors that allowed pharmacists to incorporate immunizations into their practice.

Marra, 2010, Canada	To determine pharmacists' willingness and preparedness to deliver vaccines, especially the pandemic (H1N1) influenza vaccine, as well as their preferences related to providing this service.	A survey was developed to elicit pharmacists' opinions concerning administration of vaccines. Open from October 1rst to 31rst, 2009.	Staff pharmacists and pharmacy managers and owners licensed to practice in British Columbia were invited to complete the online survey.	Most respondents were interested in administering vaccines to their clients. In general, respondents understood the importance of documentation, reporting of adverse events and reporting to their local health authorities. More than half of participants felt prepared the pandemic (H1N1) vaccination program in fall 2009.
Kamal, 2003, United States.	To conduct a follow-up to the National Pharmacist Immunization Survey of 1998 to determine changes in pharmacist involvement in immunizations and obstacles to pharmacy-based immunization services and to assess the descriptive information about pharmacy-based immunization services provided.,	Cross-sectional mail survey., Four mailings in fall 2001 yielded a response rate of 21.2% (1,266 completed, usable surveys out of 5,958 deliverable surveys).	A randomly selected national sample of 6,000 pharmacists.,	Immunization activities to adults and children, as well as willingness these services all increased during the 1998-2001 period. Move vaccines were being offered, but flu shots still accounted for the majority.
Westrick, 2010, United States	To compare earlier (sustainers) and later (new) adopters in terms of pharmacy characteristics and characteristics of in-house vaccination services	Nonexperimental multistage study using several surveys sent during 2003, 2004, and 2006-2007.	Washington Community pharmacies in this study's analyses participated in all data collection stages and provided in-house vaccination services during the third stage.	The majority of independent and supermarket pharmacies were sustainers, and chain and mass merchant pharmacies were new adopters. In-house services offered by sustainers were broader in service accessibility and scope and involved a greater number of pharmacists trained in immunization delivery than services offered by new adopters in the same year. Further, sustainers offered expanded year-round services.

Appendix 2: Ethics application

Date: 15 June, 2012 7:55:47 PM PDT

The University of British Columbi
Office of Research Services
Behavioural Research Ethics
Suite 102, 6190 Agronomy Road
Vancouver, BC V6T 1Z3

H11-03079 **APEI (Version 1.0)**				
Principal Investigator: Fawziah Marra				
1. Principal Investigator & Study Team - Human Ethics Application [View Form]				
1.1. Principal Investigator Please select the Principal Investigator (PI) for the study. Once you hit Select, you can enter the PI's name, or enter the first few letters of his or her name and hit Go. You can sort the returned list alphabetically by First name, Last name, or Organization by clicking the appropriate heading.	Last Name	First Name	Employer.Name	Email
	Marra	Fawziah	Pharmaceutical Sciences	fawziah@mail.ubc.ca

Enter Principal Investigator Primary Department and also the primary location of the PI's Institution:	Faculty of Pharmaceutical Sciences University of British Columbia Faculty of Pharmaceutical Sciences University of British Columbia Faculty of Pharmaceutical Sciences, UBC point Grey

1.2. Primary Contact Provide the name of ONE primary contact person in addition to the PI who will receive ALL correspondence, certificates of approval and notifications from the REB for this study. This primary contact will have online access to read, amend, and track the application.	Last Name	First Name
	Gastonguay	Louise

1.3. Co-Investigators List all the Co-Investigators of the study. These members WILL have online access which will allow them to read, amend and track the application. These members will be listed on the certificate of approval (except BC Cancer Agency Research Ethics Board certificates). If this research application is for a graduate degree, enter the graduate student's name in this section.	Last Name	First Name	Institution/Department
1.4. Additional Study Team Members - Online Access List the additional study team members who WILL have online access to read, amend, and track the application but WILL NOT be listed on the certificate of approval.	Last Name	First Name	Institution/Department

1.5. Additional Study Team Members - No Online Access Click Add to list study team members who WILL NOT have online access to the application and will NOT be listed on the certificate of approval.	Last Name	First Name	Institution / Department	Rank / Job Title	Email Address

1.6.1. All undergraduate and graduate students and medical residents are expected to complete the TCPS Tutorial before submission. It is strongly recommended that the Principal Investigator and all Co-Investigators are familiar with the TCPS. Indicate completion of the TCPS tutorial below: All Undergraduate/Graduate Students:	N/A (no undergraduate/graduate students participating in this study)
1.6.2. All Medical Residents:	N/A (no medical residents participating in this study)
Comments:	
1.7. Project Title Enter the title of this research study as it will appear on the certificate. If applicable, include the protocol number in brackets at the end of the title.	Assessing BC Pharmacists' Experience and Attitudes Toward Immunization
1.8. Project Nickname Enter a nickname for this study. What would you like this study to be known as to the Principal Investigator and study team?	APEI

NOTE, if this application was converted to RISe from our previous database, ORSIL, here is the previous ORSIL application number for your information.			
2 Study Dates and Funding Information - Human Ethics Application [View Form]			
2.1. A. Start date:			April 2, 2012
2.1. B. End date:			April 2, 2013
2.2. Types of Funds Please select the applicable box(es) below to indicate the type(s) of funding you are receiving to conduct this research. You must then complete section 2.3 and/or section 2.4 to enter the name of the source of the funds to be listed on the certificate of approval.			No Funding
If you selected Other, specify the type of funding below.			
2.3. Research Funding Application/Award Associated with the Study Submitted to the UBC Office of Research Services Please click Add to identify the research funding application/award associated with this study. Selecting Add will list the sources of all research funding applications that have been submitted by the PI (and the person completing this application if different from the PI). If the research funding application/award associated with this study is not listed below, please enter those details in question 2.4.	UBC Number	Title	Sponsor
2.3.1. Is this a DHHS grant?			
2.3.2. If yes, please select the appropriate DHHS funding agency from the selection box, and attach the grant application.			DHHS Sponsor List:
Attach DHHS Grant Application for each sponsor listed above			
2.4. Research Funding Application/Award Associated with the Study not listed in question 2.3. Please click Add to enter the details for the research funding application/award associated with this study that is not listed in question 2.3.	UBC Number	Title	Sponsor
2.4.1. Is this a DHHS grant?			
2.4.2. If yes, please select the appropriate DHHS funding agency from the selection box, and attach the grant application.			DHHS Sponsor List:
Attach DHHS Grant Application for each sponsor listed above			
2.5. Conflict of Interest Do any of the following statements apply to the Principal Investigator, Co-Investigators and/or their partners/immediate family members? Receive personal benefits in connection with this study over and above the direct cost of conducting this study. For example, being paid by the funder for consulting. (Reminder; receiving a finders' fee for each subject enrolled is not allowed). Have a non-financial relationship with the sponsor (such as unpaid consultant, advisor, board member or other non-financial interest). Have direct financial involvement with the sponsor (source of funds) via ownership of stock, stock options, or membership on a Board. Hold patent rights or intellectual property rights linked in any way to this study or its sponsor (source of funds).			no
4. Study Review Type - Human Ethics Application [View Form]			
4.1. UBC Research Ethics Board Indicate which UBC Research Ethics Board you are applying to and the type of study you are applying for:			UBC Behavioural Research Ethics Board - Behavioural
4.2. Institutions and Sites for Study A. Enter the locations for the institutions and sites where the research will be carried out under this Research Ethics Board approval (including specimens processed by pathology, special radiological procedures, specimens obtained in the operating room, or tissue requested from pathology). Click Add and enter the appropriate letter to see the locations for the institutions and sites where the research will be carried out under this Research Ethics Board approval: B for BC Cancer Agency C for Children's and Women's Health Centre of BC P for Providence Health Care U for UBC Campus V for Vancouver Coastal Health (VCHRI/VCHA). If you are NOT using any of these sites select N/A from the list.		Institution	Site
		UBC	Vancouver (excludes UBC Hospita
B. Please enter any other locations where the research will be conducted under this Research Ethics Approval (e.g. private physician's office, community centre, school, classroom, subject's home, in the field - provide details).			
4.3. A. If this proposal is closely linked to any other proposal previously/simultaneously submitted, enter the Research Ethics Board number of that proposal.			
B. If applicable, please describe the relationship between this proposal and the previously/simultaneously submitted proposal listed above.			
C. Have you received any information or are you aware of any rejection of this study by any Research Ethics Board? If yes, please provide known details and attach any available relevant documentation in question 9.8.			
4.4. If this research proposal has received any independent scientific/methodological peer review, please include the names of committees or individuals involved in the review. State whether the peer review process is ongoing or completed. A. External peer review details:			no peer reviews
B. Internal (UBC or hospital) peer review details:			no peer reviews

C. If this research proposal has NOT received any independent scientific/methodological peer review, explain why no review has taken place.	We believe that this study will pose no risks to participants
4.5. After reviewing the minimal risk criteria on the right, does your application fall under minimal risk (and therefore is eligible to be considered for Delegated Review, executive review or review by an Undergraduate Research Review Committee)?	yes
4.6.A. Pandemic Research Does this study involve research concerning H1N1 or any other urgent public health event such that it requires urgent review and approval? [if no, move on to 5, if yes, answer 4.6B]	no
4.6.B. Does this pandemic study require review and approval by multiple Canadian Research Boards (i.e. more than those covered under the certificate of approval for this application) [If no, move on to 5, if yes, answer 4.6.C]	
4.6.C. Are you the Lead Investigator for this pandemic study? (i.e. the pandemic study involves numerous co-investigators from various sites external to UBC and you have been selected as the lead investigator for the entire project) [If YES, move on to 5, if NO move on to 4.7]	
4.7. Pandemic Research Lead PI REB Please review the guidance note on the right and then answer the following question: If the study has NOT been approved by the Lead PI's REB, UBC's REBs will not proceed to review the study independently. They will be participating in the Lead REB approval process and accordingly, your application is premature. Please discontinue this application and submit a new application as soon as the study approval by the Lead PI REB has been obtained. If the study HAS been approved by the Lead PI's REB, UBC's REBs will make every effort to review your study as quickly as possible. In order to ensure that the required documentation is incorporated into the RISe system, you will be directed to respond to Question 9. For more information please see the accompanying guidance note. Has this study been reviewed and approved by the Lead Principal Investigator's REB?	
4A. Study Review Type - Undergraduate Behavioural Research [View Form]	
4. A1. Has this study been approved by another Canadian Research Ethics Board?	no
If Yes, provide the name of the Research Ethics Board (REB) and the REB contact information below and proceed to the next page. Attach all relevant documentation in Section 9 of the form, including all documents submitted to the other Canadian REB. The application and correspondence between the researcher and the REB must be attached in Question 9.8. If No complete question 4. A2.	
4. A2. Does this study involve individual, honours thesis or course based research by UNDERGRADUATE students that is being conducted as part of an undergraduate course offered by The University, that is NOT PART OF A FACULTY MEMBER'S research program	no
If Yes, please select the applicable Undergraduate Student Research Review Committee from the list of established committees below. NOTE: There are currently no committees established, so please select No Research Committees Available:	
5. Summary of Study and Recruitment - Human Ethics Application [View Form]	
5.1.A Provide a short summary of the project written in lay language suitable for non-scientific REB members. DO NOT exceed 100 words and do not cut and paste directly from the study protocol.	Since 2009, BC pharmacists have been part of the province immunization plan,but what have pharmacists really been experiencing during these two years in regards to their new role? The purpose of this project is to assess BC pharmacists in regard to their overall experience with their immunization implication and its process in BC. Through this investigation, we hope that we can determine the essential components which may still need to be put in place for pharmacists to enhance their involvement in immunization activities and the health of BC population.
5.1.B Summarize the research proposal:	In 2009, legislation was changed to allow BC pharmacists to immunize once they had taken a certification program. Although the legislation has given authority to pharmacists to immunize, they have only been given access to influenza and pneumococcal-23 vaccines by public health units. Since pharmacists have now taken part in two consecutive influenza seasons, it is prudent to get feedback from them on their experience with the program. This feedback will also allow us to start planning on release of other non-flu related immunizations to the pharmacists. Study Purpose Our study will be focusing on BC pharmacists' experience toward their involvement in the immunization process. The main objectives of this project will be to evaluate: 1) Pharmacists' willingness to provide non-flu vaccination services

	(e.g travel vaccinations) 2) Pharmacists' willingness to provide new injection-related services (e.g. injections for diabetes, rheumatoid arthritis, cardiovascular disease etc); 3) Pharmacists' experiences in administering the vaccination (e.g. any barriers, accessibility to the vaccines, paper work, reimbursement, time consuming or scheduling issues, support from the community, etc.); 4) Pharmacists' position on the adequacy of the training course, certification (e.g. preparedness in case of adverse events, allergic reactions etc). 5) Pharmacists' position on their relationship with Health Authorities (e.g. vaccine accessibility and availability, relationship with their local Health Units, interaction with nurses, physicians, etc). Through this investigation, we hope that we can determine the essential components which may still need to be put in place for pharmacists to enhance their involvement in immunization activities and the health of BC population.
5.2. Inclusion Criteria. Describe the subjects being selected for this study, and list the criteria for their inclusion. For research involving human pluripotent stem cells, provide a detailed description of the stem cells being used in the research.	Pharmacists licensed to practice in BC
5.3. Exclusion Criteria. Describe which subjects will be excluded from participation, and list the criteria for their exclusion.	None
5.4. Provide a detailed description of the method of recruitment. For example, describe who will contact prospective subjects and by what means this will be done. Ensure that any letters of initial contact or other recruitment materials are attached to this submission on Page 9.	All licensed pharmacists practicing in BC will be invited to participate through a telephone interview conducted by IPOS Reid. Consent will be asked for at the beginning of the interview. Each eligible pharmacist will be asked about their experiences and opinions on these different issues. Ipos Reid will obtain the address and telephone numbers from the BC Pharmacists Association.
5.5. Describe how prospective normal/control subjects will be identified, contacted, and recruited, if the method differs from the above.	There will be no control or normal subjects in this study
5.6 If existing records (e.g. health records, clinical lists or other records/databases) will be used to IDENTIFY potential subjects, please describe how permission to access this information, and to collect and use this information will be obtained.	
5.7. Summary of Procedures	To achieve the study's objectives, we plan to survey all licensed pharmacists practicing in the province of BC. An extensive questionnaire will be administered to each eligible pharmacist to inquire about their experiences and opinions on these following issues: 1) Pharmacists' willingness to provide non-flu vaccination services (e.g travel vaccinations) 2) Pharmacists' willingness to provide new injection-related services (e.g. injections for diabetes, rheumatoid arthritis, cardiovascular disease etc); 3) Pharmacists' experiences in administering the vaccination (e.g. any barriers, accessibility to the vaccines, paper work, reimbursement, time consuming or scheduling issues, support from the community, etc.);

	4) Pharmacists' position on the adequacy of the training course, certification (e.g. preparedness in case of adverse events, allergic reactions etc). 5) Pharmacists' position on their relationship with Health Authorities (e.g. vaccine accessibility and availability, relationship with their local Health Units, interaction with nurses, physicians, etc).
6. Subject Information and Consent Process - Human Ethics Application [View Form]	
6.1. How much time will a subject be asked to dedicate to the project beyond that needed for normal care?	The survey will take approximately 20 minutes to complete
6.2. If applicable, how much time will a normal/control volunteer be asked to dedicate to the project?	n/a
6.3. Describe what is known about the risks (harms) of the proposed research.	No known risks
6.4. Describe any potential benefits to the subject that could arise from his or her participation in the proposed research.	No direct benefits known
6.5. Describe any reimbursement for expenses (e.g. meals, parking, medications) or payments/gifts-in-kind (e.g. honoraria, gifts, prizes, credits) to be offered to the subjects. Provide full details of the amounts, payment schedules, and value of gifts-in-kind.	none
6.6. Specify who will explain the consent form and invite the subject to participate. Include details of where the consent will be obtained, and under what circumstances.	An explanatory consent will be administered by Ipos Reid via telephone to the potential participants. Consent will be asked for at the beginning of the interview. Each eligible pharmacist will be asked about their experiences and opinions on these different issues.
6.6.A. If you are asking for a waiver or an alteration of the requirement for subject informed consent please justify the waiver or alteration and confirm that the study meets the criteria on the right.	n/a
6.7. How long after receiving the consent form will the subject have to decide whether or not to participate? If this will be less than twenty-four hours, provide an explanation.	Less than 24 hours, but if they need more time then Ipos Reid will call the pharmacist back before the closing of the recruitment period which we believe will be 8 weeks.

6.8. Will every subject be competent to give fully informed consent on his/her own behalf? Please click Select to complete the question and view further details.

Will subject be competent to give fully informed consent?	Details of the nature of the incompetence	If not, who will consent on his/her behalf?	If not, will he/she be able to give assent to participate?	If Yes, explain how assent will be sought.
Yes				[Details]

6.9. Describe any situation in which the renewal of consent for this research might be appropriate, and how this would take place.	N/a
6.10. What provisions are planned for subjects, or those consenting on a subject's behalf, to have special assistance, if needed, during the consent process (e.g. consent forms in Braille, or in languages other than English).	N/A. Due to the licensing requirements to practice pharmacy and enrollment requirements for pharmacy programs, it is not anticipated that subjects will have difficulty completing the questionnaire.
6.11. Describe any restrictions regarding the disclosure of information to research subjects (during or at the end of the study) that the sponsor has placed on investigators, including those related to the publication of results.	N/A
7. Number of Subjects - Human Ethics Application for Behavioural Study [View Form]	
7.1. Indicate external approvals below: A. Other Institutions:	no
B. Please select Add to enter the name of the institution and if you have already received approval attach the approval letter.	Name of Institution
C. Other Jurisdiction or Country:	no
D. Please select Add to enter the name of the jurisdiction or country and if you have already received approval attach the approval letter.	Name of Jurisdiction or Country
E. Has a Request for Ethics Approval been submitted to the institution or responsible authority in the other jurisdiction or country? (Send a copy to the Research Ethics Office when approval is obtained).	
F. If a Request for Approval has not been submitted, provide the reasons below:	
G. Does this research involve aboriginal communities or organizations; or aboriginals as an identified subject category?	no
If YES, ensure that you are familiar with the guidance documents linked on the right. Also attach a copy of the research agreement with the community (if available) in Question 9.8. Please describe the community consent process. If no community consent is being sought, please justify.	
7.2. A. How many subjects (including controls) will be enrolled in the entire study? (i.e. the entire study, world-wide)	~ 3000
B. How many subjects (including controls) will be enrolled at institutions covered by this Research Ethics Approval? (i.e. only at the institutions covered by this approval)	~ 3000
Of these, how many are controls?	0

7.3. Are any of the following procedures or methods involved in this study? Check all that apply.	None of these Methods
7.4. Who will actually conduct the study and what are their qualifications to conduct this kind of research? (e.g., describe relevant training, experience, degrees, and/or courses).	Dr Fawziah Marra is an experienced researcher and professor at the University of British Columbia. She has extensive experience working with the BC Ministry of Health, College of Pharmacists of BC and the BC Pharmacy Association on matters related to immunizing pharmacists.
8. Confidentiality - Human Ethics Application for Behavioural Study [View Form]	
8.1. Security of Data during the course of the study How will data be stored? (e.g. computerized files, hard copy, videotape, audio recordings, PDA, other) How will security of the data be maintained? (For example, study documents must be kept in a secure locked location and computer files should be password protected and encrypted, data should not be stored or downloaded onto an unsecured computer or portable lap-top, backup files should be stored appropriately). If any data or images are to be kept onthe Web, what precautions have taken to prevent it being copied?	For the data analysis, the survey information will not be linked to any contact information and will be anonymous. Data obtained from the questionnaire will only be identified by the unique study ID. Data will be stored on a secure server (housed at UBC).
8.2. Access to Data Who will have access to the data? (For example, co-investigators or students). How will all of those who have access to the data be made aware of his or her responsibilities concerning privacy and confidentiality issues?	Only the research team will have access to the study information. The research team is experience in study process and are aware of confidentiality issues.
8.3. Protection of Personal Information Describe how the identity of research subjects will be protected both during and after the research study, including how subjects will be identified on data collection forms	The survey will be kept anonymous, a number will be assigned to each survey for data entry purposes only. No name or any other personal identification will be put on or linked to the survey.
8.4. Transfer of Data Will any data that identify individuals be transfered (available) to persons or agencies outside of the University?	no
If YES, describe in detail what identifiable information is released, to whom, how the data will be transferred, how and where it will be stored and what safeguards will be used to protect the identity of subjects and the privacy of their data. Attach the data transfer agreement if applicable.	
8.5. Retention and Destruction of data UBC policy requires that data be kept for at least 5 years within a UBC facility. If you intend to destroy the data at the end of the storage period describe how this will be done to ensure confidentiality (e.g. tapes should be demagnetized, paper copies shredded). UBC has no explicit requirement for shredding of data at the end of this period; however, destruction of the data is the best way of ensuring that confidentiality will not be breached. Please note that the responsibility for the security of the data rests with the Principal Investigator.	The electronic data will be kept in password protected files on a secure server and will only be accessible to the study coordinator and the PI. It will be destroyed after 5 years.
8.6. Future use of data Are there any plans for future use of either data or audio/video recordings? Provide details, including who will have access and for what purposes, below.	The findings of the overall project will be communicated to Public Health, BCCDC, the College of Pharmacists of BC, the BC Pharmacists Association and the Pharmaceutical Services Division/Ministry of Health.
8.7. Feedback to subjects Are there any plans for feedback on the findings or results of the research to the subject? Provide details below.	We are hoping that the findings will published and therefore available for consultation.

9. Documentation - Human Ethics Application [View Form]

	Name	Version	Date	Password (if applicable)
9.1.A. Protocol Examples of types of protocols are listed on the right. Click Add to enter the required information and attach the documents.	APEI Protocol Nov. 9, 2011		November 9, 2011	[V
9.1.B. Health Canada regulatory approval (receipt will be acknowledged)	Name	Version	Date	Password (if applicable)
9.1.C. FDA IND or IDE letters (receipt will be acknowledged)	Name	Version	Date	Password (if applicable)

	Name	Version	Date	Password (if applicable)
9.2. Consent Forms Examples of types of consent forms are listed on the right. Click Add to enter the required information and attach the forms.	APEI Invitation/consent letter	5	March 28, 2012	[
	APEI Invitation/consent letter	4	November 21,	

9.3. Assent Forms Examples of types of assent forms are listed on the right. Click Add to enter the required information and attach the forms.	Name	Version	Date	Password (if applicable)
9.4. Investigator Brochures/Product Monographs (Clinical applications only) Please click Add to enter the required information and attach the documents.	Name	Version	Date	Password (if applicable)
9.5. Advertisement to recruit subjects Examples are listed on the right. Click Add to enter the required information and attach the	Name	Version	Date	Password (if applicable)

documents.					
	Name	Version	Date	Password (if applicable)	
9.6. Questionnaire, questionnaire cover letter, tests, interview scripts, etc. Please click Add to enter the required information and attach the documents.	APEI survey		May 14, 2012		[Vie
	APEI Survey		November 24, 2011		

9.7. Letter of initial contact Please click Add to enter the required information and attach the forms.	Name	Version	Date	Password (if applicable)
9.8. A. Other documents: Examples of other types of documents are listed on the right. Click Add to enter the required information and attach the documents.	Name	Version	Date	Password (if applicable)

B. If a Web site is part of this study, enter the URL below. Since URL's may change over time or become non-existent, you must also attach a copy of the documentation contained on the web site to one of the sections above or provide an explanation.	
10. Fee for Service - Human Ethics Application for Behavioural Study [View Form]	
Mechanism for Submitting Fee. Please indicate which of the following method of payment will be used for this application:	
Contact information regarding where to send the invoice.	
12. Save Application - Human Ethics Application [View Form]	

Appendix 3: Survey

Assessing BC Pharmacists' Experience and Attitudes Toward Immunization (APEI)

INVITATION LETTER

SENDER (MAILBOX): survey@ipsos-research.com
DISPLAY NAME: Ipsos Research
SUBJECT LINE: Online survey on behalf of the BC Pharmacy Association (BCPhA) and the University of British Columbia (UBC)^PID^

SURVEY

CONSENT

This survey is a collaborative project between the BC Pharmacy Association (BCPhA) and the University of British Columbia

The survey investigates the challenges that BC pharmacists face in immunization. The survey looks at current immunization services offered at your pharmacy and the issues you might be facing with regards to these services and the administration a stocking of vaccines. The results will be used to develop strategies to overcome the current barriers to immunization at the pharmacy level and better support pharmacists.

All information provided will be kept strictly confidential. None of your information will be used for any purposes other than as No information that can identify you will appear in any reports or publications about the project. The information discussed is research purposes only, and will not be used to sell or market any products.

The study results will be used in two ways:

Academic Research: The results of the survey will be evaluated and presented to a national and international audience by I Fawziah Marra, a Professor at the University of British Columbia. The UBC Research Ethics Board has approved her study.

Policy decision-support Tool: The results of the survey will also be used by BCPhA to support pharmacists by indentifyin raising awareness of current barriers thereby providing decision support to industry and policy makers in the government at a to provide better health outcomes for BC residents.

The findings of the overall project will be communicated to Public Health, BCCDC, the College of Pharmacists of BC, and the Pharmaceutical Services Division/Ministry of Health.

At all times your personal and health information held by Ipsos Healthcare will be protected under the strict privacy provision *Personal Information Protection Act*, When your information is transferred to UBC for the research study it will be protected I *Freedom of Information and Protection of Privacy Act* and oversight by the UBC Research Ethics Board.

Do you agree to participate in this survey under the circumstances stated above?

Yes
No

[IF NO THANK AND TERMINATE]

SECTION I: ABOUT YOU

Thank you for participating in this survey.

1. Which, if any, of the following best describes your current position? (Select one answer only. If you have more than one position, please provide information on the position you spend the majority of your time)

Community pharmacist (staff)
Community pharmacy manager
Community pharmacy owner
Head Office position (includes regional manager, director, CEO, etc.)
Hospital pharmacist
Other (please specify)

2. In your current position, do you influence or make decisions about your practice site?

Yes
No

3. How old are you?

[RANGE 0-99]

4. What is your gender?

Male
Female

5. How long have you been a pharmacist? (Select one answer only)

Less than 5 years
5-9 years
10-19 years
20-30 years
More than 30 years

6. Are you currently authorized by the College of Pharmacists of British Columbia (CPBC) to administer injections?

Yes
No

[IF NO AT Q.6 ASK Q.7
OTHERWISE SKIP TO TEXT BEFORE Q.8]

7. Why are you not currently authorized by the College of Pharmacists of British Columbia (CPBC) to administer injections? (Select all that apply)

Didn't have time to get certified this year
Certification sessions were not available near my community
Employer unwilling to cover training costs
Not interested in administering injections
Other (please specify)

SECTION II: PRACTICE SITE

Please consider only the past 12 months when answering the following questions. If you practice in more than one setting, describe the one where you spend most of your time.

8. Please select the pharmacy where you primarily work. (Select one answer only)

Independent (please specify): _____
Chemist, The
Costco

Drug Trading Company Ltd
HBC/Zellers
Loblaw
London Drugs
Medicine Centre
Medicine Shoppe
Overwaitea Food Group
Paragon Pharmacies
People's Drug Mart
Pharmasave
Remedy's Rx
Rexall
Safeway Food and Drugs
Shoppers Drug Mart
Thrifty Foods
Walmart
Other (please specify): _____

9. In which city is the primary pharmacy where you work located? (Select one answer only)

   [PN INSTRUCTION: INSERT LIST OF CITIES IN EXCEL FILE "BC CITIES"]
   Other (please specify)

10. In the box below, please type the postal code of the primary pharmacy where you work (Please do not add a space between characters)

[OPENEND – SHOW ONE SMALL BOX AND ALLOW 6 CHARACTERS ONLY, NO MORE NO LESS]

11. What types of patient services does your pharmacy regularly provide or plan to provide in the future? For each of the patient services below, please indicate whether it is currently provided at the pharmacy where you work, whether it is not currently provided but will be in the future or neither. (Select one answer per row)

Patient service	Currently provide	Do not currently provide but plan to provide in the future	Do not currently provide and do not intend to provide in the future
Chronic Disease Management (i.e. diabetes, asthma)			
Emergency Fills			
Prescription Adaptation –Renewals			
Prescription Adaptation – Change Dose or Regimen			
Prescription Adaptation – Therapeutic Substitution			
Influenza vaccination clinic staffed with nurses			
Administration of Vaccines by pharmacists			
Medication Review Services			
Travel Clinics			
Therapeutic drug monitoring (i.e. PK or INR monitoring)			
Prescribing – minor ailments			

[ASK Q.12 IF ANSWERED "CURRENTLY PROVIDE" FOR SERVICES AT Q.11
IF NONE SHOW TEXT BEFORE Q.13]

12. Does your pharmacy currently charge fees to patients when providing each of the following services? (Please answer for each)

Patient service [PIPE BACK SERVICE IF ANSWERED "CURRENTLY PROVIDE" AT Q.11]	Yes	No

Chronic Disease Management (i.e. diabetes, asthma)		
Emergency Fills		
Prescription Adaptation –Renewals		
Prescription Adaptation – Change Dose or Regimen		
Prescription Adaptation – Therapeutic Substitution		
Influenza vaccination clinic staffed with nurses		
Administration of Vaccines by pharmacists		
Medication Review Services		
Travel Clinics		
Therapeutic drug monitoring (i.e. PK or INR monitoring)		
Prescribing – minor ailments		

SECTION III: ADMINISTERING VACCINATIONS

Please consider the provision of ANY vaccinations (e.g. seasonal influenza, tetanus booster, pneumococcal, hepatitis, travel vaccinations, etc) when answering the following questions.

13. Which of the following types of vaccines do you **stock** at the pharmacy where you work? (Select one answer only)

Public-funded vaccines only (i.e. Flu vaccine, Pneumovax)
Privately funded vaccines only (i.e. Twinrix, Zostavax)
Both public and privately funded vaccines
The pharmacy does not stock vaccines

14. Which of the following types of vaccines are being **administered** at the pharmacy where you work? (Select one answer only)

Public-funded vaccines only (i.e. Flu vaccine, Pneumovax)
Privately funded vaccines only (i.e. Twinrix, Zostavax)
Both public and privately funded vaccines
No vaccines are administered at the pharmacy

[ASK Q.15 IF SELECTED ITEM 1, 2 OR 3 AT Q.14
OTHERWISE SKIP TO Q.16]

15. Including yourself, how many pharmacists are certified to administer vaccines at the pharmacy where you work? (If none please answer zero)

[RANGE 0-99]

16. Approximately how many patients aged 65 and over have a record at the pharmacy where you work? (Select one answer only)

Less than 1,000
1,000 to 5,000
5,000 to 10,000
10,000 to 15,000
15,000 to 20,000
More than 20,000

17. What types of vaccine does your pharmacy regularly administer or plan to administer in the future? For each vaccine below, please indicate whether it is currently provided at the pharmacy where you work, whether it is not currently provided but will be in the future or neither. (Please select one answer per row)

Vaccine	Currently provide	Do not currently provide but plan to provide in the future	Do not currently provide and do not intend to provide in the future
Influenza			
Pneumococcal			
Tetanus, diptheria, acellular pertussis (Tdap)			
Tetanus, diphtheria (Td)			
Human Papillomavirus (HPV)			
Hepatitis A			
Hepatitis B			
Herpes Zoster			
Varicella Zoster			
Travel vaccines			
Live vaccines (e.g. varicella, MMR)			
School-based vaccines (e.g. meningococcal)			

18. Please select what barriers, if any, affect your ability to administer vaccines at the pharmacy where you work. (Select all that apply)

Lack of private area to confidentially obtain appropriate patient medical history
Lack of adequate space to confidentially provide vaccinations
Lack of sufficient waiting area space for vaccine recipients to sit 15 minutes post injection
Insufficient storage space for vaccine related supplies
Unable to meet refrigeration cold chain requirements
Unable to meet freezer cold chain requirements
It takes too much time to provide the service
Insufficient staffing levels
Payment of $10 does not reflect the time to provide the service
Documentation requirements are too much
Lack of physician support towards your involvement in immunizing patients
Communication with physicians with respect to vaccinating their patients
Communication with public health nursing with respect to vaccinating their patients
[EXCLUSIVE] None of the above
Other (please specify)

19. What are the benefits of pharmacists providing immunization services? From the list below, please select the 3 most important benefits in order of importance where 1 is the most important, 2 is the second and 3 is the third in importance.(Select one answer per column)

ROWS
Develops a therapeutic relationship between a pharmacist and patient
Providing immunizations to adults is an integral part of care
More convenient for your patients to obtain immunization through a pharmacy
Provides better record keeping of immunizations
Improved access for your patients to immunization services
Improves vaccination rates in my community

COLUMNS
1-Most important benefit
2-Second most important benefit
3-Third most important benefit

[ASK Q.20 IF ANSWERED "Do not currently provide but plan to provide in future" FOR VACCINES AT Q.17
IF NONE SKIP TO Q.22]

20. You mentioned earlier that your pharmacy plans to provide the following vaccines in the future. Please indicate if you would require ongoing training to administer each of the following. (Please select one answer per row)

Vaccine [PIPE BACK IF ANSWERED COLUMN 2 AT Q.17]	Would require ongoing training	Would not require ongoing training
Influenza		
Pneumococcal		
Tetanus, diptheria, acellular pertussis (Tdap)		
Tetanus, diphtheria (Td)		
Human Papillomavirus (HPV)		
Hepatitis A		
Hepatitis B		
Herpes Zoster		
Varicella Zoster		
Travel vaccines		
Live vaccines (e.g. varicella, MMR)		
School-based vaccines (e.g. meningococcal)		

[ASK Q.21 IF ANSWERED "Would require…" FOR AT LEAST ONE VACCINE AT Q.20
IF NONE SKIP TO Q.22]

21. Would you prefer this ongoing training on the administration of vaccines to be…? (Select one answer only)

Online
Hands on workshop
Both

22. Which, if any, of the following sources do you use to keep up-to-date with education around different immunizations and schedules? (Select all that apply)

Non industry continuing education events
Canadian Immunization Guide
NACI statements
Local public health notices
Industry reps visiting the pharmacy
BCCDC Immunization manual
Peer reviewed journals
Online courses
Other (please specify)
[EXCLUSIVE] I do not use any sources

[IF "CURRENTLY PROVIDE" FOR "ADMINISTRATION OF VACCINES BY PHARMACISTS" AT Q.11 ASK Q.23
OTHERWISE SKIP TO NOTE BEFORE Q.24]

23. Which of the following best describes how you currently provide vaccination services in the pharmacy where you work? (Select all that apply)

    Appointment-based
    Walk-in
    Clinic based
    Daytime
    Evening
    Weekends
    Few hours only per week
    Specific days of the week
    Other

[IF "CURRENTLY PROVIDE" FOR "ADMINISTRATION OF VACCINES BY PHARMACISTS" AT Q.11 AND/OR ANSWERED "DO NOT CURRENTLY PROVIDE BUT PLAN TO PROVIDE IN THE FUTURE" FOR AT LEAST ONE VACCINE AT Q.17 ASK Q.24 OTHERWISE SKIP TO Q.25]

24. Which of the following best describes how you would prefer to provide vaccination services in the pharmacy where you work? (Select all that apply)

    Appointment-based
    Walk-in
    Clinic based
    Daytime
    Evening
    Weekends
    Few hours only per week
    Specific days of the week
    Other

SECTION IV: HERPES ZOSTER VACCINE

25. Do you have a freezer with a separate door (i.e. not a bar fridge) for storage of vaccines or other types of medicine at -15°C?

Yes
No

[IF ITEM 2 OR 3 ANSWERED AT Q.13 ASK Q.26
ALL OTHERS SKIP TO REACTION TO PUBLIC PROGRAM SECTION]

26. Does the pharmacy where you work currently stock the Herpes Zoster vaccine?

Yes
No

[ASK Q.27 IF NO AT Q.26
OTHERWISE SKIP TO NOTE BEFORE Q.28]

27. Why does your pharmacy not stock the Herpes Zoster vaccine? (Please be as specific as possible) [OPEN END]

[IF YES AT Q.26 ASK Q.28
OTHERWISE SKIP TO REACTION TO PUBLIC PROGRAM SECTION]

28. Approximately how many doses of the Herpes Zoster vaccine did your pharmacy **dispense** in the past month?

[RANGE 0-999]

[ASK IF ITEM 1, 2 OR 3 ANSWERED AT Q.14
OTHERWISE SKIP TO REACTION TO PUBLIC PROGRAM SECTION]

29. Approximately how many doses of the Herpes Zoster vaccine did your pharmacy **administer** in the past month?

[RANGE 0-999]

Reaction to Public Program

[SHOW THE FOLLOWING ON ONE SCREEN THEN SHOW THE TEXT ABOVE ALL OF THE FOLLOWING QUESTIONS IN *ITALIC* Q.30 TO Q.35]

For the questions that follow, please assume that the BC government was considering introducing a public immunization program for the Herpes Zoster vaccine for adults aged 65 and over, to be administered by pharmacists.

30. What is your overall reaction to this? (Select one answer only)

Very positive
Somewhat positive
Somewhat negative
Very negative

[ASK Q.31 IF ITEM 1 OR 4 AT Q.13 OR IF NO ANSWERED AT Q.26
OTHERS SKIP TO NOTE BEFORE Q.32]

31. Should the Herpes Zoster vaccine become covered through a public program, how likely would you be to start offering the Herpes Zoster vaccine in your pharmacy? (Select one answer only)

Very likely
Somewhat likely
Not very likely
Not at all likely

[IF NOT VERY OR NOT AT ALL AT Q.31 ASK Q.32
OTHERWISE SKIP TO NOTE BEFORE Q.33]

32. Why wouldn't you start offering the Herpes Zoster vaccine in your pharmacy? (Please be as specific as possible) [OPEN END]

[IF YES AT Q.25 ASK Q.33
OTHERWISE SKIP TO NOTE BEFORE Q.34]

33. What would be the maximum number of doses of the Herpes Zoster vaccine you would be able to stock in your freezer should it become available through a public program?

[RANGE 0-999]

[IF NO AT Q.25 ASK Q.34
OTHERWISE SKIP TO NOTE BEFORE Q.35]

34. Would you consider purchasing a freezer to be able to offer the Herpes Zoster vaccine at your pharmacy?

Yes
No

[IF 1 OR MORE AT Q.29 ASK Q.35
ALL OTHERS SKIP TO Q.36]

35. How many doses of the Herpes Zoster vaccine do you estimate you would administer in a typical month if it became available through a public program?

[RANGE 0-999]

[ASK ALL]

36. Assuming that the Herpes Zoster vaccine was only free of charge for patients aged 65 and over, would you still offer it, at a cost, to your patients aged 50 to 64?

Yes
No

SECTION V: ADMINISTERING NON-VACCINATION INJECTIONS

37. Please indicate which, if any, of the following medications by injections (other than vaccines) are currently provided by a registered nurse in the pharmacy where you work. (Select all that apply. If none, please select “none of the above”.)

Anti-psychotic medications
Vitamin B12
Colloidal Gold
Rheumatoid Arthritis medications
Iron
Insulin
Heparin
Biologics
Botox
Generic Depo-Testosterone
Other (please specify)
[EXCLUSIVE] None of the above

38. How interested would you be in administering medications by injections (other than vaccines) to your patients? (Select one answer only)

Very interested
Somewhat interested
Not very interested
Not at all interested

[IF VERY OR SOMEWHAT INTERESTED AT Q.38 ASK Q.39
OTHERWISE SKIP TO NOTE BEFORE Q.42]

39. Please indicate which, if any, of the following medications by injections (other than vaccines) you would be interested in administering yourself at the pharmacy where you work. (Select all that apply. If none, please select “none of the above”.)

Anti-psychotic medications
Vitamin B12
Colloidal Gold
Rheumatoid Arthritis medications
Iron
Insulin
Heparin
Biologics
Botox
Generic Depo-Testosterone
Other (please specify)
[EXCLUSIVE] None of the above

40. What additional training topics, if any, do you feel would assist pharmacists in the administration of medications by injections? (Select all that apply)

Common vaccines required for travel
Self management of diseases while abroad
Diabetes
Anticoagulant medications
Immunosuppressive therapy
Self management of chronic diseases
[EXCLUSIVE] None of the above

[IF NONE OF THE ABOVE AT Q.40 SKIP TO NOTE BEFORE Q.42
OTHERWISE ASK Q.41]

41. Would you prefer this additional training to be…(Select one answer only)

Online
Hands on workshop
Both

[IF “NONE OF THE ABOVE” AT Q.37 SKIP TO NOTE BEFORE Q.43
OTHERWISE CONTINUE TO Q.42

42. Please indicate which segments of the population below currently receive medications by injections by a registered nurse at the pharmacy where you work. (Select all that apply)

Patients 18 years of age or older
Patients 12 to 17 years of age
Patients 5 to 11 years of age
Patients below 5 years of age
Special populations (ie. renal transplant, immunocompromised, HIV, etc.)

[ASK Q.43 IF ANSWERED Q.42
AND/OR ASK Q.43 IF “VERY” OR “SOMEWHAT” INTERESTED AT Q.38
ALL OTHERS SKIP TO CONCLUSION]

43. Please indicate to which [IF ANSWERED Q.42 INSERT: other] segments of the population below you would like the pharmacy where you work to provide medications by injections in the future. (Select all that apply)

[IF ANSWERED Q.42, DO NOT SHOW CHOICES SELECTED AT Q.42 FOR Q.43]
Patients 18 years of age or older
Patients 12 to 17 years of age
Patients 5 to 11 years of age
Patients below 5 years of age
Special populations (ie. renal transplant, immunocompromised, HIV, etc.)