

**Shades of gray in vaccine decision making: Understanding, exploring, and
addressing the challenges of influenza vaccine hesitancy in Ontario
community pharmacies**

by

Gokul Raj Pullagura

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Examining Committee Membership

The following served on the Examining Committee for this thesis. The decision of the Examining Committee is by majority vote.

External examiner

Dr. Roy Dobson
Professor, College of Pharmacy and Nutrition
University of Saskatchewan

Supervisor

Dr. Nancy Waite
Professor, School of Pharmacy
University of Waterloo

Internal members

Dr. Sherilyn Houle
Assistant Professor, School of Pharmacy
University of Waterloo

Dr. Tejal Patel
Assistant Clinical Professor, School of Pharmacy
University of Waterloo

Internal-external member

Dr. Heather MacDougall
Associate Professor
University of Waterloo

Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

Background: Two-thirds of Canadian adults currently do not receive the annual influenza vaccine. Vaccine hesitancy (VH), the voluntary delay or refusal of vaccination services despite availability is a significant contributor to the poor uptake of several vaccines including the influenza vaccine. The overarching intent of this thesis was to gain a nuanced understanding of the community pharmacists' experiences with influenza VH and explore means to best address it.

Methods: This thesis is comprised of three studies. The first study was a quantitative descriptive analysis of an exploratory cross-sectional online survey of 885 pharmacists. This study aimed to provide an overview of pharmacists' perceived knowledge, attitudes and practices pertaining to influenza VH. The second study was a qualitative interpretive analysis of in-depth semi-structured interviews with 22 pharmacists. An implementation science lens was then used to examine the results from the first two studies to guide the selection of a behavioural target and inform intervention design. Based on these findings, the third study included a cost-utility analysis of a novel remunerated community pharmacist consultation service on influenza vaccination for Ontario seniors from a provincial payer perspective.

Results: Pharmacists' self-reported knowledge of influenza vaccine and disease, their confidence and ability to identify and address influenza VH was generally high. Pharmacists' engagement with patients on the influenza vaccine was found to be modulated by a complex and mutually reinforcing constellation of attitudes and behaviours which included: a binary (pro-vaccine or anti-vaccine) perception of patient vaccination decisions; a conflation of those expressing hesitancy with those that are anti-vaccine; and a passive approach to patient

engagement. Despite possessing the requisite knowledge and skills, workflow barriers such as limited time, inadequate staffing, and poor remuneration were found to restrict optimal patient engagement on influenza vaccinations. Offering pharmacists a CAD \$15 consultation fee to engage with seniors on the influenza vaccine was estimated to be both cost-effective and clinically effective.

Conclusion: Facilitating optimal practice scope for pharmacists, and capitalizing the additional convenience and accessibility offered through the community pharmacy setting presents a promising means to address influenza VH. Conventional tools to aid health professionals in addressing influenza VH rely on augmenting the vaccine provider's knowledge and skills; however, our analysis suggests that reorienting efforts to enhance the provider's motivation and opportunity to engage with patients on influenza vaccine conversations are likely to be more effective in the community pharmacy setting.

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Dedication

This thesis is dedicated to my parents, Nirmala and Surendranath.

Their unfaltering love, kindness and support have enabled me to pursue my dreams.

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List of Abbreviations

ADR	Adverse Drug Reaction
BC	British Columbia
BCW	Behaviour Change Wheel
CAD	Canadian Dollar
CBC	Canadian Broadcasting Corporation
CCHS	Canadian Community Health Survey
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
COM-B	Capability, Opportunity, Motivation - Behaviour
EC	Enhanced Care
ED	Emergency Department
GBS	Guillain Barre' Syndrome
HCP	Health Care Professional
HPV	Human Papilloma Virus
ICU	Intensive Care Unit
IIV	Inactivated Influenza Vaccine
ILI	Influenza Like Illness
JRF	Joint Reporting Form
KAP	Knowledge, Attitudes and Practices
LAIV	Live Attenuated Influenza Vaccine
MMR	Measles Mumps Rubella
MOHLTC	Ministry of Health and Long Term Care
NACI	National Advisory Committee on Immunization
OCP	Ontario College of Pharmacists
ORE	Office of Research Ethics
PHAC	Public Health Agency of Canada
QALY	Quality Adjusted Life Year

RNA	Ribonucleic Acid
RR	Relative Risk
SAGE	Strategic Advisory Group of Experts
SC	Standard Care
TIP	Tailoring Immunization Programmes
TIV	Trivalent Inactivated Vaccine
UIIP	Universal Influenza Immunization Program
UNICEF	United Nations Children's Fund
USA	United States of America
USD	United States Dollar
VH	Vaccine Hesitancy
VPD	Vaccine preventable disease
WHO	World Health Organization
WTP	Willingness To Pay

| Chapter 1

Introduction

The worldwide success of vaccination programs and the consequent decline in outbreaks of devastating vaccine preventable diseases (VPDs) are amongst the foremost achievements in public health.¹ Vaccination programs have resulted in the global eradication of diseases such as smallpox and have averted significant morbidity and mortality from several others.² However, the continued sustenance of these achievements relies on a high public acceptance and uptake of vaccines and vaccination services. In recent times, the clustered outbreaks of VPDs suggest a rise in a concerning trend, termed ‘vaccine hesitancy’ (VH). VH refers to the voluntary delay or refusal of vaccination services despite availability.³⁻⁵ Consequently, the World Health Organization (WHO) in 2019 identified VH among the top 10 threats to global health.⁴

Influenza, commonly referred to as *flu*, is a vaccine preventable infectious disease of the respiratory system. It is estimated that 10-20% of the world’s population is infected with the influenza virus every year.^{6,7} Among the leading causes of death, annual influenza outbreaks result in over 3,500 deaths and 12,000 hospitalizations across Canada.⁸⁻¹⁰ In addition to the immense clinical burden, influenza is also associated with a significant social burden and indirect costs through lost productivity.¹¹ A 2018 study estimated the indirect costs of seasonal influenza in the United States to be USD \$8.0 billion, more than twice the estimated costs of direct medical care.¹² The prime preventive measure against influenza, the influenza vaccine, is available to all

Ontarians free of charge from a variety of healthcare providers including pharmacists,^{13,14} yet, vaccination rates remain suboptimal.¹⁵

Vaccines are widely recognized by healthcare authorities throughout the world as an effective way to combat vaccine preventable infectious diseases. They are effective both at the individual level through direct protection and at the community level through herd immunity.^{16,17} A

Cochrane meta-analysis conferred a 73% (95% CI, 54% to 84%) risk reduction in the development of influenza amongst vaccinated individuals as compared to those unvaccinated.¹⁸

The protective efficacy of the influenza vaccine depends upon the closeness of the match between strains in the vaccine and those circulating in the community. Influenza viruses mutate their antigenic properties that result in susceptibility of the population to viruses containing novel antigens. Additionally, vaccine induced effects wane over the year following immunization.

Therefore, annual immunization with influenza vaccine is an important public health measure in controlling influenza outbreaks.⁶

Regardless of the wealth of scientific evidence that supports and promotes vaccination as the prime preventative measure against VPDs, conflicting information invariably makes its way to the public. Such information often disputes the scientific concord on the safety and effectiveness of some or all vaccines on a number of grounds, ranging from moral, to religious and pseudo-scientific factors.¹⁹ Additionally, acceptance of vaccines in a timely manner is further compounded by issues such as complacency, a low perceived susceptibility and severity of a VPD, contradicting scientific notions and negative messaging from vaccine related controversies, and wide distribution of content critical of vaccines through social media.²⁰ Perhaps, it is only

understandable that some individuals become ‘hesitant’ about their decision to vaccinate. While the majority of the population worldwide accepts routine vaccination, a small fraction decline vaccines entirely, delay them or accept them, without being entirely convinced doing so.³

VH, public mistrust of immunization services and outright refusal of vaccines are global issues that threaten to undermine decades of progress in public health.¹⁹ The WHO recognizing the same established the Strategic Advisory Group of Experts (SAGE) on VH in March 2012. The working group submitted its final report on VH in October 2014, defining the phenomenon as, *‘[a]delay in acceptance or refusal of vaccines despite availability of vaccination services. Vaccine hesitancy is complex and context specific, varying across time, place and vaccines. It is influenced by factors such as complacency, convenience and confidence’*^{3,21}

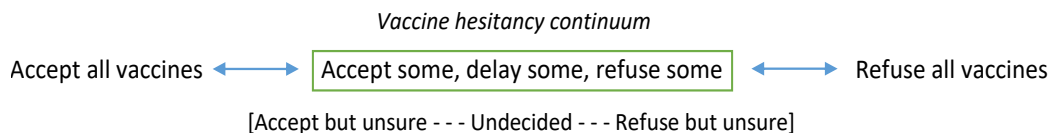


Figure 1-1 The continuum of VH³

VH may be a consequence of the growth of ‘consumerism’ in healthcare, that involves a focus on lifestyle and individual action and involvement in health decisions. The rise of the informed patient has shifted the traditional locus of power from physicians as sole directors of patient care to shared decision making between healthcare professionals and patients who want to be active participants in the decision-making process concerning their health.²² Questions regarding the benefits, safety and the very need of vaccines may be put forth by those expressing hesitancy.^{23,24} Hesitancy to certain aspects of vaccination may be harbored even in individuals who are

vaccinated.²⁰ While not exhaustive, the list of 21 unique determinants identified by the WHO working group on VH that range from historical influences, to politics, and beliefs and attitudes about health and prevention, underscore the complexity of this phenomenon.^{3,21} In addition to an increase in the rate of an unvaccinated subpopulation in the community, long term concerns of VH also include a risk of deficit in herd immunity and a possibility of VPD outbreak.²⁵ The recent outbreak of measles in 2014, resulted in confirmed cases across the USA, Canada and Mexico.^{5,26} Among most reported cases, patients were either unvaccinated or had undocumented vaccination status.²⁶ This multi-nation public health incident was all linked to *one* sick teenage tourist.²⁷ This incident serves to highlight the highly contagious nature of VPDs, the importance of vaccination, and the very real threat of VPD resurgence.

Therefore, improving vaccine uptake by untangling the barriers to immunization is paramount to preventing such occurrences and improving and sustaining vaccine coverage of the community. However, the complex, context specific, and dynamic nature of VH makes designing a single intervention to address hesitancy difficult to achieve.^{23,25,28} Traditionally socio-economic factors have direct associations with health behaviours, however, factors such as education, higher economic status, higher health literacy have all been identified as both promoters and barriers to vaccination based on the region, and the prevailing context.²¹ Despite this complexity, healthcare providers remain the most trusted advisors and influencers of patient vaccination decisions.²⁹⁻³²

The provision of information is a primary tool adopted by healthcare providers when communicating with patients. Fundamental information on the need, benefits and risks of receiving the vaccine often form the basis of an individual's decision-making process.²⁸ The

impact of physician, nurse, and pharmacist recommendations on vaccine uptake has been well documented.³³⁻⁴⁰ Provider recommendation is a strong motivator to receive a vaccine. For example, 87.5% of children were immunized against influenza when their parents received a provider recommendation, compared to 10.6% in the absence of any recommendation.⁴¹ Similarly, a randomized controlled trial evaluating the impact of pharmacist administered education and advocacy on influenza vaccine for seniors, determined an 8.7% increase in the vaccine uptake over one season.³⁵ Indeed, healthcare provider recommendations, education, and advocacy form the current best predictors of positive patient vaccine uptake.²⁹⁻³² Therefore, provider-patient interactions on vaccinations are important opportunities where patient concerns may be discussed and resolved, paving the way for vaccine recommendations and administrations to occur.

Pharmacists in Ontario have been authorized to administer influenza vaccinations since 2012,⁴² with the rationale that community pharmacy-based influenza immunization services would increase the capacity of provincial immunization efforts and increase patient access and convenience. Community pharmacies are accessible with extended work hours (i.e., evenings and weekends), and often vaccinations are offered on a walk-in basis.⁴³⁻⁴⁵ Indeed, the inclusion of pharmacists in the immunization workforce has resulted in a net increase of almost 500,000 influenza vaccinations in Ontario in just over two seasons since pharmacist delivered influenza immunizations first became available.¹¹ In a survey of pharmacy patrons conducted in Toronto, Ontario, 7% of the respondents reported being first-time vaccine recipients, and about a third responded that they would not have been vaccinated that year if pharmacy vaccination services were unavailable.⁴⁵ Such data provides a glimpse of the impact pharmacists have had on

influenza vaccination in Ontario. By virtue of their standing in the community and opportunity for frequent patient contact, pharmacists are ideally positioned to address influenza VH; however, ensuring optimal utilization of this opportunity requires preparing and enabling pharmacists to best address the challenge of VH.

To ensure a healthy uptake of vaccination services, the needs of the public and the gaps in the service must be explored. VH is complex and multifactorial, comprising emotional, cultural, cognitive, and political factors that make it difficult to characterize. Therefore, an important first step towards managing VH lies in understanding the time, context and vaccine specific nature of this phenomenon. Influenza VH in the community pharmacy is a unique dynamic involving the vaccine hesitant individual, pharmacy as the healthcare delivery setting and the pharmacists' skills including their knowledge of VH, awareness of existing tools to address VH, and attitudes towards personal and patient vaccine uptake. This body of work aims to explore and understand the community pharmacy context of the experience of influenza VH, current practices used by pharmacists to overcome influenza VH, and explore potential gaps and opportunities in the pharmacists' management of those expressing hesitancy.

1.1 Statement of problem

The emergence of VH as a global health threat calls for research to better understand, and thereby, address this phenomenon. Given the extensive individual and societal benefits of influenza vaccination, its sub-optimal utilization in a country like Canada, where it is readily available and accessible is an avoidable tragedy.

The addition of pharmacists to the immunizing work force in Ontario has resulted in improved accessibility and convenience. Pharmacists have long been recognized amongst the most trustworthy professionals and are often the first point of contact for many health-related concerns in the general population.⁴⁶⁻⁴⁸ Unsurprisingly, pharmacists have become an integral part of the immunization workforce, with community pharmacies becoming the leading destination to receive an influenza vaccination in Canada.⁴⁹

Existing research in the domain of VH has predominantly explored childhood immunizations, parental hesitancy and patient perspectives on vaccinations.^{32,38,50-57} From a provider's standpoint, research has also been conducted to understand the experiences of general practitioners, pediatricians, nurses, and midwives on vaccinations.⁵⁸⁻⁶³ However, to the best of our knowledge, little is known about community pharmacists' experiences of influenza VH, their perceived preparedness, and current practices when dealing with those expressing hesitancy.

As such, there is a distinct lack of evidence to inform the design of effective interventions specifically tailored to the pharmacy setting. This ongoing predicament motivates the focus of our research to understand the manifestation of influenza VH in the community pharmacy setting from a practicing pharmacist's perspective; and, employ this nuanced understanding to identify means to best address the challenges of influenza VH in the community pharmacy context.

1.2 Thesis objectives

The overarching intent of this thesis is to understand the community pharmacists' experience of influenza VH, including their perceived preparedness and explore means to best address influenza VH in community pharmacy practice. In doing so, the objectives are to:

1. Explore community pharmacists' self-reported knowledge and practices related to influenza vaccination and influenza VH.
2. Understand community pharmacists' perspectives of, and experiences with influenza VH in routine practice.
3. Understand the modulators of pharmacists' engagement with individuals expressing hesitancy to receive the influenza vaccine in community pharmacy.
4. Estimate the cost-effectiveness of a novel remunerated community pharmacist consultation service on influenza vaccination for seniors in Ontario, Canada from a provincial public-payer perspective.

1.3 Thesis outline

This thesis adopts a sandwich style, wherein individual research chapters (Chapters 3-5) have been written as independent, self-contained manuscripts.

Chapter 2 – A review of pertinent literature.

Chapter 3 – A quantitative descriptive analysis of a cross-sectional survey of community pharmacists.

Exploring influenza vaccine hesitancy in community pharmacies: Descriptive analysis of knowledge, attitudes and practices of community pharmacists in Ontario, Canada.

Chapter 4 – A qualitative interpretive analysis of semi-structured interviews with community pharmacists.

Shades of gray in vaccination decisions - Understanding community pharmacists' perspectives of, and experiences with, influenza vaccine hesitancy in Ontario, Canada.

Chapter 5 – A pharmacoeconomic analysis of a novel intervention. This chapter includes a brief prologue, setting the stage and rationale for the selection and design of the intervention.

Cost-utility analysis of offering a novel remunerated community pharmacist consultation service on influenza vaccination for seniors in Ontario, Canada.

Chapter 6 – Overall summary, practice and policy implications and conclusion.

Appendices – Survey questionnaire; Semi-structured interview guide and coding scheme; Survey and interviews - Participant recruitment materials and informed consent forms.

| Chapter 2

Review of literature

2.1 Burden of Influenza

Influenza is an infectious disease of the respiratory system caused by Influenza A or B viruses, belonging to the Orthomyxoviridae family.⁶⁴ Epidemics and outbreaks of influenza occur in varying patterns depending on the region in the world. In Canada, influenza generally occurs each year in the late fall and winter months.^{65,66} It is characterized by sudden onset of headache, chills, cough, fever, loss of appetite, myalgia, sneezing, rhinitis, fatigue, throat irritation and watery eyes. Nausea, vomiting and diarrhea may also occur, especially in children.

Seasonal influenza is primarily transmitted through direct or indirect contact with infected respiratory secretions.⁶⁵ The incubation period is usually two days, but can range from one to fourteen days.⁶⁵ Additionally, adults may continue to shed the virus a day before the onset to approximately five days after resolution of symptoms.⁶⁵ Most individuals recover from influenza within a week to ten days, however some – including individuals aged 65 and above, and adults and children with chronic conditions are at an elevated risk of potentially fatal complications such as pneumonia.⁶⁶

Among the leading causes of death in Canada, influenza is estimated to affect 10-20% of the Canadian population, resulting in approximately 12,200 hospitalizations and 3,500 deaths each year.⁶⁶ Unfortunately, these numbers do not depict the complete picture as laboratory confirmation is seldom performed and clinical diagnosis often takes precedence in practice.

Additionally, patients that present to hospital with complications of influenza such as pneumonia, after viral shedding has ceased, are difficult to identify and are not captured in the numbers above. Rates of infection are highest in children aged 5-9 years, but serious illness and death are highest in children aged below two and elderly aged over 65 years and individuals with underlying medical conditions.^{65,66}

The national economic burden associated with the direct medical care costs of influenza adjusted for inflation (2019 CAD) is estimated to be \$71 million.^{65,66} In addition to the immense economic and clinical burden, influenza is also associated with significant social burden and indirect costs through lost productivity.¹¹ A 2018 study estimated the indirect costs of seasonal influenza in the United States to be USD \$8.0 billion, more than twice the estimated costs of direct medical care.¹²

2.2 Influenza vaccination – An effective countermeasure

Annual influenza vaccination is an important public health countermeasure against influenza.^{16,17} The influenza virus, a single-stranded, helically shaped RNA virus has three basic antigen types A, B and C.^{64,65} Subtypes of Influenza A are determined by the surface proteins hemagglutinin (A) and neuraminidase (N).⁶⁵ The protection provided by a typical influenza vaccine is dependent on the induction of virus neutralizing antibodies, primarily against the viral hemagglutinin.⁶⁵

Hemagglutinin and neuraminidase periodically change, which is attributed to point mutations in a gene segment, this phenomenon is referred to as the antigenic drift. In addition, at irregular

intervals of 10 to >40 years, major antigenic differences may occur as a result of genetic recombination between Influenza A viruses that affect humans and/or animals, referred to as antigenic shift. Antigenic shift may result in worldwide pandemic if the virus is efficiently transmitted. The 2009 Influenza A (H1N1) outbreak is the last recorded instance of such phenomenon.⁶⁷ This represented the first pandemic of the 21st century, affecting individuals across the globe, including 214 countries, territories and communities.^{67,68} An estimated 60 million individuals were affected causing 270,000 hospitalizations and 12,500 deaths in the United States alone.^{67,69}

The protective efficacy of the influenza vaccine is determined by the closeness of match between the strains in the vaccine and the viruses that circulate in the outbreak.⁶⁵ Influenza vaccines have traditionally been produced in embryonated chicken eggs that take approximately nine months to manufacture, and as such contain antigens from strains that circulated the previous season.⁶⁵ During the 2004-2005 influenza season, the estimated strain match was only 5% as compared to 91% in 2006-2007, translating into vaccine effectiveness of 10% (95% CI, -36% to 40%) and 52% (95% CI, 22% to 70%) respectively.⁷⁰ Annual immunization is necessary even if one or more of the circulating strain was part of the previous vaccine due to waning of vaccine-induced antibody during the year following vaccination.⁶⁵ Regardless of vaccine match, the National Advisory Committee on Immunization (NACI) appointed by the Public Health Agency of Canada (PHAC) strongly recommends annual influenza vaccination for all individuals aged 6 months and above as vaccinated individuals are still more likely to be protected compared to those who are unvaccinated.⁶⁵

The vaccine effectiveness depends on several factors that include inter-individual variations such as age, presence of chronic conditions, medications and other factors, the match between the vaccine and circulating strain, the definition of disease used (laboratory confirmed versus influenza like illness – ILI) and the vaccine itself. The vaccine is available in a number of forms, including Inactivated Influenza Vaccine (IIV), Live Attenuated Influenza Vaccine (LAIV), high dose vaccine, and standard dose vaccine. In those over the age of 65 years, the high dose IIV has been demonstrated to offer better protection against ILI and improved clinical outcomes such as lower rate of hospitalization and mortality compared to standard dose IIV.⁷¹ A Cochrane systematic review looking at published evidence through July 2017 estimated the risk reduction offered by the IIV for healthy adults to be 0.41 (95% CI, 0.36 to 0.47) against laboratory-confirmed influenza and, 0.84 (95% CI, 0.75 to 0.95) against ILI.^{65,72,73} A 2012 meta-analysis that included eight randomized controlled trials of the IIV in adults aged between 18 and 64 over nine influenza seasons attributed a vaccine efficacy of 59% (95% CI, 51% to 67%) in preventing laboratory-confirmed influenza.⁷⁴ Given the moderate overall effectiveness of the influenza vaccine, infection may occur in some individuals despite vaccination. This limitation of vaccine effectiveness often forms an underpinning of hesitant and anti-vaccine behaviour.

2.2.1 Cost-effectiveness

The cost-effectiveness of the influenza vaccine has been extensively evaluated in several studies.⁷⁵⁻⁷⁸ In the high risk elderly population, the medical care costs saved by preventing influenza associated complications provided compelling rationale to endorse the annual influenza

vaccination.⁷⁸ Further, the indirect benefits such as prevention of suffering, incapacity and lost wages offset the cost of immunization in healthy adults and non-high risk elderly patients.^{11,78}

A cost-effectiveness analysis based on 10 years of surveillance data from the World Health Organization (WHO) among healthy working adults was conducted in 2005. The study accounted for inter seasonal variability in effectiveness of the influenza vaccine. A cost of 234 USD per person per year for anti-viral therapy without vaccination and 239 USD per person per year for annual vaccination was estimated. However, sensitivity analyses of the data that incorporated the lower cost of the vaccine, high annual probability of influenza and higher number of work-days lost to influenza made influenza vaccination more cost-effective than treatment.⁷⁷ An economic appraisal of the Ontario Universal Influenza Immunization Program (UIIP) compared to the previous targeted immunization program found the UIIP reduced mortality by 28% and overall cases of influenza by 61%.⁷⁹ Another study also found a reduction in the number of antibiotic prescriptions during periods of peak influenza activity since the implementation of UIIP.⁸⁰

2.2.2 Adverse reactions

The IIV is generally well tolerated. Most side effects are mild and transient such as soreness at the injection site (64% incidence).⁸¹ Healthy adults receiving the IIV did not display an increase in the frequency of febrile illness or other systemic symptoms compared to placebo.⁶⁵

The multi-dose formulations of IIV authorized for use in Canada contain Thiomersal⁸², a preservative. Large cohort studies of health-databases have demonstrated no relationship

between Thiomersal and neurodevelopmental disorders such as Autism.^{82,83} However, all single dose formulations of Trivalent Inactivated Vaccine (TIV) and LAIV are Thiomersal free.

Influenza vaccination has been on occasions linked to an increased risk of Guillain-Barre` Syndrome (GBS).^{84,85} A self-matched case series study conducted in Ontario identified 1601 hospitalized cases of GBS of which 269 were diagnosed within 43 weeks of vaccine administration. The estimated relative incidence of GBS during the primary risk interval (weeks 2-7) as compared to control interval (week 20-43) was 1.45 (95% CI, 1.05–1.99).⁸⁵ However, a separate time-series analysis showed no statistically significant increase in hospitalization for GBS after introduction of the universal influenza vaccination program.⁸⁵

Occulorespiratory Syndrome, characterized by bilateral red eyes, cough, wheeze, chest tightness, dyspnea, dysphagia, hoarseness, sore throat and/or facial swelling within a day of influenza immunization was reported following receipt of TIV supplied by one manufacturer during 2000-2001 influenza season in British Columbia.⁸⁶ However, after changes in the manufacturing process to the vaccine formulation, the incidence dropped substantially.

In summary, the influenza vaccine is differentiated from other vaccines through the need for annual re-immunization and the inter-seasonal variation in its efficacy and clinical effectiveness. It is rarely associated with serious side-effects and is generally safe. Despite some limitations, vaccination against influenza remains the current best measure to protect individuals and the community at large, from the vast clinical, societal, and economic burden of influenza disease.

2.2.3 Influenza vaccinations in Ontario and Canada

In Ontario, the influenza vaccine is provided through the Ministry of Health and Long-Term Care (MOHLTC) in form of the annual UIIP. The UIIP is a first of its kind publicly funded program that was started in the fall of 2000.⁸⁷ Through the program, the influenza vaccine is available free of charge to all individuals over 6 months of age living, working or attending schools in Ontario.⁸⁸ The service is accessible through participating pharmacies (that utilize pharmacists authorized to administer injections or other trained professionals); public health units; on-site clinics; long-term care homes; nurse practitioners; or physician offices. The program recommends the prioritization of high-risk groups such as seniors aged 65 years and over, pregnant women, individuals with chronic cardiac or pulmonary disorders and individuals with immune compromising conditions. Additionally, UIIP provides the ‘Flu consult kit’ for vaccine providers that includes fact-sheets, posters and other promotional and targeted material.⁸⁹

The introduction of the UIIP in Ontario was associated with an increase in vaccine uptake, reduction in mortality (RR=0.26), hospitalization (RR=0.25) and physician office visits (RR=0.21).⁹⁰ However, the initial increase in influenza vaccine uptake was followed by a decline and subsequent plateauing of vaccination rate. For example, the vaccination rates dropped over a period of 10 years; from 38% in 2003 to 34% in 2013-14.⁹¹ However, the current vaccination rates in Canada have again seen an upward trend, rising from 34.3% in 2015-16 to 38.3% in 2017-18.⁶⁶ The vaccination rates remain the highest among seniors aged 65 years and over at 70.7% (2017-18), yet, fall short of the NACI advised national target of 80%.^{49,66} Interestingly,

the majority of individuals that did not receive the influenza vaccine in 2017/18 felt it was either unnecessary (22.4%) or did not believe in the efficacy of the influenza vaccine (20.2%).⁶⁶ Such data suggests that there are underlying issues of influenza vaccine hesitancy (VH) in Canada.

2.3 Pharmacists as immunizers

Amongst several other strategies to improve influenza vaccination rates, allowing pharmacists to immunize forms one.^{43,92} As of July 2019, nine provinces in Canada including Ontario have passed regulations that allow a pharmacist to administer the influenza vaccine with one province awaiting legislation for implementation.⁹³ Pharmacists are ideally placed professionals who are well trained and accessible to the community.^{43,94} They are respected sources of health information for patients, with potential to positively influence the influenza vaccine acceptance.⁹⁵ Community pharmacies have the advantage of extended work hours and convenient locations, and they typically do not require appointments for consultation.^{44,94} This added convenience is possibly reflected through the 2017/18 national influenza immunization coverage survey data, which described pharmacies to be the primary place of influenza vaccination (34.2%) for Canadians, surpassing physician offices (30.4%) and vaccine clinics (11.4%).⁴⁹

In a survey of pharmacy patrons conducted in Toronto, Ontario, 92% of the respondents receiving the influenza vaccination in the pharmacy were very satisfied with the service and 99% reported that they would recommend pharmacy vaccination services to friends and family. Interestingly, 7% of the respondents were first-time vaccine recipients and about a third responded that they would not have been vaccinated that year if pharmacy vaccination services

were unavailable.⁴⁵ With pharmacists having rapidly become an integral part of the immunization work force, the roadmap to their future in immunization must include preparation for challenges such as VH.

2.4 VH – A complex and multidimensional issue

Vaccinations are undoubtedly amongst the foremost achievements in the upkeep of public health. Vaccination programs have reduced the morbidity and mortality of several infectious diseases and global vaccination programs continue to be the most successful and cost-effective intervention in improving health outcomes.² Mass immunization programs have been credited with the worldwide eradication of smallpox and the elimination of polio in several countries including North America. Vaccines are effective at both the individual level through direct protection and the community level through herd immunity.^{96,97} The continued success of immunization programs in reducing the incidence and prevalence of vaccine preventable disease (VPD) relies upon attaining and sustaining high vaccine uptake rates.²⁰

Despite the wealth of extensive scientific evidence that supports and promotes vaccination as the primary preventive measure against VPD, conflicting information often makes its way to the public, that, disputes the scientific concord on the safety and effectiveness of some or all vaccines on a number of grounds, from religious to cultural and political factors.¹⁹ Additionally, acceptance of the recommended vaccination in a timely manner is challenged by many issues, such as complacency when the risk of contracting a VPD has dropped due to high rates of immunization, declining trust in government, contradicting scientific notions and the negative

influence of vaccine related controversies in the media, including the wider diffusion of vaccine critical content on social media.²⁰

The proliferation of such information and the ease with which misinformation can amplify – both, through traditional and new media channels has resulted in a confusing context to individuals seeking to gain information about the risks and benefits of vaccines. It is therefore understandable that some individuals have become ‘hesitant’ about their decision to vaccinate. Dube *et al.* (2015) estimate that up to a third of individuals might have doubts and uncertainties that might result in refusing certain vaccines but agreeing to others or accepting the recommendations with reluctance.⁹⁸ VH and outright refusal of vaccines are global issues that threaten the sanctity of public health.¹⁹ The WHO, recognizing the same, established the Strategic Advisory Group of Experts (SAGE) on VH in March 2012. The working group submitted its final report on the issue in October 2014, defining VH as, *‘[a]delay in acceptance or refusal of vaccines despite availability of vaccination services. Vaccine hesitancy is complex and context specific, varying across time, place and vaccines. It is influenced by factors such as complacency, convenience and confidence’*²¹

2.4.1 Understanding VH

While the majority of the population worldwide accept vaccination, a smaller fraction decline entirely, delay them, or accept them while not being entirely sure while doing so.^{3,99} Hesitancy, is thus situated in the space between those who receive vaccinations with no doubts and those who refuse vaccines without doubts.³ (Figure 2-1)

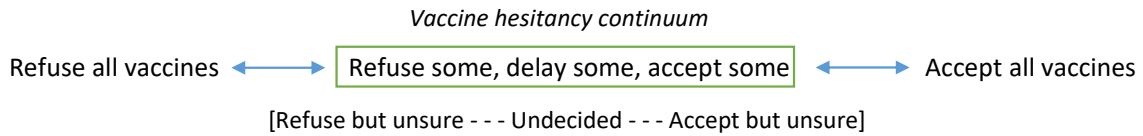


Figure 2-1 The continuum of VH between full acceptance and outright refusal of all vaccine ³

A ‘3C’ model was put forward to facilitate an easy comprehension of the term VH. ²¹ It categorizes the reasons for VH into three primary domains:

Confidence - (i.e., trust) In the safety and efficacy of the vaccine itself, trust in the system that delivers it, competence and reliability of the health care professionals administering them and the motives of the policy-makers pressing on the needs for vaccination. ^{3,21}

Complacency - Occurs when the perceived risk of contracting a vaccine preventable illness is low and thereby vaccination is deemed unnecessary. Immunization programs have become victims of their own success. Individuals tend to disregard the need for vaccines as a necessary preventive measure when the perceived risk of VPDs decrease. Further, individuals may weigh the odds of contracting a VPD to be less than the risks associated with the vaccine itself, thereby contributing to hesitancy. ^{3,21}

Convenience - Factors such as availability, accessibility, affordability and willingness to pay, health literacy and the appeal of immunization services affect the uptake of immunization services significantly. The quality of the service and the extent of the aforementioned factors may affect the decision of an individual to get vaccinated, thereby paving way to hesitancy. ^{3,21}

Beyond the WHO, VH has increasingly been a subject of interest for immunization researchers worldwide and extensions and alternatives to the WHO '3C' model and definition to better understand the phenomenon have since been proposed.^{58,96,100-102} Researchers have criticized the current definition of VH for its inability to incorporate attributes that extend beyond the mere behavioural outcomes of vaccine acceptance, delay, and refusal.

Alternatives to the WHO definition have described VH as:

1. A 'motivational state' of being conflicted about or opposed to receiving a vaccine. This definition takes a psychological perspective to the phenomenon, and describes VH as a challenge relating to motivation. The authors further classify the gamut of motivations that an individual may exhibit towards vaccination into those: a) asking to be immunized, independent of a provider raising the issue; b) being open to immunization when presented with the opportunity; c) displaying passive hesitancy; d) initially resistant to receive immunization but open to persuasion and; e) absolutely opposed to some or all vaccines.^{100,102,103}
2. A decision-making process (of how/why people come to accept, refuse or delay vaccination) that is influenced by contextual (historical, social, cultural, political) factors, resulting in a variety of behavioural outcomes. Further, the authors suggest that perhaps those who are hesitant may face difficulty in this process of decision making compared to those who are pro- or anti-vaccine, as polarized individuals likely hold strong convictions about the vaccine, and their decision making process is practically automatic.⁹⁶

3. *'A reluctance to receive recommended vaccination because of concerns and doubts about vaccines that may or may not lead to delayed vaccination or refusal of one, many or all vaccines.'* This definition was conceived through a consultation with vaccine providers and researchers, and accounts for attitudes and beliefs (ex. doubts, concerns) extending beyond binary behavioural outcomes of accepting or rejecting a vaccine.⁵⁸

Indeed, the myriad definitions and descriptions of VH speak to the complexity of this phenomenon. In addition to these definitions, alternative models to better understand vaccination behaviour and VH have also been proposed. Betsch *et al.* (2018) used empirical and theoretical modeling to propose, assess and validate an alternate '5C' model to better understand the psychological antecedents of vaccination behaviour.¹⁰¹ In addition to: a.) 'Complacency', a low perceived risk of acquiring VPDs, and b.) 'Confidence' (or lack thereof), in vaccine and the system delivering/advocating vaccines; the authors include, c.) 'Calculation', an active process of weighing and deliberating the risks and benefits of accepting and/or refusing a vaccine, d.) 'Collective responsibility', involving herd immunity and social protection, and modify 'Convenience' (as described in the WHO 3C model of VH³) to e.) 'Constraints' as the authors argue the choice of convenience as placing the onus of vaccination on an individual regardless of systemic barriers that may hinder access to vaccination services.

2.4.2 Potential causes of VH

Concluding from a systematic review of the existing literature,^{3,104} models of VH, the WHO immunization managers' survey on hesitancy,^{3,105} experiences of the immunization experts and researchers working in the area, a total of 21 unique determinants of VH were identified. These

determinants were further formulated into a ‘determinants matrix’ and grouped into three categories: *contextual, individual and group influences and vaccine/vaccination specific issues* (Presented in Table 2-1).²¹

Unlike the social determinants of health, VH determinants such as socio-economic status and education do not affect the outcome in a single direction. Additionally, each determinant may have different effect on vaccine uptake in different geographical settings. Studies from China,¹⁰⁶ Lebanon,¹⁰⁷ Israel,¹⁰⁸ Bangladesh¹⁰⁹ and USA¹¹⁰ identified higher education as a potential barrier, whereas studies from Greece,¹¹¹ Netherlands,¹¹² Nigeria¹¹³ and Pakistan^{114,115} identified the same as a promoter. Furthermore, lower education had different effects in different countries. In India,¹¹⁶ lower education was associated with lower health-knowledge but not anti-vaccination attitudes, whereas in Nigeria the same was associated with higher anti-vaccination attitudes.^{21,104} Thus, the findings of these studies serve to reinforce the necessity to consider multiple influences and importance of context when estimating the cause for hesitancy.^{21,104}

<p>Contextual influences Influences arising due to historic, socio-cultural, environmental, health system/institutional, economic or political factors</p>	a. Communication and media environment
	b. Influential leaders, immunization program gatekeepers and anti- or pro-vaccination lobbies
	c. Historical influences
	d. Religion/culture/gender/socio-economic
	e. Politics/policies
	f. Geographic barriers
	g. Perception of the pharmaceutical industry
<p>Individual and group influences Influences arising from personal perception of the vaccine or influences of the social/peer environment</p>	a. Personal, family and/or community members’ experience with vaccination, including pain
	b. Beliefs, attitudes about health and prevention
	c. Knowledge/awareness

	d. Health system and providers – trust and personal experience
	e. Risk/benefit (perceived, heuristic)
	f. Immunization as a social norm vs. not needed/harmful
Vaccine/vaccination – specific issues Directly related to vaccine or vaccination	a. Risk/benefit (epidemiological and scientific evidence)
	b. Introduction of a new vaccine or new formulation or a new recommendation for an existing vaccine
	c. Mode of administration
	d. Design of vaccination program/Mode of delivery (e.g., routine program or mass vaccination campaign)
	e. Reliability and/or source of supply of vaccine and/or vaccination equipment
	f. Vaccination schedule
	g. Costs
	h. The strength of the recommendation and/or knowledge base and/or attitude of healthcare professionals

Table 2-1 VH determinant matrix³

2.4.3 Significance of historical, political and socio-cultural context

Several sociocultural changes contribute to VH. Social science research suggests that vaccine uptake is to be understood in a broad socio-cultural context, wherein a decision to vaccinate is not a simple preventive-health measure but one that has its ambiguities and is influenced by several factors such as, controversies surrounding the particular vaccine at a given time, selecting between potentially competing risks (disease versus vaccine or one vaccine versus another), traction between the idea of private and public good, socio-economic status and education amongst several others.^{104,117} Vaccination has been described as part of the wider social world wherein, factors such as previous experiences with immunization services, conversations with

friends, or simply the order of one's priorities may play a role in an individual's decision to get vaccinated.¹¹⁸

Since their inception, vaccinations have been subject to several controversies. In the 1990's the universal vaccination program in France was suspended due to associations between the hepatitis-B vaccine and development of multiple sclerosis despite evidence that stated otherwise. In recent times, the false link between MMR (measles, mumps and rubella) vaccine and autism is well known and reported to-day as a reason for concern.^{119,120} This scare caused the vaccination rates to drop significantly in the United Kingdom and parts of Europe, however, it had negligible impact in Canada where it was equally well publicized.¹²¹ Such evidence further underscores the non-linear and context specific nature of VH.

2.4.4 Media and communication

Despite strong evidence of the safety and effectiveness of vaccines, media controversies impart a negative influence on vaccine uptake.^{122,123} A 2011 study conducted in Quebec determined that exposure to negative stories on vaccination through mass media acted as a barrier to vaccine uptake.¹²⁴

The advent of the internet has facilitated easy access to information surrounding health and vaccination. Although health professionals remain the primary and most trusted source for health information, easy access and convenience of the internet has rapidly made it an essential source for all sorts of information including on vaccinations.¹²⁵ However, the unregulated nature of content on online sources leads individuals to information of variable quality that is often

inexact, and predominantly negative.^{123,126,127} A study simulating a lay persons' search on a popular internet search engine for advice on the relationship between autism and MMR vaccine resulted in 59% of the results supporting the incorrect relationship. Betsch *et al.* (2010) conducted an experimental study with 325 participants to identify the nature of the relationship between exposure to anti-vaccine websites and the decision to vaccinate one's child. The study concluded that surfing anti-vaccination websites for 5-10 minutes resulted in a negative outlook towards vaccination, decreasing the perception of risk of omitting vaccines and increasing the perception of risks associated with vaccines.¹²⁸ Further demonstrating the wide-reaching impact of social media, a study evaluating 300,000 Twitter messages concerning H1N1 vaccine found a strong correlation ($r=0.52$) between the prevailing sentiment (positive or negative) in a geographical region and vaccine uptake.¹²⁹

Interestingly, social and psychological theories indicate that people cluster in physical and social spaces on the basis of similarities, and that these similarities spread through networks, phenomena referred to as *homophily* and *contagion*.^{102,130,131} Implications of these phenomena on vaccine conversations in the online space and social media include amplification and polarization of views.¹⁰² Indeed, a study analyzing user comments on influenza vaccine related news reports on the Canadian Broadcasting Corporation's (CBC) website, observed extreme polarization of vaccine positions in the online space.¹³² The authors indicate that such overwhelming presence of strong beliefs likely serves to foster polarization rather than promote consideration of contrasting views.¹³² More importantly, the implications of these observations include the likely dissolution of space for individuals between the two extremes of the vaccine continuum, rendering individuals with vaccine hesitancy as mere spectators in online vaccination debates.¹³²

2.4.5 Vaccine policies and public health

Public health organizations need to adequately communicate with the population.¹²³ Despite the presence of stringent regulatory requirements and surveillance systems that ensure the safety and reliability of vaccines on an ongoing basis, the lack of effective communication regarding the same results in misinterpretation and dissemination of false beliefs.^{123,133,134} However, health interventions to improve vaccine uptake based on education and information alone have not been successful.¹³⁵ Blanket interventions including broad educational attempts that rely on supplying probabilistic information on the benefits and risks of vaccines may only impact a very small subsection of those expressing hesitancy and may not be as effective as targeted and tailored strategies.²⁸ Researchers have described messaging from official sources as being dry, factual and forgettable in comparison to vaccine critical content that tend to include first-person testimonies and stories which tend to be more relatable.^{102,136,137} As such, public health communicators must design their messaging to target those hesitant and proactively communicate to promote vaccinations, contain and prevent the spread of vaccine misinformation, and counter vaccine critical content.¹³⁸

Mandatory vaccination of certain vaccines has been initiated in some countries to encourage higher vaccine uptake.¹³⁹ A study in the USA suggested an increasing opposition to compulsory vaccination. Unsurprisingly, such individuals were significantly more likely to hold negative beliefs towards the safety and utility of vaccines.¹⁴⁰ Mandatory vaccination policies such as vaccinate or mask policies have been increasingly used to promote vaccine uptake of health care providers in institutional settings.¹⁴¹⁻¹⁴⁴ While effective in increasing the vaccine uptake, such

measures have been criticized on legal, moral and ethical grounds and remain controversial. ¹⁴¹⁻

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2.4.6 Knowledge and attitudes about vaccination

Patient vaccination decisions are often associated with a perceived self-sufficiency of information on the need, advantages and disadvantages of vaccination.¹²³ Interestingly, studies suggest that generally, people getting vaccinated have limited knowledge on vaccination and VPDs as compared to individuals who refuse vaccines, indicating that dissemination of misrepresented information often outweighs correct or no information.^{147,148} Perceiving vaccinations as a social-norm has been identified as a potent promoter of vaccination.²⁴ Individuals may perceive it to be their social responsibility to obtain a vaccine to maintain herd-immunity. However, qualitative studies have determined that while ‘benefit to others’ is a motivator, the decision to immunize oneself is largely based on perceived benefit to self.^{56,149}

2.5 Health care professionals and hesitancy to personal immunization

The interaction between recipient and provider is the foundation of maintaining belief in vaccination.¹²³ The attitude and knowledge of healthcare professionals towards vaccines is determinant of their own vaccine uptake as well as the strength of recommendation to their patients. Although most healthcare professionals are supporters of vaccination, a hesitant attitude may be present in some. A study conducted amongst nurses illustrated a reluctance to receive the influenza vaccine despite freely available vaccines and strong recommendations supporting immunization.^{150,151} To assess the vaccination attitudes and practices of general practitioners in France, Verger *et al.* performed a nation-wide cross-sectional survey that looked at the self-

reported frequency of recommendation of six specific vaccines. The study found that up to 43% of certain vaccines were never recommended in the target populations. Additionally, although the majority of surveyed physicians were confident in their ability to explain the safety and utility of vaccine, many also held negative beliefs regarding immunization. The authors conclude the above findings as an indicator of the practitioners' own VH.¹⁵² Other studies further establish a strong association between the attitudes and beliefs of healthcare professionals, their recommendation of vaccines to their patients and the eventual uptake of vaccines by their patients.^{153,154}

2.6 Factors involved in vaccine decision making

2.6.1 Previous experience with vaccination service

Negative encounters with immunization providers can influence decisions regarding future vaccinations. Fear of needles and pain also contributes to VH and refusal.⁵⁷ Additionally, personal experiences including those of friends and acquaintances may affect an individual's decision to vaccinate.

2.6.2 Perceived necessity of vaccination for maintaining health

Studies establish the perceived redundancy of vaccination as a barrier to improving coverage.^{123,148} Individuals believe that by maintaining good hygiene and habits, VPDs may be avoided or that their immunity is sufficient to ward off a VPD.¹²³ While a good immunity or hygiene practice may be beneficial to a certain extent, the air borne nature of influenza and rapid mutation of the influenza virus comprehensively undermine those beneficial effects.^{151,155}

2.6.3 Risk perception

Risk in vaccination is a cumulative measure of an individual's perceived susceptibility to a VPD and perceived intensity of consequence if the disease were to occur.¹⁵⁶ A perceived risk of a VPD can improve the uptake of a vaccine, whereas the perceived risk from a vaccine can contribute to refusal. The prophylactic nature of vaccines, wherein the intended recipients are healthy individuals, may also result in a relative inflation of perceived vaccine associated risks compared to any benefits, which may not be immediately tangible.¹⁵⁷ Further, many individuals tend to be risk-averse preferring a consequence of inaction (i.e., not taking vaccine) than getting an 'unsafe' vaccine.^{123,158}

2.6.4 Trust

Lack of trust may encompass several factors such as the vaccine, its provider, the health care system, the government or even the pharmaceutical industry.^{99,123,148} A sociological study on trust and vaccination concludes that trust is not just based on knowledge, but also on a 'leap of faith' that arises from several accountable and unaccountable parameters including relationship with the provider and opinion gathered through various sources of information that may include friends, family or media.¹⁵⁹

2.6.5 Moral and religious beliefs

Vaccine refusal has often been linked to philosophical beliefs and moral convictions regarding immunity and health. Strong religious tenets have been associated with refusal of vaccines. A well-known example is the refusal of HPV vaccine in adolescent girls in several countries. In

Calgary, Bishop Fredrick Henry issued an edict that withheld the free HPV vaccination in Catholic schools on religious grounds. The belief that chastity and abstinence were the ‘holistic’ means to prevent sexually transmitted diseases and that the vaccine promoted promiscuity resulted in thousands of young children not being vaccinated.^{160,161} McRee *et al.* performed a state wide study of health care workers in Minnesota, USA to assess HPV VH. The study determined that only 76% of the health professionals routinely recommended the vaccine to the target population, citing parent’s belief of sexual inactivity of their child among other reasons.¹⁶²

In conclusion, despite identifying a host of factors associated with VH and vaccination behaviour, individual decision-making regarding vaccination is complex and cannot be predicted. It involves cultural, social, emotional, spiritual and political factors to the same extent as cognitive factors.¹²³ Additionally, in recent times ‘changing scientific, cultural, medico-legal and media environments’ have resulted in heightened hesitancy.²² Further research is needed to understand individual vaccine decision-making processes.²⁴

2.7 Measuring hesitancy towards influenza immunization

A challenge associated with VH is determining the extent of its presence in society. Although assessing vaccine uptake through immunization registries and health care authorities may provide an ‘estimate’ of influenza vaccine uptake in a given area, the dynamic nature of any population and the availability of vaccine from multiple providers and sites prevents one from obtaining an absolute value of the coverage.^{163,164} Vaccine uptake serves as an indirect measure of hesitancy, yet, distinguishing the degree of vaccine avoiders and those ambivalent within a sub-group not covered by vaccine is difficult to determine. Further, coverage rates encompass

non-hesitancy aspects such as vaccine shortages and program delivery obstacles. The problem is further compounded by the fact that many individuals although vaccinated may delay their vaccination. Such individuals may be counted for as vaccinated, but, by definition, are hesitant.

Therefore, determining extent of VH calls for specific and targeted tools. It has been estimated that VH occurs in pockets and subgroups within the general population.^{20,165} The Tailoring Immunization Programmes (TIP) for seasonal influenza guide published in 2015 is an adaptation of the original guide to TIP, which was published in April 2013 by the WHO regional office for Europe that aimed to increase and maintain parental participation in child vaccinations. The TIP guide is based upon evidence from behavioural economics, medical humanities, psychology and neuroscience, and is an example of a tool that may be used to identify and prioritize vaccine hesitant populations and subgroups. The TIP Flu guide provides a model in-depth semi-structured interview guide, and a survey to identify the presence and determinants of hesitancy.^{21,166}

The WHO/UNICEF Joint Reporting Form (JRF) questionnaire, intended to be answered by the national immunization managers is another monitoring tool that can capture hesitancy on a routine basis. In 2012, the JRF introduced two questions to assess the level of hesitancy and determine the reasons for hesitancy within the member nations.¹⁶⁶ These questions were revised in 2013 to widen the scope of VH to not just include confidence but also complacency and convenience, to align with the WHO SAGE definition of VH.¹⁶⁶ Further, initiatives at the WHO are currently underway to develop a validated measure to identify vaccine hesitant subgroups in the population and understand the drivers of their hesitancy. The WHO Working Group on VH

has established a universal compendium of validated survey questions in this regard. The generated information can be used to tailor targeted interventions to resolve hesitancy and increase vaccine acceptance. The use of a standardized compendium of questions further enables comparison of VH determinants across population subgroups, socio-cultural and geographical contexts, providing a nuanced understanding of the phenomenon.¹⁶⁷

2.8 Interventions to address influenza VH

Hesitancy being a complex, context specific and dynamic phenomenon that varies across time, place and vaccine²⁵, makes designing a single intervention strategy to address all causes of hesitancy hard to achieve.^{23,28} The traditional *knowledge-deficit* approach that assumes hesitancy can be overcome by provision of knowledge, is not effective.^{123,168} Thus, understanding the nature of hesitancy within a sub-population or a country is an essential first step, followed by identification and implementation of customized strategies backed by evidence to eliminate the root cause of hesitancy.¹⁶⁹

The Centers for Disease Control and Prevention (CDC) has published evidence-based recommendations to improve the uptake of vaccination delivery. The interventions have been categorized into three groups based on the outcome they attempt to influence: (1) interventions to increase community demand for vaccinations; (2) interventions that enhance access to vaccinations and (3) provider based interventions.^{28,135}

2.8.1 Interventions to increase community demand for vaccinations

Client or family incentive rewards have been demonstrated to be effective in improving the uptake of vaccination service. These may include food vouchers, lottery prizes, gift cards etc. *Reminder and recall interventions* have strong evidence of effectiveness in varying settings of practice and communities. *Quasi-obligation of immunization service* through policies, such as compulsory immunization for attendance to school or workplace have been used in certain communities to enhance vaccine uptake but have faced criticism. Community based interventions are often implemented in combination to increase effectiveness.²⁸

2.8.2 Interventions to enhance access to vaccinations

The definition of VH considers a voluntary delay or refusal of vaccination services despite their availability.³ It is of value however, to differentiate availability and accessibility, as one may not imply the other. Interventions that enhance public accessibility to vaccinations have resulted in a positive impact on vaccine uptake. For example, the addition of pharmacists to the Ontario immunization work-force has improved influenza vaccine accessibility and convenience, resulting in a net increase of approximately half a million doses administered over two seasons since pharmacist administered influenza immunizations first became available.⁴⁵ While not quantifiable, a portion of this increase may be attributed to those who were previously hesitant.

2.8.3 Provider or system based interventions

Health care professionals are the primary and most trusted sources of information on vaccines. They play an important role in providing the community they serve with clear, factual

information regarding influenza and its vaccine.¹⁷⁰⁻¹⁷² Their recommendations, advocacy and education form an effective intervention to positively impact uptake of all vaccines.^{32,34,35,40,102,170}

Two studies conducted with pediatricians in Canada concluded that confidence in personal knowledge, training in vaccination and perceived severity of a VPD were promoters of vaccine recommendations.^{60,61} On the flipside, Kempe *et al.* (2009) note that a less severe VPD was a barrier to vaccine recommendation.¹⁷³ Studies demonstrate that greater provider knowledge on vaccines and VPDs is associated with a greater likelihood of them recommending vaccines to their patients.⁴⁰ Important areas of knowledge pertaining to the influenza vaccine include its safety and effectiveness, and the severity and prevalence of influenza and its complications.

To ensure an optimum response to a provider's vaccine recommendation it is important that they tailor their communication to address specific concerns and doubts while maintaining a trustworthy relationship.¹²³ As such, several interventions and communication frameworks have been designed to augment the provider's knowledge and help them steer vaccine conversations with patients. These tools have been developed to understand a patient's reason for hesitancy and provide tailored information. Some examples include the Ontario, MOHLTC's 'Flu consult kit'¹⁷⁴, Immunize BC's 'ASK approach'¹⁷⁵ and the PHAC's 'Canadian Immunization Guide'.⁶⁶ However, the relative naivety of these tools has meant that their adoption, applicability and effectiveness across providers and settings remains unexplored.

Other recommendations from researchers include pain mitigation and promotional communication as an effective tool to positively change knowledge, attitudes and behaviours of individuals towards immunization.¹⁷⁶ Emphasizing the importance of right communication,

UNICEF's Benjamin Hickler, contends (that) "The best approach tends to be to identify those people who are looking for information and make sure that they get the correct information in a clear and compelling way, so they aren't swayed by some of the more outlandish stuff."¹⁹

Reviews evaluating interventions to improve vaccine uptake conclude that health-care provider recommendations, one-on-one education, household visits, information campaigns, communication using multiple means of mass media and using social media as a tool to promote vaccinations are most effective in improving vaccine uptake and addressing hesitancy.^{28,32,102}

| Chapter 3

Exploring influenza vaccine hesitancy in community pharmacies: Descriptive analysis of knowledge, attitudes and practices of community pharmacists in Ontario, Canada

The contents of this chapter are reflective of an original manuscript written by the PhD candidate (Gokul Raj Pullagura). The candidate was responsible for conception and design of the study, data collection, analysis and interpretation of data, drafting and revising the manuscript.

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As of this writing, the manuscript has been submitted and is under review for consideration of publication.

3.1 Overview

Background: Vaccine hesitancy (VH) continues to remain a prime contributor to poor influenza vaccine uptake. This study seeks to explore the knowledge, attitudes and practices of community pharmacists towards influenza VH, including their personal influenza immunization attitudes and behaviours.

Methods: A web-based cross-sectional survey questionnaire was designed and administered to community pharmacists practicing in Ontario, Canada. The survey tool comprised of 38 questions exploring five domains including pharmacists' personal attitudes and behaviour towards influenza immunization, their self-reported knowledge of influenza, its vaccine and vaccine hesitancy, and their attitudes, practices and experiences with influenza VH at the community pharmacy. The data was analyzed descriptively.

Results: A total of 5,530 survey invitations were e-mailed and 885 responses were collected (response rate 16%). Two-thirds (n=568, 65.7%) of the respondents reported receiving the influenza vaccine in the preceding season. The most frequent reasons for personal influenza immunization were prevention of disease transmission to patients, friends and family, and contribution to herd immunity. In addition to their confidence and perceived ability to identify and address influenza VH, respondents' self-reported knowledge across a 15 item Likert questionnaire was high. Respondents reported coming across an average of 16 (SD 28) individuals hesitant to receive the influenza vaccine each week. Regular workload (n=419, 65.6%), and insufficient time (n=406, 65.3%) were reported as the most limiting barriers to optimal engagement in influenza vaccine conversations.

Conclusion: Facilitating optimal practice scope for pharmacists, and capitalizing the additional convenience and accessibility offered through the community pharmacy setting presents a promising means to address influenza VH. However, barriers to pharmacist-initiated engagement on influenza vaccine must be explored and addressed.

3.2 Introduction

Irrefutably, vaccinations remain the most effective way to combat vaccine preventable infectious diseases. They are effective both at the individual level through direct protection, and at the community level through herd immunity.^{17,177} Despite extensive scientific evidence backing the safety, efficacy, and overall benefits of all vaccines^{66,74,85,178-182}, achieving and sustaining high vaccine uptake remains a challenge. Vaccine hesitancy (VH), defined as the voluntary delay or refusal of vaccinations despite availability is an increasingly prevalent phenomenon with potential to undo decades of public health progress.^{3,183} Consequently, the World Health Organization (WHO) in 2019 identified VH as a threat to global health.⁴

VH challenges the traditional dichotomous notion of vaccination decisions and outcomes as strictly acceptance or refusal of the vaccine. Instead, it recognizes vaccine decision making as a complex, context specific, and dynamic process, wherein individuals may display an array of attitudes or behaviours as they transition across a spectrum of possibilities in response to a variety of influences between complete acceptance and refusal.^{96,104,123} While VH can be specific to one or all vaccines, influenza VH is of unique interest due to the need for annual re-immunization, seasonal variations in vaccine effectiveness, and the existence of influenza vaccine specific myths such as, ‘influenza vaccination causes influenza’ among others.^{32,184}

While reasons for non-vaccination among people are varied and complex, health care providers remain the most trusted advisors and influencers of vaccination decisions.³⁰⁻³² Experiences of general practitioners, pediatricians, nurses, and midwives on vaccinations have been studied before.⁵⁸⁻⁶³ Previous literature has established that greater knowledge on vaccines, beliefs

aligning with scientific evidence and favorable attitudes toward vaccination are associated with a greater intention to recommend and administer vaccines.⁴⁰ While most healthcare providers are generally strong supporters of vaccinations, research suggests that vaccine hesitant attitudes and beliefs may exist in some, impacting their personal vaccine uptake, and, their likelihood to recommend vaccinations to their patients.^{40,185-187}

Proven to increase vaccination rates, pharmacists' recommendation, education, and advocacy on the influenza vaccine are valuable tools in promoting positive vaccine outcomes.^{35,36} Their standing within the community as trusted sources of health information, coupled with an opportunity for frequent patient contact by means of easy accessibility and convenient hours of service of community pharmacies, makes pharmacists well-positioned to address influenza VH.³³ Pharmacists have fast become an integral part of the immunization workforce, with community pharmacies being the choice destination for influenza vaccine administration in Canada;⁴⁹ yet, the experience of influenza VH in this setting remains unexplored. The current study aims to help bridge this gap by exploring community pharmacists' personal knowledge and practices related to influenza vaccination, and their experiences with influenza VH in practice.

3.3 Methods

3.3.1 Study design and population

A cross-sectional, anonymous online survey was administered in English to community pharmacists practicing in Ontario, Canada. The survey was distributed by email to pharmacists listed in the Part A of the Ontario College of Pharmacists (OCP) membership database who had

previously provided consent to be contacted for research purposes. To ensure participation from pharmacists who primarily practiced in community settings, the source database was filtered to only include pharmacists whose primary workplace was listed as a community setting, and, a screening questioning regarding place of practice was included at the beginning of the survey. Approval for the study was obtained through the Office of Research Ethics, University of Waterloo (ORE#21648).

3.3.2 Survey development and distribution

The survey was designed using a knowledge, attitudes, and practices (KAP) approach, which describes the behaviour of an individual in a given context as a linear function of their underpinning knowledge and attitude.¹⁸⁸ The KAP framework is widely used in health research to elicit context-specific dynamics describing, identifying, and exploring barriers to optimal behaviour in a health care setting.¹⁸⁹⁻¹⁹¹ The survey questionnaire was built and refined through an iterative process, using existing literature, clinical expertise of the research team, and discussions with collaborating immunization researchers from other institutions across Canada.

The survey consisted of 38 questions exploring five domains relating to the pharmacists': 1) Professional characteristics; 2) Personal attitudes and behaviour towards influenza immunization; 3) Self-reported knowledge of influenza, its vaccine, and other vaccination-related issues; 4) Attitudes and behaviour with regards to influenza vaccinations at the community pharmacy; and 5) Experiences with seasonal influenza VH at the community pharmacy. (See Appendix A for survey instrument). Likert questions followed a 1-5 scale, with 1 representing a negative/disagreement score and 5 representing a positive/agreement score.

Face validity of content was assessed by eight registered pharmacists, six immunization researchers, and four pharmacy practice researchers. Survey flow, functionality and language were refined through a pilot with ten individuals who were not part of the research team. The survey was distributed using the online survey platform, Qualtrics® (Qualtrics Labs, Inc., 2016, Provo, UT, USA). The initial request for participation was followed by reminder emails to non-responders at weeks 2, 3, and 4. No incentives were provided for participation in the study.

3.3.3 Survey analysis

Descriptive analysis of the survey data was performed using IBM SPSS®, version 22.0 (IBM Corp, 2015, Armonk, NY, USA). Free text comments were assessed qualitatively and coded into existing quantitative variables as appropriate or used to identify new themes by GRP, and cross checked by RV to improve accuracy. To aid interpretation, responses to five-point Likert questions were categorized as positive (scores of 4 or 5), neutral (score of 3), or negative (score of 1 or 2).

Internal consistency of multi-item Likert questions was measured by calculating Cronbach's alpha coefficient. A value of ≥ 0.9 was considered excellent and a value between 0.9 and 0.8 was considered good.¹⁹²

3.4 Results

3.4.1 Sample demographics

A total of 5,530 electronic survey invitations were sent and 885 responses were collected (response rate 16%). Most respondents were authorized to administer injections (n=753, 86.6%),

held a baccalaureate degree in pharmacy (n=765, 87.0%), and practiced in pharmacies that offered influenza immunizations (n=739, 85.0%). Around half the respondents were female (n=452, 51.5%), and practiced in urban locations (n=467, 53.9%). A third of the respondents worked as full-time staff pharmacists (n=289, 33.0%), and a quarter worked in independent pharmacies (n=219, 25%). On average 217 prescriptions were dispensed daily at the respondent practice sites, and respondents authorized to administer injections reported administering an average of 158 influenza vaccines in the preceding influenza season. Complete demographic details are presented in Table 3-1.

Table 3-1 Participant demographics

<u>Characteristics</u>	<u>Number (%)</u>
Gender (n=878)	
Man	425 (48.4%)
Woman	452 (51.5%)
Other	1 (.1%)
Education* (n=879)	
BSc Pharmacy	765 (87.0%)
Post-baccalaureate PharmD	19 (2.2%)
Entry-to-practice PharmD	26 (3.0%)
Master's in pharmacy	71 (8.1%)
PhD in Pharmacy	19 (2.2%)
Residency	21 (2.4%)
Fellowship	2 (0.2%)
Other(s)	71 (8.1%)
Experience (n=877)	
Less than 5 years	169 (19.3)
5-10 years	164 (18.7)
11-15 years	94 (10.7)
16-20 years	74 (8.4)
More than 20 years	376 (42.9)
Authorized to administer injections (n=870)	
Yes	753 (86.6%)

No	117 (13.4%)
Position at primary place of practice* (n=875)	
Pharmacist - Manager	244 (27.9%)
Staff pharmacist – Full time	289 (33.0%)
Staff pharmacist - Part-time	158 (18.1%)
Pharmacy owner	178 (20.3%)
Relief pharmacist	83 (9.5%)
Other(s)	8 (0.9%)
Type of pharmacy (n=876)	
Chain (more than 6 stores with one owner)	175 (20.0)
Independent (one owner up to 6 stores)	219 (25)
Franchise	176 (20.1)
Banner	144 (16.4)
Mass merchandiser/Food store	138 (15.8)
Other	24 (2.7)
Location	
Rural (population <1000 individuals)	25 (2.9)
Small population centre (1000 to 29,999 individuals)	205 (23.7)
Medium population centre (30,000 to 99,000 individuals)	169 (19.5)
Large urban population centre (>100,000 individuals)	467 (53.9)
Involvement with influenza immunization (n=869)	
Yes, pharmacist(s) administer the vaccine	731 (84.1)
Yes, nurses/nursing agencies contracted by the pharmacy administer the vaccine	8 (.9)
No current involvement, but planning to participate in the future	52 (6.0)
No current involvement and no immediate plans for involvement in the future	78 (9.0)
	Mean (SD)
Average prescriptions volume per day (n=847)	217 (147.3)
Influenza vaccines administered in the preceding season (2015-16) (n=738)	158 (100)

3.4.2 Pharmacists' personal attitudes and behaviour related to influenza immunization

Two-thirds (n=568, 65.7%) of survey respondents reported receiving the influenza vaccine in the preceding season. The most frequent reasons for receiving the influenza vaccine were preventing disease transmission to patients (n=476, 70.4%) or to family and friends (n=460, 68%),

contributing to herd immunity (n=434, 64.2%), and to ensure personal protection (n=434, 64.2%). The most frequent reasons reported by respondents that did not receive the influenza vaccine in any of the preceding three seasons (n=189, 21.4%) were skepticism on the effectiveness of the vaccine (n=42, 22.2%), and absence of prior personal experience with seasonal influenza illness (n=38, 20.1%).

3.4.3 Pharmacists' self-reported knowledge

Fifteen items exploring the respondents' self-reported knowledge on various aspects of influenza vaccination, including influenza, its vaccine and administration, and other vaccination-related issues demonstrated consistently high scores (Table 3-2). The knowledge areas most frequently rated high (scores 4 or 5 on a 5-point Likert scale) across all respondents were adverse reactions to the influenza vaccine (n=679, 81.2%), and its dosing and indications (n=677, 81.0%). Among pharmacists who were authorized to administer injections, knowledge on influenza vaccine administration technique (n=655, 91.4%) was most frequently rated to be high. Knowledge areas least frequently rated high were annual influenza vaccine updates, such as updates on circulating strains and vaccine match, (n=409, 49.0%), composition of the influenza vaccine (n=424, 50.8%) and vaccine communication frameworks (n=438, 52.6%).

Table 3-2 Pharmacists' self-reported knowledge

Knowledge Item	Median	Frequency of Responses [§]		
		Low (n (%))	Average (n (%))	High (n (%))
Influenza disease:				
Pathophysiology	4	49 (5.8%)	300 (35.8)	488 (58.3%)
Pharmacotherapy	4	23 (2.8%)	210 (25.1%)	603 (72.1%)
Influenza vaccine:				
Dosing and indications	4	43 (5.1%)	116 (13.9%)	677 (81.0%)
Formulations	4	86 (10.3%)	213 (25.5%)	537 (64.2%)
Composition	4	119 (14.3%)	292 (35.0%)	424 (50.8%)
Interactions	4	55 (6.6%)	221 (26.5%)	558 (66.9%)
Pharmacology	4	53 (6.4%)	222 (26.6%)	559 (67.0%)
Adverse reactions	4	20 (2.4%)	137 (16.4%)	679 (81.2%)
Contraindications	4	29 (3.5%)	147 (17.7%)	656 (78.8%)
Influenza vaccine administration*:				
Administration technique	4	8 (1.1%)	54 (7.5%)	655 (91.4%)
Management of anaphylaxis	4	39 (4.7%)	168 (20.3%)	621 (75.0%)
Other vaccination-related issues:				
Vaccines and autism	4	112 (13.4%)	210 (25.2%)	511 (61.3%)
Vaccine hesitancy	4	66 (7.9%)	264 (31.7%)	502 (60.3%)
Annual influenza vaccine updates	3	94 (11.3%)	331 (39.7%)	409 (49.0%)
Vaccine communication frameworks	4	94 (11.3%)	300 (36.1%)	438 (52.6%)

[§]Row totals may not add to n=885 due to non-response to any of these items.

*These questions were only provided to pharmacists authorized to administer injections.

Cronbach's alpha (15 items) = 0.919

3.4.4 Influenza vaccine and the community pharmacist: Attitudes and behaviour

Most respondents (n=494, 59.5%) reported recommending the influenza vaccine to at least half of all patrons accessing their pharmacy. Two thirds (n=800, 66.2%) of all vaccine recommendations were described as being made specifically to patrons at high risk of influenza and its complications. Respondents authorized to administer injections estimated that at least two out of three (n=465, 66.3%) individuals getting the influenza vaccine at their pharmacy made an active request for it. Most (n=507, 61.7%) believed that at least seven out of ten individuals receiving the vaccine had made their decision prior to discussing with a healthcare provider. Interestingly, almost half the respondents (n=371, 44.8%) did not consider their ability to influence patrons' vaccination decisions to be high.

3.4.5 Influenza VH at the community pharmacy

Pharmacists' description of VH

Survey respondents most frequently described individuals expressing hesitancy as those that did not trust the vaccine and immunization services (n=576, 69.1%), or as those that received the vaccine without being completely convinced of its benefits (n=399, 47.9%) (Table 3-3).

Table 3-3 Pharmacists' description of individuals expressing VH (n=833)

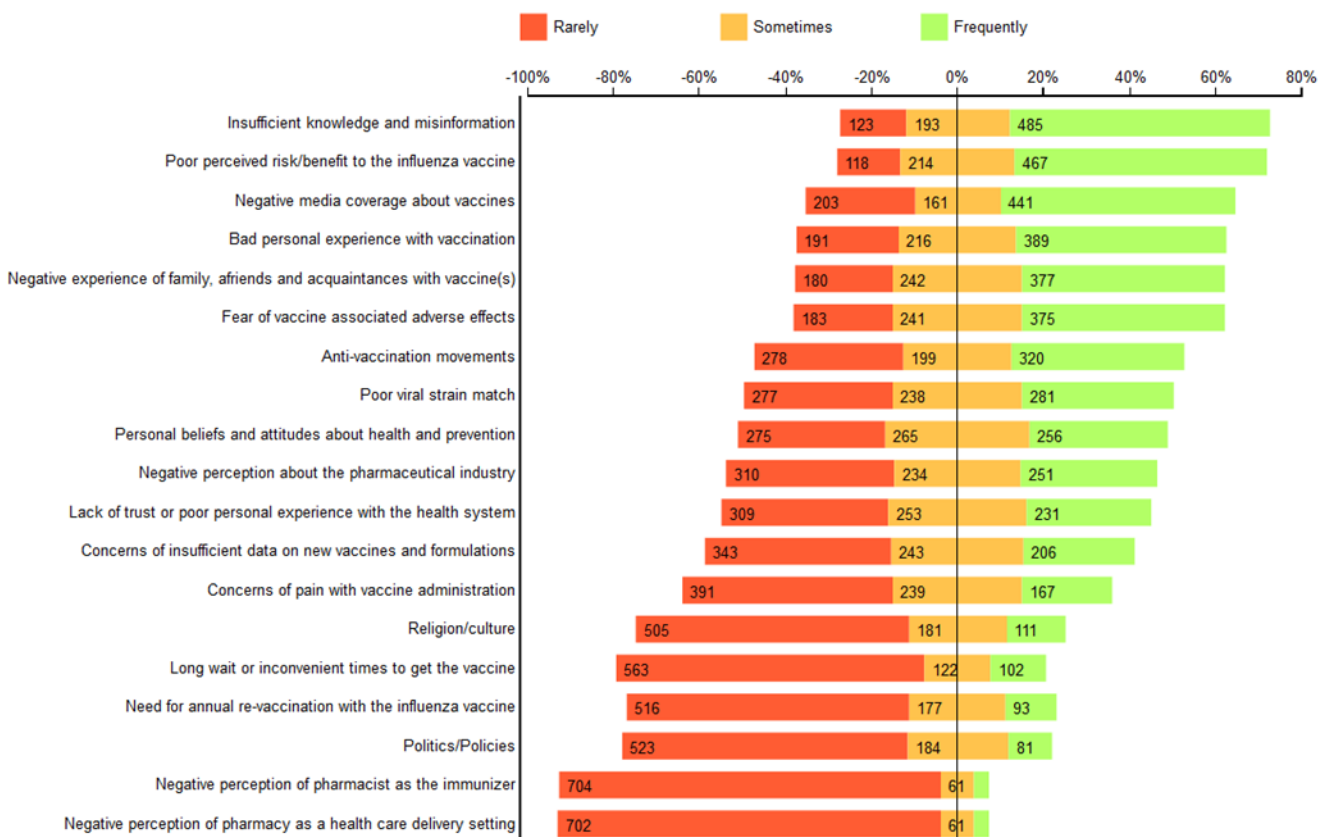
Someone is vaccine hesitant when*:	n	%
They do not trust the vaccine and immunization services	576	69.1
They are accepting of a vaccine while not being entirely convinced of its benefits	399	47.9
They've had negative experiences with immunizations in the past	376	45.1
They refuse a vaccine	373	44.8
They've had an uncomfortable and/or inconvenient vaccination experience	338	40.6
They believe they have a low risk of contracting a vaccine-preventable disease	334	40.1
They delay receiving the vaccine	331	39.7
They cannot get the vaccine due to an insufficient vaccine supply and/or lack of trained personnel to administer the vaccine	8	1.0

*Respondents were asked to select all applicable options.

Reasons for influenza VH expressed to community pharmacists

Respondents reported that the most frequent reasons for delay or refusal of influenza vaccination at the pharmacy were related to misinformation (n=485, 60.5%) and poor patient perception of influenza vaccine's risks and benefits (n=467, 58.4%). Reasons reported least frequently included concerns about the community pharmacy as a vaccination setting (n=26, 3.3%), and community pharmacist as the immunizer (n=26, 3.3%) (Figure 3-1).

Figure 3-1 Patrons’ reported reasons for delay or refusal of influenza vaccination



Cronbach’s alpha (19 items) = 0.872

3.4.6 Pharmacists’ experiences with and attitudes towards influenza VH

On average, respondents reported encountering 16 (SD 28.2) individuals hesitant to receive the influenza vaccine each week in the preceding influenza season. Most respondents considered engagement with these individuals on the importance of vaccination as either ‘very’ or ‘extremely’ important (n=643, 78.3%). However, 84.2% (n=507) of pharmacists authorized to

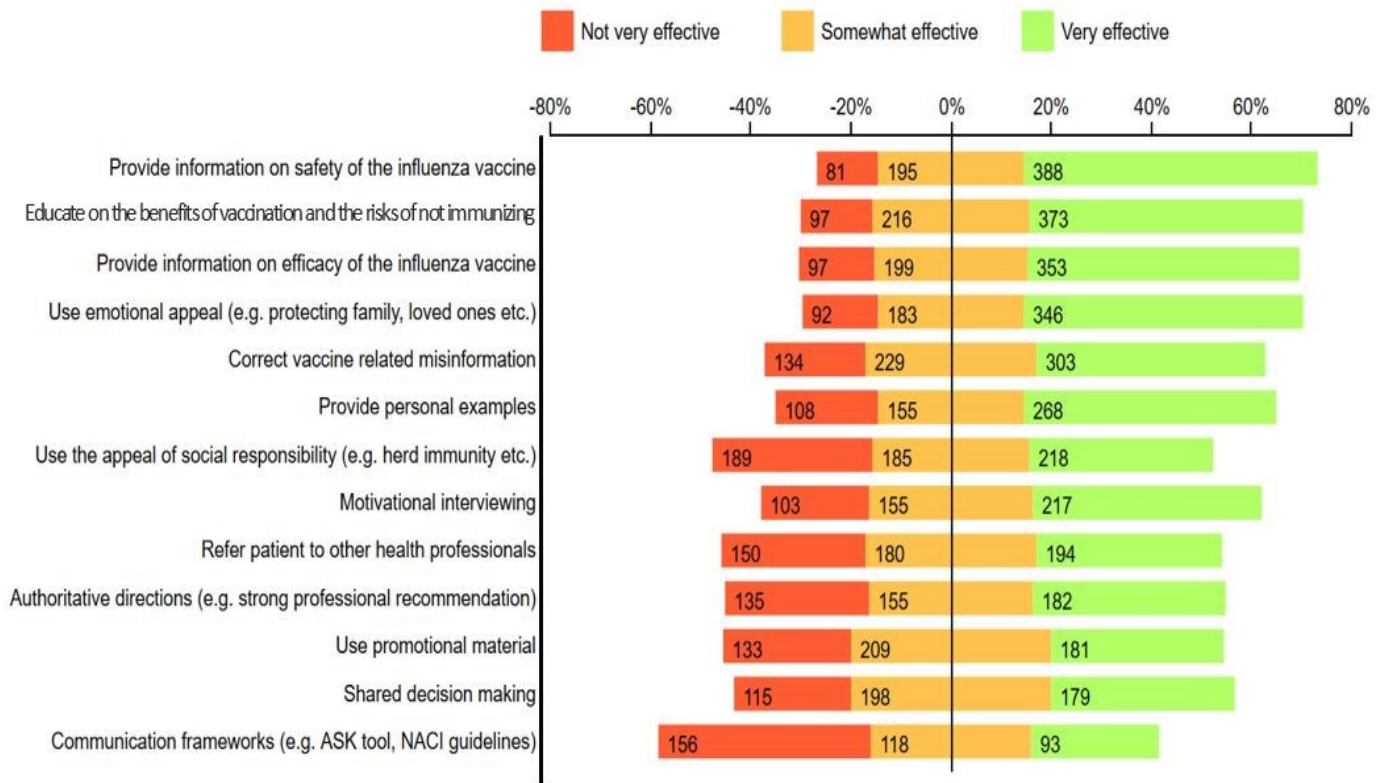
administer injections estimated that upon engaging, less than half of the individuals expressing hesitancy ultimately received the vaccine at their pharmacy.

Self-reported confidence in addressing patron queries on issues of influenza vaccine safety (n=619, 82.3%), and efficacy (n=619, 82.3%) was generally high, with the lowest levels of confidence reported for addressing questions involving conspiracy theories (n=338, 47.7%), and hidden ties to pharmaceutical organizations (n=406, 54.2%). Most respondents also reported their ability to identify hesitant individuals (n=745, 65.5%), determine the cause of their hesitancy (n=741, 60.1%), engage in conversation (n=741, 59%), and respond to their concerns (n=740, 64.7%) as high.

3.4.7 Addressing influenza VH at the community pharmacy

Among 13 approaches identified in the literature to address influenza VH, respondents reported that the most effective strategies included the provision of information on safety (n=388, 54.4%) and efficacy (n=353, 54.4%), and educating patients on the risks of non-vaccination and the benefits of vaccination (n=373, 54.4%). Specialized vaccine communication tools (such as the ASK tool¹⁷⁵ and recommendations from the NACI guidelines⁶⁶) were rated the least effective (n=367, 25.3%) (Figure 3-2).

Figure 3-2 Effectiveness of current practices in addressing VH



Cronbach's alpha (13 items) = 0.903

5.5 Barriers to optimal immunization service delivery

Respondents rated regular workflow (n=419, 65.6%), and insufficient time (n=406, 65.3%) as the most limiting barriers to optimal immunization service delivery. In contrast, items such as the quality of immunization training received (n=56, 8.8%), privacy (n=100, 11.3%), and space (n=115, 17.9%) were infrequently reported to be barriers (Figure 3-3).

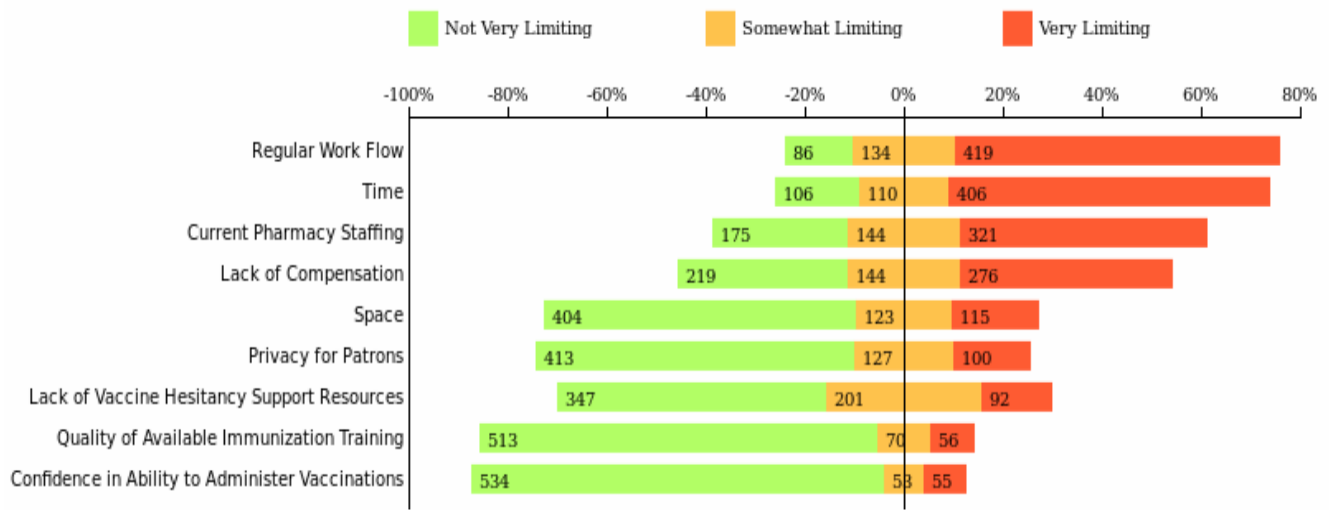


Figure 3-3 Barriers to optimal immunization service delivery reported by respondents authorized to administer injections (n=753)

Cronbach's alpha (8 items) = 0.780

3.5 Discussion

Our study is the first to investigate pharmacists' experiences with influenza VH in the community pharmacy setting using a large provincial sample. Our findings indicate that influenza VH is frequently encountered in community pharmacy practice. Pharmacists' self-reported scientific knowledge of influenza and its vaccine were high; however, the perceived effectiveness of communication tools to structure discussions with individuals expressing hesitancy appeared to be low. Further, pharmacists' engagement in discussions with those expressing hesitancy appeared to be limited in nature and compounded by barriers relating to the available time, and regular workload in community practice.

Personal influenza immunization rates reported among pharmacists in our sample (65.7%) were higher than those reported in other Canadian health professionals such as nurses (57%), dentists (44%) and specialist physicians (59%), but were lower than that of general practitioners (72%).¹⁹³ Reasons pharmacists cited to be vaccinated such as prevention of disease transmission to patients, family, and friends were consistent with those expressed by other health providers.⁵⁸ Despite the relatively high vaccination rates, one in five responding pharmacists did not receive the influenza vaccine in any of the three previous influenza seasons, suggesting the presence of influenza VH in some pharmacists. Reasons for not receiving the vaccine, assessed through the 5C scale of psychological antecedents of vaccination behaviour (confidence, complacency, constraints, calculation, collective responsibility),¹⁰¹ revealed confidence (skepticism on vaccine effectiveness), and complacency (not suffering from seasonal influenza before) as the prime domains shaping behaviour in vaccine hesitant pharmacists. Interventions aiming to improve personal influenza vaccine uptake among community pharmacists should therefore focus on these domains.

Self-reported measures have been used previously to gauge knowledge and competence of healthcare providers in other settings.¹⁹⁴⁻¹⁹⁸ Our results illustrate pharmacists' self-reported knowledge of influenza disease and its vaccine, and their confidence and ability to identify, assess and address patient vaccine concerns to be generally high. These results align with previous Canadian literature reporting high perceived preparedness among general practitioners and nurses when dealing with hesitant individuals.⁵⁸ Interestingly, communication frameworks exclusively designed to assist health professionals in steering vaccine conversations were ranked as being the least effective strategy in addressing influenza VH. However, it is unclear whether

this ranking actually reflects low perceived effectiveness or is rather a reflection of the respondents' unfamiliarity with such tools. Future programs should focus on improving awareness of vaccine communication tools among pharmacists and assessing their utility in the community pharmacy setting.

With accessible locations and convenient hours, community pharmacies provide frequent opportunities for pharmacist-patient interaction.³³ Yet, our results suggest that most vaccinations administered at the pharmacy are done upon patient request, suggesting that provider-patient engagement on influenza vaccination at the pharmacy is primarily passive and 'patient-driven'. The phenomenon of VH recognizes vaccination attitudes and beliefs across a dynamic continuum of possibilities.³ However, given the lower likelihood that individuals who are ambiguous or complacent about influenza vaccination will initiate vaccine conversations, this approach to influenza vaccine conversations likely results in missed opportunities to identify and positively nudge vaccine hesitant patients along this continuum.

The passive approach to vaccine conversations is also reflected through a low reported frequency of encounters with those expressing influenza VH, relative to: a) A low population uptake of influenza vaccine;⁴⁹ b) Literature describing those refusing all vaccines without doubt as only a small fraction of the overall population;^{3,98} and c) The high prescription volume at respondents' practice sites. While the overarching stressors of limited resources such as inadequate time and insufficient staffing contribute to pharmacists' passive approach to patient engagement on vaccinations, further research is imperative to understand other determinants of this behaviour and strategies to best address it.

3.6 Limitations

The use of convenience sampling and a response rate of 16% may result in selection bias. As such, the results described in our study may not be representative of all Ontario pharmacists. A contrast of the participants' demographic characteristics in relation to the Ontario pharmacists at large is available in Appendix B. Inherent to the nature of voluntary participation surveys, non-response bias cannot be evaluated. The use of subjective, self-reported measures may also result in recall bias and information bias. Finally, the use of a primarily quantitative survey and analysis does not allow us to further explore contextual factors and personal beliefs impacting the responses observed. Future research will use the results of this survey as a framework to further explore pharmacists' experiences with VH in practice through qualitative methods.

3.7 Conclusion

Pharmacists self-reported knowledge, confidence, and ability to address influenza VH at the community pharmacy was high. Facilitating optimal practice scope for pharmacists and capitalizing on the convenience and accessibility offered through the community pharmacy setting presents a promising means to address influenza VH. In addition to addressing environmental barriers to pharmacist-led initiation of vaccine conversations, future programs to assist pharmacists must explore strategies that encourage active pharmacist-patient engagement on influenza immunizations.

| Chapter 4

Shades of gray in vaccination decisions - Understanding community pharmacists' perspectives of, and experiences with, influenza vaccine hesitancy in Ontario, Canada

The contents of this chapter are reflective of an original manuscript written by the PhD candidate (Gokul Raj Pullagura). The candidate was responsible for conception and design of the study, data collection, analysis and interpretation of data, drafting and revising the manuscript.

Pullagura GR, Violette R, Houle SKD, Waite NM. Shades of gray in vaccination decisions - Understanding community pharmacists' perspectives of, and experiences with, influenza vaccine hesitancy in Ontario, Canada. 2019.

As of this writing, the manuscript has been submitted and is under review for consideration of publication.

4.1 Overview

Background and objectives: Vaccine hesitancy (VH) has been increasingly recognized as a global threat to public health. Yet, limited research exists exploring healthcare providers' experience of this phenomenon. Our study aims to understand community pharmacists' attitudes towards, and experiences with, influenza VH, and explore factors affecting their engagement with patients on the influenza vaccine.

Methods: A semi-structured interview guide was developed, and interviews were conducted to saturation with community pharmacists practicing in Ontario, Canada. Interview data were transcribed verbatim and analyzed using a thematic content analysis framework. The analysis yielded 110 unique codes, which were merged into five major themes and 15 subthemes.

Results: A total of 22 pharmacists were interviewed to achieve saturation. Most pharmacists were authorized to administer injections (n=20, 90.9%) and practiced for >20 years (n=16, 72.7%). Pharmacists' engagement with patients on the influenza vaccine were found to be modulated by a complex and mutually reinforcing constellation of attitudes and behaviours which included: a binary (pro-vaccine or anti-vaccine) perception of patient vaccination decisions; a conflation of those expressing hesitancy with those that were anti-vaccine; and a passive approach to patient engagement, wherein patients were found to be the primary initiators of vaccine conversations. Although pharmacists recognized the importance of educating patients and addressing their vaccine-related concerns, barriers such as limited time, inadequate staffing, and poor remuneration were found to restrict optimal patient engagement on influenza vaccinations.

Conclusion: While pharmacists hold the potential to effectively address influenza VH within their communities, future interventions must aim to break the loop of passive patient engagement and enable proactive pharmacist-patient interactions on influenza vaccinations in this setting.

4.2 Introduction

Successful vaccination initiatives and the resulting decline in devastating vaccine-preventable disease outbreaks are among the most notable achievements in public health.² However, the continued success of vaccination programs has been jeopardized in recent times through the voluntary delay or refusal of vaccines despite their availability, an increasingly prevalent phenomenon, referred to as ‘vaccine hesitancy’ (VH).^{3,4} Subsequently, VH has been recognized as one of the top ten threats to global health in 2019 by the World Health Organization (WHO).⁴

VH challenges existing perceptions of vaccination attitudes and behaviours as a dichotomous outcome of merely accepting or rejecting a vaccine. Rather, it proposes vaccine decision making as an ongoing, complex and multifactorial process, wherein individuals dynamically transition across a continuum of possibilities, displaying varying beliefs, attitudes, and behaviours toward a vaccine in response to new information and influences.^{3,32,104,123} While not exhaustive, the list of 21 unique determinants identified by the WHO working group on VH highlights the complexity of this phenomenon.³ Interestingly, these determinants have a bi-directional influence on an individual’s decision to vaccinate depending on the extrinsic context, for example, the prevailing outlook towards a vaccine in news and social media at a given time, and an individual’s response to these factors.^{3,98,120,123,148}

Despite such complexity, healthcare providers – through their standing as trusted sources of health information – remain the strongest influencers of vaccination decisions.²⁹⁻³² The effect of physician, nurse, and pharmacist recommendations on vaccine uptake has been well documented.³³⁻⁴⁰ Provider-patient engagement on vaccinations is an important opportunity where

patient concerns about a vaccine can be expressed and resolved, allowing vaccine recommendations or administration to occur. While existing research has focused on the patient experiences of VH,^{32,50-53} little is known about the provider's perceptions and experiences. Prior research suggests that pharmacists may not fully engage with those expressing hesitancy as a result of a complex interplay of multiple personal, pharmacy, and non-pharmacy specific factors such as workload and time among others.¹⁹⁹

While hesitancy may be expressed towards one or all vaccines, influenza VH is of particular interest to immunization researchers for a number of reasons: 1) The need for annual re-vaccination of the entire population; 2) Seasonal variation in the vaccine's efficacy; 3) Low perceived severity of influenza as a disease among the public; and 4) The prevalence of influenza vaccine-specific myths, including that vaccination against influenza causes the illness.^{32,184,200} Despite offering a Universal Influenza Immunization Program (UIIP) that provides influenza vaccination at no charge to all residents of Ontario through multiple providers, and the addition of pharmacists to the immunizing workforce (which has resulted in a net increase in influenza vaccines administered), overall vaccination rates remain below target.^{11,201}

Although Ontario pharmacists have been able to provide influenza immunizations since 2012, influenza VH in the community pharmacy setting remains unexplored. The current study aims to understand community pharmacists' attitudes towards, and experiences with, influenza VH in practice, and factors impacting pharmacists' engagement with their patients about the influenza vaccine.

4.3 Methods

4.3.1 Study design, population, and recruitment

This study adopted a qualitative interpretive approach to gain an in-depth understanding of Ontario community pharmacists' experiences with influenza VH. Semi-structured interviews were conducted with pharmacists who were licensed in Ontario, practiced in community pharmacies, and indicated interest in participating in a one-time interview following the completion of a survey on the same topic. The study was approved by the Office of Research Ethics at the University of Waterloo (#21648).

4.3.2 Interview guide

A semi-structured interview guide was designed using existing literature, expertise of the research group, and exploratory findings from a survey examining community pharmacists' knowledge, attitudes and practices towards influenza VH.¹⁹⁹ The interview aimed to elicit pharmacists' attitudes towards influenza VH, their perceived role in vaccination and VH, and their experiences when engaging with those expressing hesitancy to receive the influenza vaccine.

The interview guide was assessed for face validity through review by three practicing pharmacists and two pharmacy practice researchers. Interview questions were screened for sensitive content through a pilot conducted with two pharmacists not part of the research group. Following these, the interview guide was refined and interview probes developed. (See Appendix C for interview guide).

4.3.3 Data collection

All interviews were conducted by telephone and data were recorded using interviewer field notes and audio recording. To ensure consistency, all interviews were conducted by GRP and data collection was performed to saturation (defined as three interviews past the point where novel information could no longer be discerned). An iterative approach was taken to data collection, wherein, data analysis was performed concurrently, and emerging themes were used to inform questioning in future interviews. All interviews were conducted between September 2016 and December 2016. No incentives were provided for participation in the study.

4.3.4 Data analysis

Audio recordings were transcribed verbatim by a professional transcriber and checked for accuracy by GRP. Data saturation was assessed through concurrent analysis of the data. The organization and analysis of data was performed using NVivo 12 (QSR international, Burlington, Massachusetts, USA). The data was analyzed using Braun and Clarke's guide for thematic data analysis to identify, analyze and describe themes.²⁰² The coding framework adopted deductive (pre-determined concepts underpinning the research questions) and inductive (prominent and recurring themes identified within the data) forms of coding, as the use of such 'hybrid approach' is known to improve rigor in qualitative research.²⁰³

GRP and RV independently coded the interview transcripts and coding discrepancies were resolved through consensus. Consultation with a third researcher (NW who was not part of the initial analysis) was done when consensus could not be reached. Through repeated evaluation

and comparison, overlapping codes were then grouped into appropriate themes reflective of the content patterns.

4.4 Results

Of the 42 survey respondents expressing interest in being interviewed, twelve did not respond to follow-up through emails or phone calls, and one withdrew interest. A total of 22 pharmacists were interviewed to achieve saturation. Of these, all but two were authorized to administer injections, almost three-quarters practiced pharmacy for >20 years, and half currently practiced in urban locations. The interview length ranged from 15-64 minutes (average: 31 minutes). Complete participant demographics are presented in Table 1.

From the transcribed interviews, 710 significant statements were extracted and grouped into 110 unique codes (See Appendix D for code list). These codes were further merged into five major themes and 15 subthemes as described below.

4.4.1 Theme 1: Pharmacists and immunization services

Degree of support for pharmacist's role in influenza immunization

Most participants were supportive of their role in administering immunizations, emphasizing their ability to provide accessible and convenient services to patients who otherwise may not receive the influenza vaccine. Participants also identified this service as an opportunity to build and enhance ongoing pharmacist-patient relationships, contribute to the province's pandemic preparedness plans, and provide other vaccinations.

“I think that our basic role as a pharmacist is to promote the healthcare and well-being of all our patients and vaccination is an essential component of that.” PH13

Those who were critical of this service identified challenges with workflow and remuneration, as discussed in detail in other themes.

Integration of vaccinations into pharmacy workflow

In general, requests for vaccinations were processed like regular prescriptions within the pharmacy’s workflow. Interestingly, participants did not comment on organizing specialized influenza clinics, instead, highlighting the walk-in nature of the service.

4.4.2 Theme 2: Pharmacists’ attitudes towards influenza vaccine and VH

Attitudes towards personal influenza immunization

Participants described personally receiving the influenza vaccine primarily to prevent disease transmission to family and patients. Revealing one’s own personal immunization status was also used as a strategy to promote vaccination to patients. Participants who did not receive the influenza vaccine themselves expressed poor efficacy of the vaccine and no prior experience of influenza as the reasons for refusal.

Perceived role in VH

The participants perceived their role in VH primarily as educators and advocates of the vaccine, by resolving concerns and fulfilling patient information needs. This role was contextualized with

an appreciation of the greater contact-time and opportunity for patient engagement in the pharmacy setting as compared to other healthcare settings.

“We have so much direct contact with patients that I think we are able to mostly address the issue than a lot of doctors because doctors only see their patients when they are ill, so [at] the time of the vaccine season, especially the flu vaccine, they may not necessarily see their patients.” PH11

Attitudes towards VH and those expressing hesitancy

Two participants referred to VH as a complex but *modifiable* issue, encompassing a variety of reasons resulting in the delay or refusal of a vaccine. However, most pharmacists interviewed perceived those expressing hesitancy as difficult to convince and strongly opinionated against the vaccine. In these scenarios, the participants emphasized the importance of providing information and supporting individual autonomy on the eventual vaccination decision.

“People have preconceived notions, you know you can think that perhaps they have been brain washed, but then on the other hand they think that you have been brain washed. So, you cannot convince them otherwise, and all that you do is present them with evidence and hope that they see the light.” PH22

Conflation of VH with binary vaccination decisions

Most participants described those expressing hesitancy as ‘adamant’ and ‘close-minded’ individuals, who had made a decision to not receive the vaccine and were unlikely to change.

This description is consistent with a binary outlook to vaccination decisions, wherein patients either received (pro-vaccine) or refused (anti-vaccine) the influenza vaccine. This results in a *compression* of the VH continuum, and the reduction of vaccination decisions to a static binary of yes/no, rather than a dynamic space of possibilities.

“I just have this recollection of people being adamant that they are not getting the vaccine, and nothing I could do could change their mind and they make me sad, this is what it did, it made me sad.” PH8

Interestingly, one participant acknowledged this misclassification; however, described difficulty distinguishing those hesitant from those that are anti-vaccine in practice.

“I do think there is a significant difference between the anti-vaccine and vaccine hesitancy... I am not sure I can do that, I am not sure that I have the insight or the experience to tell.” PH14

Despite the conflation, some participants recognized that individuals may re-think their initial vaccination decision over time as a result of multiple influences and interactions, passively acknowledging the dynamic nature of vaccination decisions.

“I feel it is just about planting the seed, and if you have several people planting seeds, something might grow. So, my job is not really to force people into getting it, but just to make them think about it in a different way.” PH13

4.4.3 Theme 3: Pharmacists' experiences with influenza VH and those expressing hesitancy

Frequency of VH experiences

Most pharmacists described the frequency of coming across those hesitant to receive the influenza vaccine as a minor proportion of their patient population over the influenza season.

"I am sure there are lot of them, but I did not really come across them in my practice places, not really, no." PH1

"Fortunately, not too often, I would say, in a flu season may be twice a week" PH17

One pharmacist described frequent encounters with those hesitant; however, the availability of time to proactively engage with patients on vaccinations was highlighted.

"It is quite often because prior to where I am right now, where I worked it was a slower pace pharmacy and I had quite a bit of time at my hand to engage customers walking to the store and it was quite often." PH20

Reasons for patient influenza VH

The participants described the most frequent reasons for influenza VH expressed in the pharmacy as being rooted in misinformation, specifically, patients believing influenza vaccine leads to influenza. This was followed by complacency, wherein patients did not feel the necessity to be vaccinated. Other reasons expressed included fear of needles, and religious reasons.

“It is usually that every time they get the flu vaccine, they get sick, regardless of the fact that you can explain that it is not a live vaccine...” PH14

Perceived influence on individuals expressing hesitancy

The participants described most individuals they come across as having already made a vaccination decision to either receive or not receive the vaccine prior to meeting with them. With individuals expressing hesitancy, the participants generally described a poor ability to influence their acceptance of getting vaccinated.

“I have not been able to convince any client who was hesitant or reluctant to take the vaccine.” PH15

Interestingly, twice the number of respondents shared anecdotes about a negative vaccination outcome, wherein those expressing hesitancy chose not to receive the vaccine, compared to a positive vaccination outcome.

4.4.4 Theme 4: Patient engagement on influenza vaccinations

Passive engagement

Often initiated by the patient, engagement on influenza vaccination at the pharmacy was primarily passive in nature. In contrast to assuming a proactive role in seeking and addressing VH, most participants described their engagement as primarily responding to questions asked by their patients.

“If they ask you about it [influenza vaccine], then it is important to engage in the conversation just like any other topic they raise, but it is not something you just randomly bring up with people.” PH21

“I think that right now there is no promotion about vaccines, hesitancy or about asking questions. We are not being advocates; we are just responding to questions.” PH2

For others, time and resource limitations further amplified this passive style of engagement.

“I do not want to encourage everybody because I am already overwhelmed, I do not even want to promote the service because I am already overwhelmed and I cannot handle the workload without any extra help!” PH19

Business implications of engagement

Interestingly, some participants expressed friction between the ‘business’ and ‘health care delivery’ aspects of community pharmacy as a barrier further preventing active engagement. The fear of losing patients to other pharmacies by continuing to discuss vaccination upon an initial refusal was expressed by some owner-operator participants.

“If we challenge their beliefs, they could go to another pharmacy where they are not going to be challenged, so we have to walk a fine line in terms of the services that we provide and what we do.” PH22

Process of patient engagement

Consistent with the *passive* approach described earlier, most pharmacists described regular engagement on influenza vaccine as a brief conversation that happened after a degree of acceptance to receive the vaccine was expressed, such as while filling out the requisite paperwork or patients seeking reassurance right before vaccine administration.

“I can say, it is more of a discussion just before you inject them.” PH17

In contrast, two pharmacists described proactive engagement and utilizing other patient-facing opportunities such as medication reviews and non-prescription drug recommendations to initiate discussions on influenza vaccination.

“If I’m called to counsel or if I am actually in the aisle giving advice or recommendations on cough and cold products or whatever else, I usually ask, ‘Do you normally get the flu shot?’ ...and that is when I try to address whatever concern they have.” PH13

4.4.5 Theme 5: Addressing influenza VH in the community pharmacy

Current strategies to address influenza VH

Consistent with their own perceived role in VH, patient education was described as the choice strategy when engaging with those hesitant to receive the influenza vaccine.

“I think one on one discussion with the patient and just giving them the information, letting them make their own decision, so they do not feel pressured, is a good thing.”

PH10

To enhance the effectiveness of these conversations, participants underscored the importance of establishing rapport, capitalizing on existing relationships with their patients, and respecting patient autonomy over the eventual vaccination decision. Some participants also described the use of varying engagement styles such as use of humor and lighthearted tone when conversing with specific patients. Other arguments used were personal vaccination anecdotes and highlighting social/community protection benefits offered through vaccination.

Barriers to engaging in VH conversations

The most common barriers to engaging and addressing VH described were resource constraints, specifically related to personnel and time.

“You tend to engage people if you have a quiet period, when you are not actually rushed off your feet and then you can suggest to them, ‘Would like to get a flu shot?’, ‘Have you had your flu shot this year?’ But if you are busy filling scripts and the phone is ringing that conversation does not happen because you do not have time.” PH21

Resource burden was consistently emphasized as a barrier to not just engaging with those who may be hesitant to receive the influenza vaccine, but also to administering the vaccine in patients who have made a decision to receive it.

“Just with logistics and the workload of injecting people that want to be injected or need to be injected, I think is very challenging as a community pharmacist, so I do not think our main focus is on the patients who are reluctant to have a flu shot right now.” PH17

Additionally, the current remuneration model for provision of influenza vaccine at the pharmacy, which includes a fee of CAD \$7.50 for each completed vaccination, was criticized by the participants as being insufficient and not rewarding the additional time that may have been spent consulting with those expressing hesitancy, resulting in reduced motivation to engage in vaccine conversations.

“We are not getting paid for the effort, we are getting paid for results and that is wrong...” PH8

In addition to the aforementioned barriers, the participants also described the impact of pressures to increase vaccination volume, issues with obtaining adequate supply of vaccine, and paperwork relating to billing, communication, and record keeping as limiting time available for patient engagement on the influenza vaccine.

Proposed strategies to support pharmacists in addressing influenza VH

In addition to enhanced personnel and financial resources to enable vaccine discussions, the most frequently proposed strategies to promote influenza vaccination and address influenza VH revolved around equipping the pharmacist with knowledge and skills to counsel patients expressing hesitancy and answer frequently asked questions.

Other proposed strategies included: provision of fiscal incentives, improved access and availability to preservative-free vaccine products (i.e., pre-filled syringes rather than multi-dose vials), and ‘proactive’ engagement with patients on the influenza vaccine. Interestingly, only one participant described the need for specialized communication tools to handle VH conversations.

“If we could find a way to make it easier to open the door to having a conversation about what it is that is preventing them from getting the flu shot, that might be handy.” PH22

4.5 Discussion

This study explores pharmacists’ experience with influenza VH and the nuances of their interactions with patients about the influenza vaccine. Our findings indicate that pharmacists primarily assume the role of educators, with knowledge provision and correction of misinformation being the strategy of choice when dealing with those expressing hesitancy. Pharmacists’ appeared to hold a binary perception of patient vaccination decisions, and the initiation of influenza vaccine conversations at the pharmacy was predominantly done by patients. Further, pharmacists’ capacity to engage in vaccine conversations appears to be limited by time and resource constraints.

The association between healthcare provider recommendations and vaccine uptake by patients has been extensively documented.^{31,36,37,40,51,204} A trial evaluating the impact of personalized education on influenza vaccinations by pharmacists demonstrated an 8.7% increase in vaccine uptake among seniors.³⁵ In a survey of pharmacy patrons conducted in Ontario, 62% of respondents expressed willingness to receive a vaccine if recommended by their health care professional.⁴⁵ As such, encouraging active engagement between providers and patients on

vaccines is of great value towards maximizing the known association between provider recommendations and positive vaccination outcomes.

Our results suggest that pharmacists' engagement about influenza vaccine and with those expressing hesitancy is modulated through a complex and mutually reinforcing constellation of attitudes and behaviours. These include pharmacists' perception of the phenomenon of VH as static and immutable, and the impact of prior experiences with individuals expressing hesitancy on their future behaviour. Based on our findings, we propose a model to illustrate the relationship between the various components modulating pharmacists' engagement on influenza vaccines at the pharmacy (Figure 4-1). The model comprises three overarching components: 1) The passive engagement loop; 2) Practice consequences and missed opportunities; and 3) Extrinsic factors.

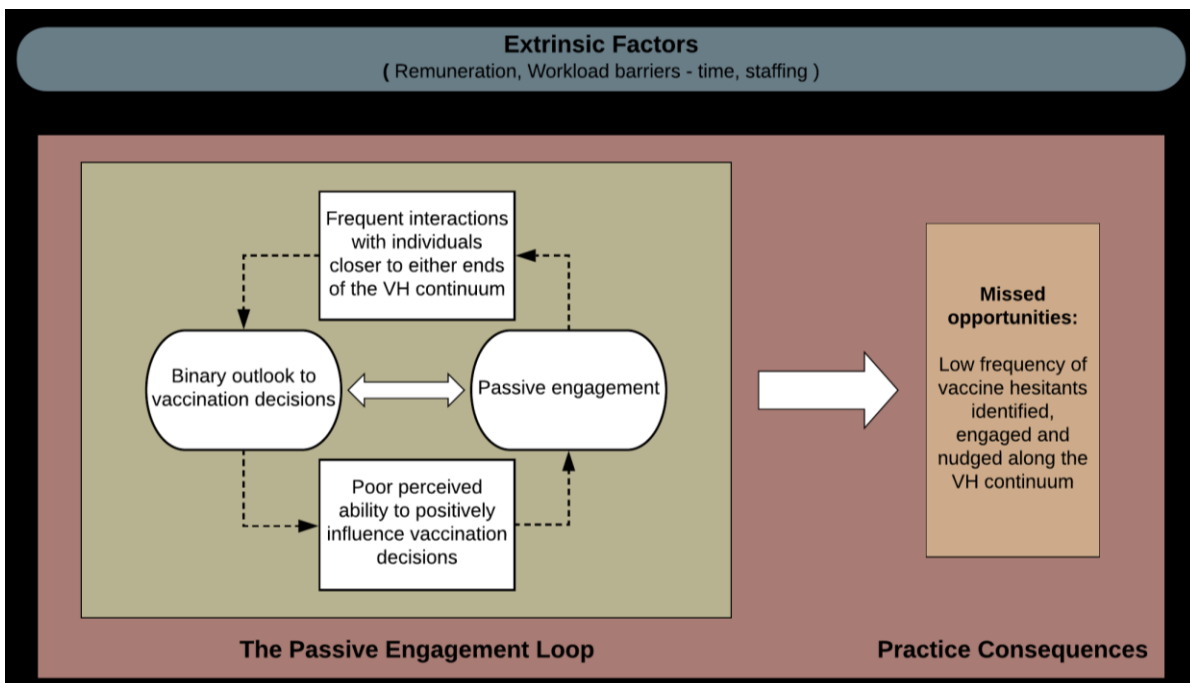


Figure 4-1. Modulators of community pharmacists' engagement with patients on influenza vaccine

The passive engagement loop

‘Passive engagement’, simply described as patient-led initiation of vaccine conversations, likely results in frequent interactions with individuals polarized about the vaccine, as those that are complacent or do not have strong opinions may not necessarily vocalize their concerns.^{102,132}

This experience is reflected through the pharmacists’ description of individuals expressing hesitancy as ‘adamant’ and ‘close-minded’ – expressions more commonly associated with those that are closer to the anti-vaxx end of the VH spectrum.

A byproduct of this lived experience, pharmacists’ continued exposure to individuals who are polarized about vaccines further reinforces a binary outlook to patient vaccination decisions. This, in turn, enables a perception that all individuals merely accept or reject a vaccine, effectively negating the space on the spectrum for those that are hesitant. The resultant compression of the VH continuum and the misclassification of vaccine hesitant as anti-vaxxers essentially creates a ripple effect, dampening the pharmacists’ perceived ability to influence patient vaccination decisions, and further lowering their likelihood of engaging with individuals that express hesitancy. This therefore completes and sustains a positive feedback loop.

Practice consequences and missed opportunities

Despite being ideally placed to address VH due to frequent contact with patients and the public, easy accessibility, and convenient hours of service, our results describe a low frequency of community pharmacist encounters with those hesitant. A portion of this observation appears to be a direct consequence of the passive engagement loop. Such passive pharmacist engagement

on influenza vaccines at the pharmacy further results in missed opportunities, as a low rate of identification results in fewer opportunities to engage and positively nudge individuals along the VH continuum.

Extrinsic factors

Vaccinations in the pharmacy are nested within the context of constrained resources. Regular workload, limited time, and inadequate staffing, among others, were consistently identified as barriers to both vaccine administration and patient engagement on vaccinations. In combination with a binary outlook to vaccination decisions, insufficient fiscal incentives and a remuneration model tied to the act of administration further moderate pharmacists' motivation to engage with those expressing hesitancy.

A low influenza vaccine uptake rate in Ontario (~35%)⁹¹, coupled with evidence describing anti-vaxxers as forming a small minority of the population^{3,98,205}, leads us to believe that a vast majority of the population could be considered vaccine hesitant to some degree, either actively (by choice) or passively (through complacency). Pharmacists have an important role in addressing influenza VH within their communities; however, future research must explore strategies to break the loop of passive engagement and foster proactive pharmacist engagement on vaccines. The proposed model provides potential targets to address influenza VH in the community pharmacy with a focus on improved pharmacist engagement with patients on the influenza vaccine. However, future interventions must also explore means to alleviate resource constraints and other extrinsic barriers to support patient engagement and improve positive vaccination outcomes.

4.6 Limitations

Only pharmacists who responded to a prior survey (n=885) conducted by the research team had the opportunity to participate in this research. As such, our results reflect the subjective experiences of the interview participants only, which may differ from those who did not participate in this study. While two independent researchers carried out the analysis, the effects of researcher biases cannot be ruled out.

4.7 Conclusion

Our research suggests that pharmacists' engagement with patients on the influenza vaccine is modulated by a complex and mutually reinforcing constellation of attitudes and behaviours, including: a binary perception of patient vaccination decisions, a conflation of individuals expressing vaccine hesitancy with those that are anti-vaccine, and a passive approach to patient engagement on the influenza vaccine. While pharmacists hold the potential to effectively address influenza VH within their communities, future interventions must explore means to break the loop of passive patient engagement and enable proactive pharmacist-led discussions on the influenza vaccine.

Table 4-1. Participant demographics

1	Gender	n	%
	Male	12	54.5
	Female	10	45.5
2	Authorized to administer injections	n	%
	Yes	20	90.9
	No	2	9.1
3	Location	n	%
	Small population centre (<29,999 individuals)	5	22.7
	Medium population centre (30,000 – 99,999 individuals)	6	27.3
	Large urban (>100,000 individuals)	11	50.0
4	Pharmacy type	n	%
	Independent	7	31.8
	Mass merchandiser	6	27.3
	Chain	5	22.7
	Franchise	4	18.2
5	Daily prescription volume	n[§]	%
	< 100	7	33.3
	101 – 200	4	19.0
	201 – 300	7	33.3
	> 300	3	14.3
6	Position	n	%
	Full time: Staff pharmacist	8	36.4
	Full time: Owner/Designated Manager	8	36.4
	Part time/Relief	6	27.3
7	Years in practice	n	%
	< 5 years	1	4.5
	6 to 10 years	1	4.5
	11 to 15 years	1	4.5
	16 to 20 years	3	13.6
	> 20 years	16	72.7
§Information not gathered from one respondent.			

Table 4-2. Major themes and sub-themes identified

Pharmacists and immunization services	Degree of support for pharmacist's role in influenza immunization
	Integration of vaccinations into pharmacy workflow
Pharmacists' attitudes towards influenza vaccine and VH	Attitudes towards personal influenza immunization
	Perceived role in VH
	Attitudes towards VH and those expressing hesitancy
	Conflation of VH with binary vaccination decisions
Pharmacists' experiences with influenza VH	Frequency of VH experiences
	Reasons for patient influenza VH
	Perceived influence on individuals expressing hesitancy
Patient engagement on influenza vaccinations	Passive engagement
	Business implications of engagement
	Process of patient engagement
Addressing influenza VH in the community pharmacy	Current strategies to address influenza VH
	Barriers to engaging in VH conversations
	Proposed strategies to support pharmacists in addressing influenza VH

| Chapter 5

Cost-utility analysis of offering a novel remunerated community pharmacist consultation service on influenza vaccination for seniors in Ontario, Canada

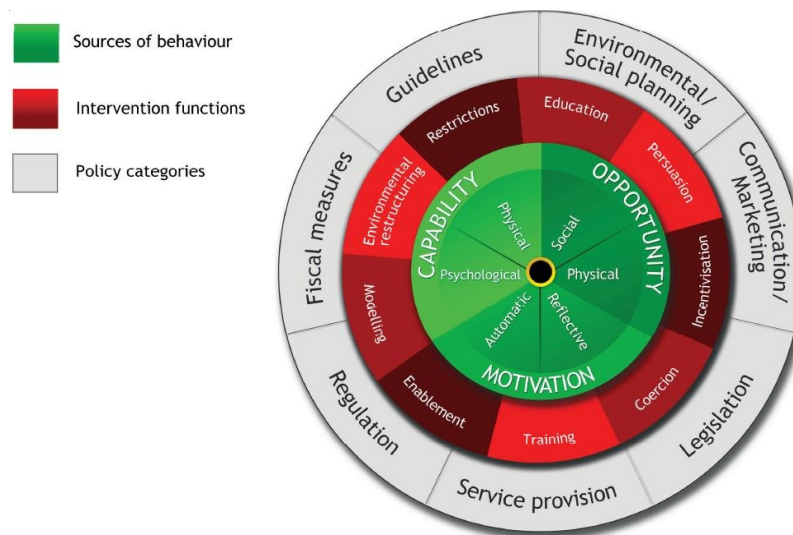
The contents of this chapter are reflective of an original manuscript published by the PhD candidate (Gokul Raj Pullagura) in the Journal of the American Pharmacists Association (JAPhA). The candidate was responsible for conception and design of the study, data collection, analysis and interpretation of data, drafting the manuscript and performing peer-requested revisions.

Pullagura GR, Waite NM, Houle SKD, Violette R, Wong WWL. Cost-utility analysis of offering a novel remunerated community pharmacist consultation service on influenza vaccination for seniors in Ontario, Canada. *J Am Pharm Assoc (2003)*. 2019;59(4):48-497.e1. doi: [10.1016/j.japh.2019.02.011](https://doi.org/10.1016/j.japh.2019.02.011).

Prologue

Having gained a better understanding of influenza vaccine hesitancy (VH) through the quantitative and qualitative studies (described in Chapters 3 and 4) in the community pharmacy setting, a natural progression for our research was to explore potential interventions that addressed this challenge. The implementation of evidence to practice often involves modifying or incorporating changes to individual and collective behaviours.²⁰⁶ Such change is best enabled through a thorough understanding of the ‘nature’ of the target behaviour, which in turn enables the selection of ideal intervention characteristics and components tailored to make the most of this understanding.^{206,207} Implementation science researchers therefore advocate the use of a systematic, theory driven approach to intervention design and evaluation.²⁰⁷⁻²⁰⁹

Based on 19 theories, the behaviour change wheel (BCW)²⁰⁶ is a widely adopted meta-framework to guide intervention design in a systematic and transparent manner. The application of this framework primarily involves: 1) An analysis of the target behaviour; 2) Determination of



The Behaviour Change Wheel (BCW)¹

appropriate intervention functions to bring about the desired change in behaviour; and 3)

Identification of policy categories to enable and support the choice intervention.

To best address influenza VH in the pharmacy setting, it is critical to first identify a central target behaviour, which when modified has the greatest potential to bring about the desired change in practice. A distillation of our research findings leads us to believe that breaking the loop of ‘passive engagement’ (described in Chapter 4) has the most potential in this regard. More specifically, the ideal behavioural target would be to ensure that pharmacists utilize all available opportunities to proactively initiate and engage patients in influenza vaccine conversations. In addition to resolving existing patient concerns, such behaviour is expected to create space for issues of dormant hesitancy to be expressed and prevent passive VH through complacency.

To facilitate an analysis of the target behaviour, the authors of BCW also present a behavioural model, (termed COM-B) that acts as a central ‘hub’ of the behaviour change ‘wheel’. This system proposes an individual’s physical and psychological Capability, their automatic and reflective Motivation, and the physical and social Opportunity to engage in the target behaviour, as the fundamental interacting components that generate and modulate Behaviour.²⁰⁶

An assessment of the current behaviour of passive engagement through the COM-B lens hints at the need to target the ‘Motivation’ and ‘Opportunity’ components affecting this behaviour for most impact; as findings from our research (presented in Chapter 3) indicate that pharmacists’ already possess a high ‘Capability’ (i.e., knowledge, ability and confidence) to address influenza VH and; issues of time and remuneration appear to be the bigger challenges to optimal patient engagement. Interestingly, current approaches to address influenza VH such as the Canadian

Immunization Guide⁶⁶ and, the ASK tool¹⁷⁵ rely on the provision of knowledge, skills and/or information intended to augment the healthcare provider's 'Capability'. However, our analysis suggests that reorienting our efforts to target the 'Motivation' and 'Opportunity' components may be of increased benefit in the community pharmacy context.

Based on the tenet of positive reinforcement, the use of incentives has been linked to improve both automatic (involving emotions, impulses and associative learning) and reflective (involving plans and evaluations) processes driving 'Motivation'.^{206,207} In this chapter, we propose, design, and evaluate the cost-effectiveness of a novel incentive-based intervention targeting the pharmacists' motivation to engage in influenza vaccine conversations.

“We are not getting paid for the effort, we are getting paid for results and that is wrong...” PH8

5.1 Overview

Background: Despite the availability of free and accessible influenza vaccine to all Ontarians, uptake has remained suboptimal. While reasons to not receive the vaccine vary widely, healthcare provider recommendations remain the most effective strategy to positively influence vaccination decisions.

Objective: This study aimed to predict the relative quality of life, costs and cost-effectiveness of introducing a remunerated community-pharmacist consultation service on influenza vaccination for Ontarians aged ≥ 65 years.

Methods: A cost-utility analysis was performed from a third-party public-payer perspective over one-year. The delivery of consultation services by community-pharmacists on influenza vaccination, billable at CAD \$15 was compared to current standard practices (absence of remunerated consultations). Model inputs were sourced primarily from existing literature. The impact of parameter uncertainties was assessed through deterministic and probabilistic sensitivity analyses.

Results: The provision of influenza vaccine consultation services was predicted to prevent 2,407 cases of mild-influenza and 3 influenza-related deaths at an additional cost of CAD \$2.03/person over current practices. The incremental costs per quality-adjusted life-year (QALY) gained for the Enhanced Care strategy relative to Standard Care was CAD \$2,087. The interpretation of the base-case result was found to be robust across all sensitivity analyses. The projected additional costs of implementing pharmacist consultations in Ontario was estimated at CAD \$1.15 million/year and the anticipated benefits included a gain of 507 QALYs/year.

Conclusion: Pharmacist delivered consultation services on influenza vaccination are cost-effective and lead to improved clinical outcomes for Ontario seniors. Introduction of such services offers a promising strategy to address challenges related to poor vaccine uptake in this group.

5.2 Introduction

Influenza is a vaccine preventable infectious disease of the respiratory system that affects 10-20% of the world's population annually.⁶ In Ontario alone, the 2016-17 influenza season resulted in 3,839 hospitalizations and 260 deaths.²¹⁰ The national economic burden in Canada associated with the direct medical care costs of influenza was estimated to be CAD \$60 million.²¹¹ Through Ontario's Universal Influenza Immunization Program, all residents can be vaccinated against influenza free of charge from a variety of healthcare providers including pharmacists,¹⁴ yet vaccination rates remain suboptimal.⁹¹

While the entire population is susceptible to influenza, it is well recognized that individuals aged 65 years and over have higher morbidity and mortality.⁶ An analysis of 2005-2011 health care data in the United States revealed that up to 85% of deaths and 70% of hospitalizations from seasonal influenza occurred in those that were aged ≥ 65 years.²¹² Other studies have also observed a longer hospital stay in this age group, ranging between 130-200% relative to others.^{182,213}

From a socio-cultural perspective, a decision to vaccinate is not a simple dichotomy of accept or reject, but one that is complicated and influenced by multiple factors that vary across time, place, vaccine and context.^{3,58} As such, attitudes and behaviours towards vaccination are best perceived on a continuum, wherein individuals dynamically transition across a spectrum of possibilities.⁵⁸ Therefore, a personalized approach specifically tailored around each individual's questions and concerns may hold the most potential to improve vaccine uptake.^{214,215}

Pharmacists are accessible sources of trustworthy information and education, who play a vital role in providing the community they serve with clear, factual information regarding influenza and its vaccine.⁴³ In a 2014 survey of pharmacy patrons conducted in Ontario, 62% of respondents expressed willingness to receive a vaccine if recommended by their health care professional.⁴⁵ Pharmacists in Ontario currently receive a fee of CAD \$7.50 if a patient receives the vaccine, intended to only offset administration costs.²¹⁶ As a result, any additional time spent providing education to patients who may be uncertain about their decision to receive the vaccine is not remunerated. In a busy community pharmacy environment, this lack of remuneration is an additional barrier which prevents these conversations from occurring.¹⁹⁹ The introduction of standalone consultation services is anticipated to promote active patient engagement on influenza vaccine, provide means to address individual patient concerns, and exert positive influence on patient vaccination decisions.

This study aimed to predict the relative quality of life changes, costs, and cost-effectiveness associated with the provision of a novel remunerated influenza vaccine consultation service by community pharmacists for Ontario seniors, when compared to current standard practices.

5.3 Methods

5.3.1 Type of economic evaluation

The analysis was conducted using a cost-utility approach, wherein cost-effectiveness was assessed as the incremental cost per quality-adjusted life-year (QALY) gained. Such analysis

allows decision-makers to make comparisons across an array of conditions and interventions, facilitating the allocation of resources based on health gain maximization.²¹⁷

5.3.2 Study perspective and time horizon

The analysis was conducted using a third-party public-payer perspective, specifically, the Ontario Ministry of Health and Long-Term Care (MOHLTC). The base-case analysis of the services was conducted over the duration of one year.

5.3.3 Target population

The Canadian National Advisory Committee on Immunization recommends the seasonal influenza vaccine to all individuals over the age of 6 months unless contraindicated, however, those aged ≥ 65 years are identified to be at a higher risk of influenza related complications and hospitalizations.¹⁵ The target population for this study therefore included all Ontarians aged ≥ 65 years who accessed community-pharmacy services. Ontario cost-benefit projections were performed using a sample of 5,20,509 simulations, equivalent to the number of Ontarians aged ≥ 65 years estimated to utilize immunization services in the Enhanced Care arm:

Number of Ontario seniors estimated to receive their influenza vaccine at the community-pharmacy in the Enhanced Care arm = (Population of seniors in Ontario (2,424,818)²³⁴ X Proportion of seniors receiving the influenza vaccine in the Enhanced Care arm (0.7252) X Proportion of adults receiving their influenza vaccine at community-pharmacies (0.296)).²⁶⁰

5.4 Strategies assessed

This study compared two different formats of influenza vaccination service delivery by community pharmacists: 1. Standard Care (SC) (status quo), and 2. Enhanced Care (EC). The SC strategy presented traditional means of influenza immunization delivery at the community pharmacy for Ontario seniors ≥ 65 years, which do not include the availability of remunerated influenza immunization consultations. The EC arm included the provision of all services available to those ≥ 65 years in the SC arm, with the additional availability of pharmacist delivered influenza immunization consultations.

The provision of consultation services was considered to be at the professional discretion of the consulting pharmacist in response to an identified knowledge gap or questions around influenza vaccination from eligible individuals, or upon request from eligible individuals. The consultation service was considered to comprise a face-to-face, comprehensive and individualized assessment of the patient's reservations surrounding influenza vaccination, followed by an appropriate resolution through the provision of high-quality tailored information. This interaction was expected to be conducted in a private counselling area housed within the pharmacy and was anticipated to take under 15 minutes of the pharmacists' time including standard documentation requirements.

5.4.1 Model description

A decision-analytic model was implemented in TreeAge[®] Pro 2017 (TreeAge Software Inc., Williamstown, MA, USA). In this model, seniors utilizing pharmacy services chose to either receive the influenza vaccine or not. Based on their choice, the decision tree then explored

possible vaccination and disease related outcomes. Vaccination-specific outcomes included the presence or absence of an adverse event, which were further stratified into those that resulted in a cost to the health care system and those that did not. Disease-related outcomes included the occurrence of influenza, which was further stratified into mild [i.e., treated with non-prescription drugs, not resulting in physician office/emergency department (ED) visit], moderate [i.e., resulting in a physician office/ED visit], severe [i.e., admission to the hospital/ICU, not resulting in death] and death. The SC strategy was also considered to serve as an active control, as provision of no-cost annual influenza immunization constitutes the current standard of care for seniors (aged ≥ 65 years) in Ontario.²¹⁸ The EC arm included the provision of all services available to those ≥ 65 years in the SC arm, with the additional availability of pharmacist delivered influenza immunization consultations.

Based on the guidelines for economic evaluation of health technologies in Canada,²¹⁷ discounting of future events was not performed as the current analysis utilized a time-horizon of one year. In this study, a decision tree was selected as the choice decision analytic model due to the absence of recurring events, and a short time horizon. The decision tree is presented in Figure 5-1.

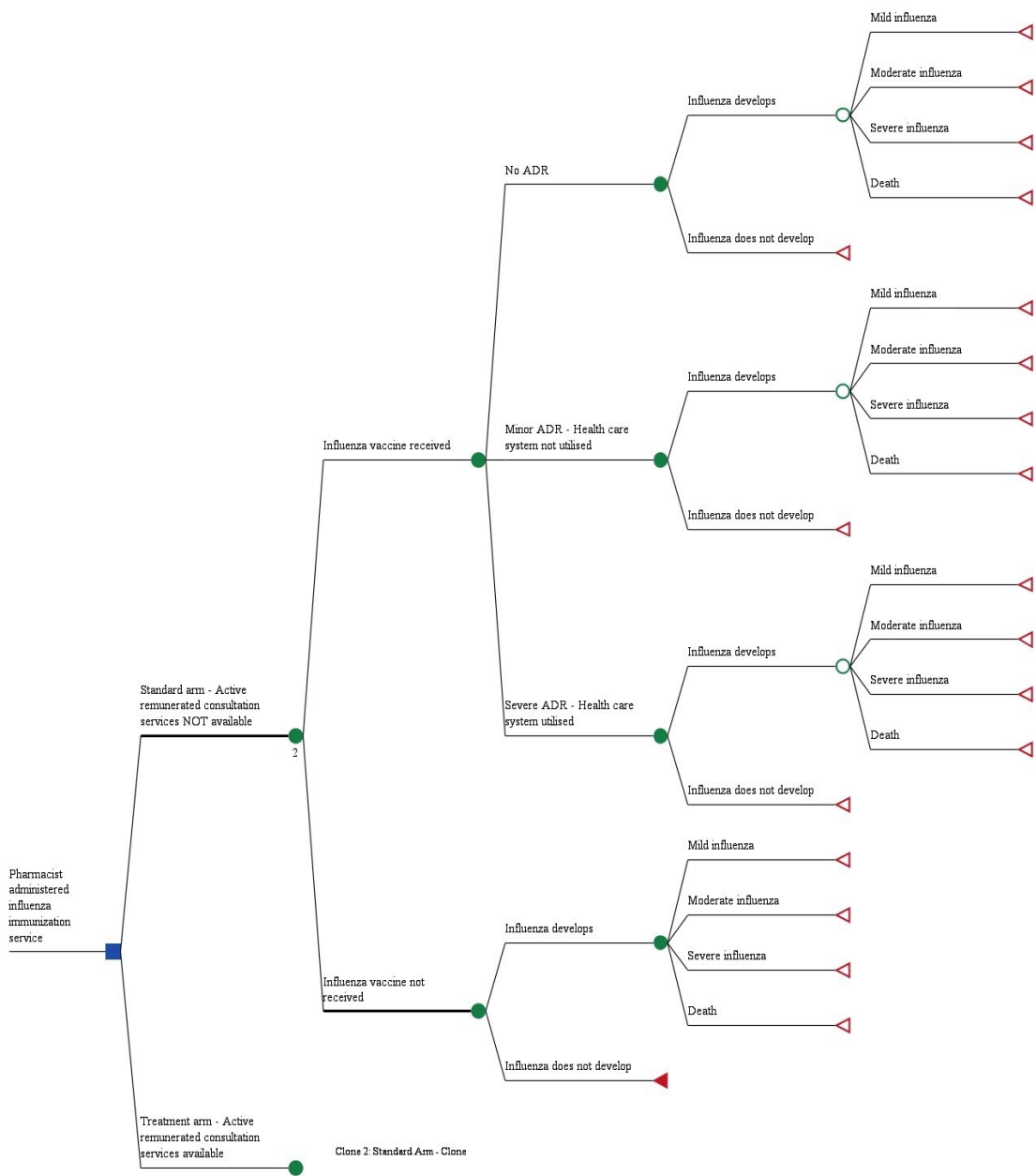


Figure 5-1. The decision model schematic

The Enhanced Care arm is identical in structure to the Standard Care arm.

5.4.2 Input data

a. Efficacy, safety and transition probabilities

The baseline estimate for the risk reduction offered by the influenza vaccine was obtained from a Cochrane meta-analysis that incorporated data from five randomized controlled trials.⁷² The vaccine uptake in the SC arm was estimated from the Canadian Community Health Survey data across seven influenza seasons (2007/08-2013/14).¹⁹³ The impact of patient education and facilitation activities by pharmacists on influenza vaccine uptake has been studied previously with demonstrated gains in uptake ranging from 4% to 26.3%.^{36,219-221} The EC strategy assumed a relatively conservative 8.7% incremental gain in vaccine uptake, obtained from a sufficiently powered, controlled, cluster randomized controlled trial assessing the impact of personalized pharmacist education on influenza vaccine uptake among community dwelling seniors aged ≥ 65 years in Tokyo, Japan.³⁵ The decision to choose this study over other available literature was based on similarities in study and population characteristics.

The probability of contracting influenza was obtained from the U.S. Centers for Disease Control and Prevention guidebook on influenza.⁶ The transition probabilities for severe influenza and death were estimated using data from Public Health Ontario's influenza surveillance summaries spanning five seasons (2012/13-2016/17).²²² The probabilities of developing moderate influenza and adverse drug reactions (ADRs) from the influenza vaccination were obtained from existing literature.^{223,224} Data on transition probabilities used in the analysis are presented in Table 5-1.

b. Costs

Costs for all resources were adjusted to 2017 Canadian Dollars using Statistics Canada's Consumer Price Index (health care component) for Ontario and Purchasing Power Parity where applicable.²²⁵ Costs for vaccination in the SC arm were calculated by adding the cost of vaccine and the professional fee for administration, available from existing literature.^{216,223} In addition, the EC arm included a consultation fee, which was set at CAD \$15. Provision of influenza vaccine consultations were considered comparable in terms of time, effort and documentation requirements to that of the Pharmaceutical Opinion Program in Ontario, a service currently offered by pharmacists and reimbursed at a rate of CAD \$15 by the Ontario MOHLTC.²¹⁶ This assumption was established by reaching consensus with practicing pharmacists and pharmacy practice researchers.

The EC arm also incorporated additional costs to account for: a) consultations that did not result in vaccinations (18.4% of all consultations)³⁵, and b) individuals who may receive the vaccine irrespective of a consultation, but choose to receive the consult anyway upon its availability (10% of baseline vaccine uptake). Both the adjustments stated above resulted in increased costs without contributing to additional vaccinations.

Costs for vaccination:

Standard Care arm = (Cost/dose + Professional fee for vaccine administration)

Enhanced Care arm = (Cost/dose + Professional fee for vaccine administration + (Number of consultations X Consultation fee) + Additional costs (Consults not resulting in vaccinations and vaccinations occurring regardless of consultations)).

Costs for physician office visits, hospitalizations and ED visits were obtained from existing literature.⁷⁹ Costs for influenza-related intensive care unit (ICU) admissions were obtained from the Canadian Institute for Health Information.^{226,227} Costs for influenza related deaths were assumed to be similar to the costs of ICU admissions, as death was considered to be a sequelae of severe influenza. Data on costs used in the analysis are presented in Table 5-1.

c. Utilities

Utility values were assigned for the occurrence of clinically relevant events (influenza and/or ADRs to the vaccination). Utility values were sourced from existing literature.^{79,228,229} Utility for severe influenza was assumed to be similar to the utility of community acquired pneumonia requiring hospitalization.²³⁰ Life expectancy was adjusted for baseline utility at a given age.⁷⁹ Minor ADRs included were transient, self-resolving, and did not require health professional intervention, such as fever, malaise, and soreness at the injection site. The utility score for minor ADRs was assumed to be 0.99, a value greater than mild/moderate influenza (0.9707),⁷⁹ but less than 1 (perfect health). Data on utility scores used for the analysis are presented in Table 5-1.

Table 5-1. Input parameters					
<u>Name</u>	<u>Base-case estimate</u>	<u>Range used in sensitivity analysis</u>		<u>Distribution used in PSA</u>	<u>Reference(s)</u>
		<u>Low</u>	<u>High</u>		
Age	65	65	110	^	-
Vaccine effectiveness	0.58	0.34	0.73	Normal	72
Costs[†]					
Consultation fee	\$ 15	\$ 10	\$ 20	Gamma	Assumed (based on ²¹⁶)
Death	\$ 17918.97	\$ 16127.073	\$ 19710.867	Gamma	Assumed (based on ^{226,227})
Mild Influenza	\$ 0	\$ 0	\$ 0	^	NA (As defined)
Physician office visit	\$ 40.90	\$ 21.03	\$ 70.11	^	79
ED Visit	\$ 257.07	\$ 213.8315	\$ 433.5054	^	79
No Influenza	\$ 0	\$ 0	\$ 0	^	NA (As defined)
Severe ADR	\$ 69349.77	\$ 57,346.25	\$ 81,353.29	Gamma	231
Severe Influenza	\$ 7499.293	\$ 2424.592	\$ 25178.37	Gamma	226,227
Influenza vaccine and administration	\$ 12.93	\$ 11.637	\$ 14.223	Gamma	223
Transition probabilities					
Occurrence of influenza	0.15	0.10	0.20	Beta	6,232
Physician Visit	0.0022521	0.002027	0.002477	Beta	223
ED Visit	0.0010134	0.000912	0.001115	Beta	223
Severe Influenza	0.00100760	0.000423	0.001108	Beta	222
Death	0.000101	0.000037	0.000162	Beta	222
Minor ADR	0.12605	0.102345	0.149068	Beta	224
Severe ADR	1.02927E-06	9.26E-07	1.13E-06	Beta	233
Influenza vaccine received - Standard Care arm	0.6671	0.65	0.68	Beta	193
Incremental vaccine uptake - Enhanced Care arm	0.087	0.033	0.141	Beta	35,219
Utilities					
Death	0	0	0	^	NA
Influenza	0.9707	0.9651	0.9767	^	79
Minor ADR	0.99	0.891	0.999	^	Assumed (based on ⁷⁹)
Severe ADR	0.5225	0.36	0.74	Beta	228
Severe influenza	0.7	0.63	0.77	Beta	Assumed (based on ²³⁰)
^Not included in PSA, [†] In 2017 Canadian dollars.					
Abbreviations: ADR, Adverse Drug Reaction; ED, Emergency Department; NA, Not Applicable; PSA, Probabilistic Sensitivity Analysis.					

5.4.3 Analysis

a. Validation

Face validation of the model structure was performed by a health economist. Face validation of the hypothesis formulation and input parameters were performed by 4 clinical experts, including pharmacy practice researchers and practicing pharmacists.

b. Base-case analysis and cost-benefit projections

The estimation of base-case cost-effectiveness was performed by conducting eight age-stratified analyses in five-year intervals (65-70 years to 100-105 years), where each analysis accounted for age dependent changes in life expectancy and baseline health utility. The results were scaled using 2018 Ontario census data²³⁴ to obtain an aggregate incremental cost-effectiveness ratio for all Ontario residents aged ≥ 65 years. The cost projection for the provincial MOHLTC was made by multiplying the consultation fee with the number of individuals estimated to receive the consultation.

c. Sensitivity analyses

Extensive univariate sensitivity analyses were conducted to test the effects of changing individual underlying assumptions and parameter values within the model. In addition, probabilistic sensitivity analyses were performed by conducting 10,000 iterations of second order Monte Carlo simulation. The analysis incorporated distributions for uncertainties related to vaccine efficacy, transition probabilities, costs, and utilities. Estimates for incremental costs, and QALYs were obtained by running the model using parameter values derived from probability

distributions. In the absence of uncertainty information, the analysis adopted a 10% deviation around parameters.

d. Threshold analyses

Multiple threshold analyses were conducted to determine the value of a parameter required to change the interpretation of the base-case result. This was based on the routinely employed willingness-to-pay (WTP) threshold in Canadian health technology assessments of CAD \$50,000/QALY.²³⁵

5.5 Results

5.5.1 Base-case analysis

The analysis modeled residents of Ontario, Canada aged 65 years to 105 years. The average costs in the SC arm was CAD \$14.63, compared to the EC arm at CAD \$16.66. The net additional costs of introducing the consultation service were CAD \$2.03/person over current practices. The EC arm was found to be only slightly more effective at 12.3243 QALYs than the SC arm at 12.3234 QALYs. The incremental cost per QALY gained for the EC arm relative to the SC arm was CAD \$2,087.25. The base-case results are presented in Table 5-2.

Age group	Population (Ontario, 2018) ¹⁹	Cost (\$)		QALY		ICUR (\$)
		EC arm	SC arm	EC arm	SC arm	
65 to 69 years	757,793	16.67	14.63	17.2233	17.2246	1493.44
70 to 74 years	613,928	16.67	14.63	13.7786	13.7797	1866.80
75 to 79 years	426,449	16.67	14.63	10.6965	10.6974	2404.69
80 to 84 years	302,369	16.67	14.63	7.6264	7.6270	3372.72
85 to 89 years	198,414	16.67	14.63	5.4349	5.4354	4732.69
90 to 94 years	94,793	16.67	14.63	3.6817	3.6820	6986.36
95 to 99 years	27,614	16.67	14.63	2.5421	2.5423	10118.17
100 to 105 years	3,458	16.67	14.63	1.7532	1.7533	14671.35
Weighted average:						
65 to 105 years	2,424,818	16.67	14.63	12.3234	12.3243	2087.25

Table 5-2. Base-case cost-effectiveness results

The EC strategy was estimated to prevent 2,407 cases of mild influenza, 48 cases of moderate influenza requiring physician/ED visits, 24 cases of severe influenza requiring hospitalization/ICU admission, and 3 influenza-related deaths over the SC arm per influenza season. The results of the clinical outcomes analysis are presented in Table 5-3. The additional costs incurred to the provincial MOHLTC to implement remunerated community-pharmacist consultation services were estimated to be CAD \$1.15million/year and the anticipated benefits included a cumulative gain of 507 QALYs/year.

Table 5-3. Clinical outcomes analysis			
	Number of cases per season (#/season)		
	<u>SC arm</u>	<u>EC arm</u>	<u>Net outcomes prevented</u>
Mild influenza	46603	44196	2407
Moderate influenza	1038	990	48
Severe influenza	350	318	24
Death	24	21	3

5.5.2 Threshold analysis

Threshold analysis was conducted assuming a WTP value of CAD \$50,000 per QALY gained. The SC arm was found to be the cost-effective alternative when: a) the additional gain in vaccine uptake as a result of consultations fell below 0.27%, b) the vaccine effectiveness dropped below 32.64%, c) the probability of contracting influenza was <7.68%, or d) when the cost of each consultation was over CAD \$451.

5.5.3 Deterministic sensitivity analysis

Model results were most sensitive to the efficacy of the influenza vaccine followed by the age of the patients. The Incremental Cost Utility Ratio was not found to breach the WTP threshold of CAD \$50,000/QALY in any of the tests. A tornado diagram summarizing results from the univariate sensitivity analysis is presented in Figure 5-2.

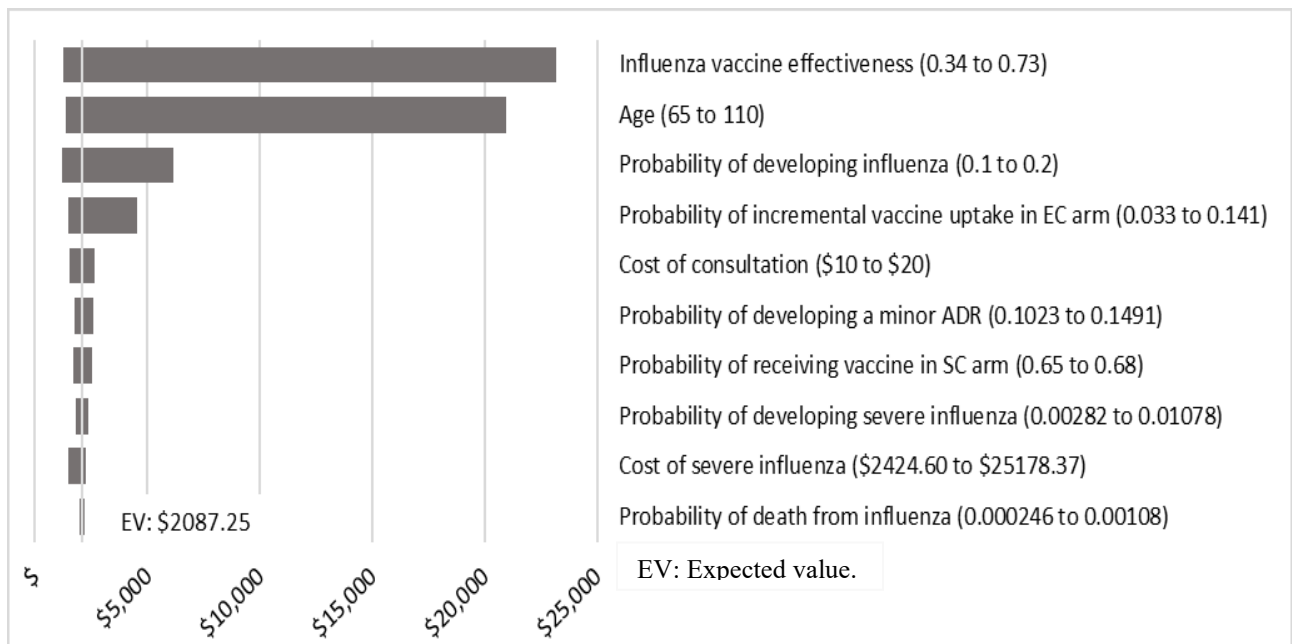


Figure 5-2. Tornado diagram presenting the relative significance of variables

This summary of the 1-way sensitivity analysis describes the impact of modifying individual parameter values on the base incremental cost-effectiveness ratio of the EC arm relative to the SC arm.

5.5.4 Probabilistic sensitivity analysis

The EC strategy was the optimal choice in 81.23% replications at a WTP value of \$5,000/QALY. At a WTP/QALY value of CAD \$10,000 and more, the probability of the cost-effectiveness of the two strategies compared plateaued. The cost-effectiveness acceptability curve is presented in Figure 5-3.

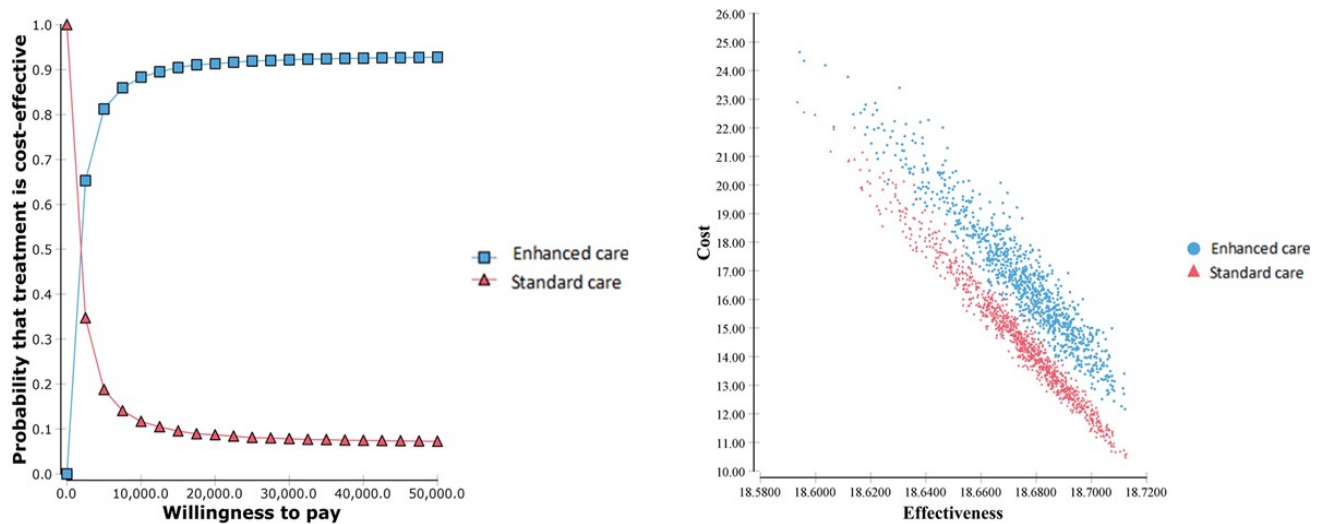


Figure 5-3. Probabilistic sensitivity analysis

Cost-effectiveness acceptability curve and scatter plot.

5.6 Discussion

Offering a remunerated community-pharmacist consultation service on influenza vaccination for Ontario seniors is expected to be both cost-effective and clinically effective, preventing an estimated 20 cases of severe influenza requiring hospitalization/ICU admission and 3 influenza related deaths per influenza season. Cost-effectiveness of the EC strategy was found robust across all sensitivity analyses, adding confidence to the interpretation of the base-case result. The results were most sensitive to the efficacy of the influenza vaccine, followed by age, which is explained by the decline in life expectancy with increasing age.

Currently, remuneration provided for publicly funded influenza immunizations in Ontario pharmacies is limited to a vaccine administration fee and does not include compensation to encourage engagement with those who may have questions about their decision to receive the vaccine. Ongoing research with community-pharmacists by our group suggests that despite having the knowledge, ability and confidence to impact a patient's vaccination decision, this lack of payment for time discussing patient concerns on vaccination is a significant barrier preventing such discussions from being initiated more widely.¹⁹⁹

As this is the first published pharmacoeconomic study evaluating the potential impact of a remunerated pharmacist consultation service on influenza vaccination, we are unable to directly compare our findings to other works. However, systematic reviews of economic analyses evaluating professional pharmacy services, such as patient education and consultation across varying settings, populations and health conditions, found such services to be generally cost-effective.^{236,237} A study evaluating the cost-effectiveness of pharmacist services (education,

consultation and/or prescribing) for managing hypertension in Canada determined the service as being simultaneously more effective and cost-saving relative to usual care.²³⁸ A 2011 cost-utility analysis in the United Kingdom identified one-on-one community pharmacist counselling as the choice strategy for smoking cessation when compared to group-based support or absence of additional external support.²³⁹ Consistent with our results, pharmacist delivered professional services in other contexts were routinely found to be cost-effective.

The results of this study should be interpreted with consideration of several limitations. Owing to the novel nature of the proposed intervention, estimates for incremental vaccine uptake in the EC arm were based on a Cluster-RCT conducted in Tokyo, Japan. Despite potential differences in socio-geographical contexts, similarities in baseline vaccine uptake rates, study population (community dwelling elderly aged 65 years and older); intervention (community pharmacist delivered in-person education on influenza vaccination); control (current practices); outcome and duration (increase in influenza vaccination rates over one-year) most resemble our proposed study intervention compared to other available literature.^{36,219-221} Further, sensitivity analyses incorporating a broad range and distribution of vaccine uptake in the EC arm did not change the base result. However, effectiveness data obtained following a controlled pilot study of the proposed intervention in Ontario may provide better estimation of the intervention effectiveness.

Although costs of some prescription medications for those ≥ 65 years in Ontario are covered by the provincial government, these costs were not incorporated into the analysis. Neuraminidase inhibitors Oseltamivir (Tamiflu®) and Zanamivir (Relenza®) used in the treatment of influenza are only covered for institutionalized seniors during confirmed outbreaks.²⁴⁰ Amantadine is

covered for all, but is not recommended for use due to high levels of resistance.^{240,241} Therefore, prescription drug costs borne by the provincial government excluded from this analysis are expected to be limited to drugs for symptomatic management and secondary bacterial infections. The exclusion of these costs is not expected to have a significant impact on the conclusions reached by this analysis, and only underestimates the cost-effectiveness of the EC strategy.

Data on hospitalizations and deaths were obtained from Public Health Ontario's influenza surveillance program. This data may not be complete as it primarily includes laboratory confirmed cases of influenza and cases that are coded specifically as influenza in patients' electronic health records. Several cases of influenza may be missed as laboratory confirmation is not always performed.

The complex and context specific nature of vaccine hesitancy, a prime contributor to poor vaccine uptake, necessitates the need to tailor messaging and communication to meet the specific needs of those expressing hesitancy. As such, the introduction of a standalone pharmacist-led consultation service on influenza vaccination would enable patients to freely discuss their concerns and receive information tailored specifically for them. Considering that healthcare professional recommendations are important predictors of vaccination decisions, the provision of a CAD \$15 fee, consistent with fees offered in Ontario for other professional opinion services, may encourage pharmacists to increasingly engage in these discussions with patients. Such engagement is ultimately anticipated to improve the population vaccination rate, while remaining cost-effective from the payer's perspective.

Expanding on this study, suitability of similar standalone fee-for-service consultations may be evaluated across other vaccines, target populations, providers or jurisdictions. Future research should consider the feasibility of implementing this service within the existing workflow of community pharmacies.

5.7 Conclusion

Community-pharmacist consultation services on influenza vaccination for Ontario seniors offers a cost-effective addition to current practices. Considering the positive impact of health professional recommendations on vaccination outcomes, policymakers should consider the humanistic and economic benefits achieved through the introduction of pharmacist-led consultation services on vaccination that are remunerated independent of any administration fees.

| Chapter 6

Summary, implications, and conclusion

6.1 Summary

Vaccinations are easily amongst the greatest achievements of the 20th century, yet, inadequate uptake of vaccination services continues to burden population health. From a socio-cultural context, a decision to vaccinate is complex and influenced by multiple factors that vary across time, place, vaccine and context.^{3,123,183} VH challenges the traditional dichotomy of perceiving vaccination decisions as mere outcomes of vaccine-acceptance (pro-vaxx) or vaccine-refusal (anti-vaxx). Instead, the phenomenon of VH describes vaccine decision making as a dynamic process wherein individuals transition across a spectrum of possible attitudes and behaviours ranging from complete acceptance to absolute refusal of all vaccines.^{3,96} Therefore, a vast majority of the individuals, in fact, lie somewhere along the ‘continuum’; accepting, delaying, or refusing some or all vaccines.

Despite such complexity in vaccine decision making, healthcare provider recommendations remain highly influential in positively swaying patient vaccine decisions.^{29-32,40,102} Their recommendations, education and advocacy form the current best predictor of positive vaccine outcomes.^{29-32,40,102} In addition to serving as a cue to action, provider recommendations can be acted upon immediately, bridging the behaviour-intention gap and sidestepping logistical barriers to immunization (ex. scheduling and making specific arrangements to get immunized).¹⁰² Further, provider recommendations, and their personal immunization serve to establish social norms, construing vaccination as the default, which may be of particular benefit to those

hesitant.¹⁰² As such, healthcare providers remain an indispensable asset in the global efforts to combat VH.

Although recent years have witnessed a surge in VH research and an increasing prominence of pharmacists as immunizers,^{32,33,40,96,98,101,184,193,242-246} no work has been done to examine the community pharmacists' preparedness or experiences with influenza VH. As such, our research presents some of the first work done on influenza VH in the community pharmacy space.

6.2 Main findings

The goal of this research was to establish a foundational understanding of community pharmacists' experiences with influenza VH. To achieve this primary objective, we utilized a mixed-methods approach incorporating an exploratory cross-sectional survey, followed by in-depth semi-structured interviews. Mixed-methods approach by virtue of its ability to gather robust data has been widely recommended,²⁴⁷⁻²⁵¹ and extensively utilized^{68,252-255} in healthcare research. The combined findings from the quantitative and qualitative studies inform a better theoretical understanding of the phenomenon under study.²⁵⁶ Considering the relative naivety of research on influenza VH in the pharmacy space, the exploratory survey provided an overview of current practices and attitudes of pharmacists with regards to influenza VH, and the interview component allowed further investigation into distinct observations.

In Chapter 3, we descriptively explored pharmacists' self-perceived knowledge, current attitudes and practices relating to influenza VH. Our results illustrated that pharmacists' self-rated knowledge of influenza disease and its vaccine, and their perceived confidence and ability to

identify, assess and address patient vaccine concerns were generally high. Interestingly, despite high prescription volumes, pharmacists' encounters with individuals expressing hesitancy were relatively infrequent and pharmacist-patient engagement on influenza vaccination appeared to be passive in nature and patient-driven. However, overarching stressors of workload and poor perceived remuneration, limiting pharmacists' engagement on influenza vaccine conversations do provide some context to understand this observation.

In Chapter 4, we continued to build on our findings, and sought to gain an in-depth understanding of the pharmacists' experiences with influenza VH and the modulators of their engagement with patients on the influenza vaccine. In addition to a *passive* style of engagement with patients, pharmacists appeared to hold a *binary outlook* to patient vaccination decisions, perceiving them as being static and an immutable dichotomy of either vaccine acceptors (pro-vaccine) or rejectors (anti-vaccine). We believe these two findings are inter-related as passive engagement, through insufficient interactions with those expressing hesitancy, contributes to a binary perception of patient vaccination decisions and vice-versa; thereby, completing and sustaining a feedback loop. In the context of limited resources, this loop is further compounded as vaccinations and vaccine conversations compete for the pharmacists' limited time. The implications of this 'passive engagement loop' includes infrequent interactions with those expressing hesitancy and thereby, fewer opportunities exist for pharmacists' to positively engage and nudge those expressing hesitancy along the VH continuum.

Having gained a better understanding of pharmacists' current preparedness and experiences with influenza VH, a natural progression for our research was to explore potential interventions

tailored to the community pharmacy setting. As the translation of evidence to practice in healthcare often involves changing the behaviour of one or more individuals, we examined our results from Chapter 3 and 4 through an implementation science lens. Using the COM-B behavioural model and the behaviour change wheel (BCW)²⁰⁶, we identified that targeting pharmacists' current behaviour of passive engagement and bolstering their motivation to proactively engage in vaccine conversations holds the most potential to address influenza VH in community pharmacies.

Using these principles, we proposed and designed a remunerated pharmacist consultation service on influenza vaccination for Ontario seniors, and evaluated its cost-effectiveness from a third-party public-payer perspective. The delivery of consultation services by community-pharmacists on influenza vaccination, billable at CAD \$15 were compared to current standard practices (absence of remunerated consultations). Our results determined pharmacists' influenza vaccine consultation services for seniors to be both cost-effective and clinically effective, preventing an estimated 2,407 cases of mild influenza, 20 cases of severe influenza requiring hospitalization and 3 influenza related deaths per influenza season, while only costing the public-payer an additional CAD \$2.03 per person over current practices. The complex and context specific nature of VH limits a 'one size fits all' approach to address it. The introduction of standalone pharmacist consultation services on influenza vaccine would enable patients to freely discuss their concerns and receive tailored information, thereby, positively influencing their vaccination outcome.

6.3 Implications for practice, policy and research

The work presented in this thesis provides data relevant to policymakers, healthcare providers, and the patients they care for. Community pharmacies offer an excellent proposition to identify and address influenza VH. The added convenience through the extended work hours, availability of walk-in immunization services, accessible locations and a high volume of patient foot-traffic provides multiple opportunities to identify, resolve and positively nudge those expressing hesitancy along the VH continuum. Existing research has described the demographic using Ontario pharmacy immunization services (younger, higher income quintile or non-immigrant) as being different from those immunized in physician offices (older, lower income quintile or those identifying as immigrant).²⁵⁷ As such, pharmacies can help target an important but difficult to reach group of healthy adults, who often tend to be caregivers for those at a higher risk. Therefore, community pharmacies provide a unique, yet complementary avenue for recognizing and addressing patient VH and positively impacting vaccine uptake.

Capitalizing on this opportunity, however, requires pharmacists to let go of the binary outlook to patient vaccine decisions and proactively engage with all patients on the influenza vaccine. The important, albeit unintended practice consequences of holding such binary perceptions include:

- Conflation of those hesitant with anti-vaxxers, thereby limiting engagement with patients who may in fact be influenced. Such conflation also leads to a diminished perception of pharmacists' self-perceived ability to influence patient vaccine decisions.

- Framing engagement with patients in a binary context (ex. Would you like to get an influenza vaccine today?), limiting possible responses to either acceptance or refusal, essentially negating the scope for a fruitful engagement.

Therefore, future research must explore means to improve the pharmacists' awareness on the spectrum of hesitancy, break the loop of passive engagement, and explore tools to assist pharmacists engage in quick and productive interactions with patients on the influenza vaccine.

In regard to VH, policymakers must recognize that while administration of vaccine may be the optimal outcome, it is not the only beneficial outcome. Positively nudging those expressing hesitancy along the VH continuum is arguably just as valuable. Recognizing and rewarding positive progress towards a goal has been established as important in other clinical areas such as weight loss, smoking cessation, and substance-abuse recovery, among others. However, the same approach has not been recognized for vaccine decisions.^{258,259} Perhaps, pharmacists' binary outlook to patient vaccine decisions may stem from the fact that remuneration to pharmacies for influenza immunization is directly tied to the act of administration, devoid of any incentivization to consult with patients. From a policymaker's perspective, the evidence on the cost-effectiveness of incentivizing pharmacists' time to consult with seniors on influenza vaccine supports the consideration of such services in Ontario. However, given the high heterogeneity between provinces in terms of legislation, pharmacists' scope of practice, and remuneration models, the generalizability of our findings remains unclear.^{93,258,259}

'In face of rising hesitancy and an increasingly interprofessional milieu of healthcare delivery, patient receipt of the vaccine is paramount, regardless of the provider.'

6.4 Conclusion

A key challenge of immunization lies not with the small vocal minority of outright vaccine refusers, but rather with those who are hesitant to vaccinate. When engaging with those hesitant, it is important for community pharmacists to move beyond the traditional assumption of binary vaccination outcomes, and instead focus on positively nudging those hesitant along the VH continuum. Facilitating optimal practice scope for pharmacists, and capitalizing the additional convenience and accessibility offered through the community pharmacy setting presents a promising means to address influenza VH. However, efforts must be reoriented to enhance pharmacists' motivation and opportunity to proactively engage with patients in one-on-one influenza vaccine conversations to best address influenza VH in the pharmacy.

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Appendix A

Survey - Ontario community pharmacists' knowledge, attitude and behaviour towards influenza vaccine hesitancy – An exploratory study

1. Do you currently practice at a community pharmacy in Ontario?

- Yes
- No

2. What degrees/certificates have you completed?

[Select all that apply]

- BSc Pharmacy
- Post-baccalaureate PharmD
- Entry-to-practice PharmD
- Masters in Pharmacy
- PhD in Pharmacy
- Residency
- Fellowship
- Other (please specify): _____

3. How many years have you practiced as a pharmacist in Ontario?

- Less than 5 years
- 5-10 years
- 11-15 years
- 16-20 years
- More than 20 years

4. Which of the following best describes you?

- Man
- Woman
- Other (e.g. Trans-gender): _____

5. What type of community pharmacy is your primary place of practice?

- Chain (more than 6 stores with one owner, e.g. PharmaPlus, Medical Pharmacy)
- Independent (one owner up to 6 stores)
- Franchise (e.g. Rexall, Medicine Shoppe)
- Banner (e.g. IDA, Guardian, Pharmasave)
- Mass merchandiser/Food store (e.g. Loblaws, Walmart)
- Other (please specify): _____

6. What is your current position at your primary place of practice?

[Select all that apply]

- Pharmacist - Manager
- Staff pharmacist - Full time (30 hours/week or more)
- Staff pharmacist - Part time (Less than 30 hours/week)
- Pharmacy owner
- Freelance/Relief pharmacist
- Other (please specify): _____

7. What are the first three digits of the postal code of your primary place of practice?

8. Which of the following best describes the area where your primary place of practice is located?

- Rural (population <1000 individuals)
- Small population centre (1000 to 29,999 individuals)

- Medium population centre (30,000 to 99,000 individuals)
- Large urban population centre (>100,000 individuals)

9. What is the average number of pharmacists that work in your primary place of practice during peak times?

- One
- Two
- Three
- Four or more

10. On average, how many prescriptions are filled at your pharmacy per day?

_____ Prescriptions filled per day

11. Is your community pharmacy currently involved with influenza immunizations?

- Yes, pharmacist(s) administer the vaccine
- Yes, nurses/nursing agencies contracted by the pharmacy administer the vaccine
- No current involvement, but planning to participate in the future
- No current involvement and no immediate plans for involvement in the future

12. Are you currently certified to administer vaccines?

- Yes
- No

[If certified to administer vaccines]

13. To how many individuals did YOU PERSONALLY ADMINISTER the influenza vaccine during the 2015-16 influenza season?

[If NOT certified to administer vaccines]

14. Are you planning to become certified to administer the influenza vaccine in Ontario?

- Yes
- No
- Not sure

15. In which of the following influenza seasons did YOU PERSONALLY RECEIVE the influenza vaccine? [Select all that apply]

- 2015-16
- 2014-15
- 2013-14
- I did not receive the influenza vaccine in any of the above seasons

[If influenza vaccine was received at least once in the preceding three seasons]

16. Please specify, which of the following best describe YOUR MOTIVATION(S) TO RECEIVE the influenza vaccine:

[Select all that apply]

- I am afraid of contracting influenza
- I have suffered from influenza in the past
- I believe influenza is a serious disease
- I believe that influenza vaccine will protect me from influenza
- I do not wish to transmit influenza to the patients I come in contact with
- I do not wish to transmit influenza to my family and friends
- I wish to protect my community by contributing to herd immunity
- It was encouraged by my employer
- It was required by my employer
- It was encouraged by my environment (e.g. colleagues, family, friends)
- It was influenced by media

Any other reason (please specify): _____

[If influenza vaccine was NOT received in the preceding three seasons]

17. Please specify, which of the following best describe YOUR RATIONALE FOR NOT RECEIVING the influenza vaccine:

[Select all that apply]

- I have never had seasonal influenza before
- I believe that seasonal influenza is not a serious disease
- My religious beliefs are against vaccinations
- I believe that acquiring immunity by contracting the disease is better than getting vaccinated
- I don't believe I am at risk for seasonal influenza
- I am concerned about vaccine side effects
- I am concerned about getting influenza from the vaccine
- I am skeptical about the effectiveness of the influenza vaccine
- I have suffered from vaccine related side effects in the past
- I have allergies to the influenza vaccine or components of the vaccine
- I believe I have acquired immunity due to the nature of my work
- I am afraid of needles
- I am skeptical about the long-term health effects of the vaccine
- Getting the vaccine is inconvenient
- I've had negative experience with immunizations before
- I have not thought about getting it
- Any other reason (please specify): _____
- I do not wish to specify

18. On a scale of 1 to 5, 1 being limited and 5 being expert, how would you rate your knowledge in each of the following:

	1	2	3	4	5
Pathophysiology	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pharmacotherapy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dosing and indications	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Formulations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Composition	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Interactions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pharmacology	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Adverse reactions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Contraindications	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[If certified to administer vaccines] Management of allergic reactions and adverse effects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vaccines and autism	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vaccine hesitancy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Annual influenza vaccine updates (e.g. strain match, new formulations, safety updates etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Communication frameworks to promote vaccinations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19. What does 'Vaccine hesitancy' mean to you? Someone is vaccine-hesitant when:

[Select all that apply]

- They do not trust the vaccine and immunization services
- They are accepting a vaccine while not being entirely convinced of its benefits
- They delay receiving the vaccine
- They refuse a vaccine
- They cannot get the vaccine due to an Insufficient vaccine supply and/or lack of trained personnel to administer the vaccine
- They've had negative experiences with immunizations in past
- They believe they have a low risk of contracting a vaccine preventable disease
- They've had an uncomfortable and/or inconvenient vaccination experience
- Others (please specify): _____

Comments: _____

20. In your experience, what percent of individuals make their decision to receive the influenza vaccine prior to meeting their health care professionals?

_____ %

21. Think back to a typical week during the 2015-16 influenza season. How often did you recommend the influenza vaccine?

- Never
- Rarely (1-24% of eligible individuals)
- Sometimes (25-49% of individuals)
- Frequently (50-74% of individuals)
- Always (75-100% of individuals)

22. Think back to a typical week during the 2015-16 influenza season. What percentage of your total vaccine recommendations were aimed at individuals with high risk of influenza-related complications (e.g. age \geq 65 years, individuals with cardiac/pulmonary disorders etc.)? _____ % total recommendations

[If certified to administer vaccines]

23. Based on your experience, what percentage of individuals getting the influenza vaccine at your community pharmacy come in asking for the service?

_____ % of individuals actively requesting vaccination at your pharmacy

24. On a scale from low to high, how would you rate your ability to influence an individual's decision to vaccinate?

25. Vaccine hesitancy as defined by the World Health Organization:

‘[a] delay in acceptance or refusal of vaccines despite availability of vaccination services.

Vaccine hesitancy is complex and context specific, varying across time, place and vaccines. It is influenced by factors such as complacency, convenience and confidence’

MacDonald NE, SAGE Working Group on Vaccine Hesitancy. Vaccine hesitancy:

Definition, scope and determinants. Vaccine. 2015;33(34):4161

To what degree does this definition align with your experience of vaccine hesitancy in the community pharmacy?

26. Drawing from your professional experience, how frequently do the following factors form the basis of vaccine hesitancy among individuals visiting your community pharmacy?

	1	2	3	4	5
Negative media coverage about vaccines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anti-vaccination movements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Religion/culture	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Politics/policies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Negative perception about the pharmaceutical industry	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bad personal experience with vaccination	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Negative experience of family, friends and acquaintances with the vaccine(s).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Concerns of pain with vaccine administration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personal beliefs and attitudes about health and prevention (e.g. maintenance of personal hygiene negates the need for vaccine)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Insufficient knowledge or misinformation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of trust or poor personal experience with the health system	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Poor perceived risk/benefit to the influenza vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Poor viral strain match	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Concerns of insufficient data on new vaccines and formulations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fear of vaccine associated adverse effects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Negative perception of pharmacist as the immunizer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Negative perception of pharmacy as a health care delivery setting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Need for annual re-vaccination with the influenza vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Long wait or inconvenient times to get the vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Others (please specify):	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

27. Now that you are acquainted with the idea of vaccine hesitancy, how many vaccine-hesitant individuals did you come across during a typical week of the 2015-16 influenza season?

[If certified to administer vaccines]

28. Upon engaging, what percent of vaccine-hesitant individuals received the influenza vaccine at your pharmacy?

_____ % of hesitant individuals receiving the vaccine at your pharmacy

[If NOT certified to administer vaccines]

29. Upon your encouragement, what percent of vaccine-hesitant individuals do you think, received the influenza vaccine?

_____ % of hesitant individuals receiving the vaccine

30. As a pharmacist, how important do you perceive your role in engaging with individuals hesitant about getting the influenza vaccine?

	Not important at all	Slightly important	Moderately important	Very important	Extremely important
Your role in engaging with vaccine hesitant individuals is	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

31. Which of the following have you used to address influenza vaccine hesitancy at your practice site? How effective are they?

[Grade their effectiveness from 1-5. 1 being not very effective and 5 being very effective]

	Utilization		Effectiveness				
	Yes	No	1	2	3	4	5
Provide information on safety of the influenza vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provide information on efficacy of the influenza vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use emotional appeal (e.g. protecting family, loved ones etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use the appeal of social responsibility (e.g. herd immunity, protecting those vulnerable etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Remind the benefits of vaccination and point out the risks of not immunizing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Correct vaccine related misinformation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Communication frameworks (e.g. ASK tool, NACI guidelines)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Promotional material including fact sheets, websites and other vaccination resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shared decision making	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Refer patient to other health professionals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Authoritative directions (e.g. strong professional recommendation)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Motivational interviewing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provide personal examples (own vaccination/ examples of vaccination-preventable diseases in practice)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[If certified to administer vaccines]

32. Have any of the following ever deterred you from making a vaccine recommendation? If yes, how often?

	Never	Rarely	Sometimes	Frequently	Always
Elderly patients with multiple co-morbidities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pregnant women	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Risk of ADRs from the influenza vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Insufficient information when recommending new formulations of the influenza vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personal beliefs on the safety, efficacy or need for vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of confidence in ability to provide vaccinations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of tools to promote influenza vaccinations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Risk of anaphylaxis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[If NOT certified to administer vaccines]

33. Have any of the following ever deterred you from making a vaccine recommendation? If yes, how often?

	Never	Rarely	Sometimes	Frequently	Always
Elderly patients with multiple co-morbidities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pregnant women	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Risk of ADRs from the influenza vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Insufficient information when recommending new formulations of the influenza vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personal beliefs on the safety, efficacy or need for vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of tools to promote influenza vaccinations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

34. From which of the following resources do you obtain most of the information you use when answering vaccine-related questions?

[Rank the options in decreasing order of preference, 1 being the most used source of information and 10 the least. Drag and drop the options to re-arrange. Click and move an option to begin ranking]

- _____ Peer reviewed articles
- _____ Print media
- _____ Social media and pharmacy blogs
- _____ Pharmacist listservs (e.g. Pharmacy Immunization-Net, CANAPS-L, APhA-ASP)
- _____ Colleagues
- _____ Compendium of Pharmaceuticals and Specialties (CPS)
- _____ Annual influenza guides (from PHAC, CDC WHO etc.)
- _____ Regulatory and professional body websites and newsletters (e.g. OPA, OCP)

_____ Online drug information resources (e.g. RxTx, UptoDate, Micromedex)

_____ Others (please specify):

35. How confident do you feel answering patron's questions about:

	1	2	3	4	5
Efficacy of the influenza vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Safety of the influenza vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Risk of contracting influenza	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anti-vaccine positions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vaccines causing autism	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[If certified to administer vaccines] Your professional competence in providing the vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[If certified to administer vaccines] Ability to manage adverse reactions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pharmacy being a retail space where vaccinations are promoted for financial gains	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collusion between government and pharmaceutical companies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other conspiracy theories	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[If certified to administer vaccines]

36. Thinking back to the previous influenza seasons, rate your ability in each of the following:

	1	2	3	4	5
Identify a vaccine hesitant individual	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determine the cause of hesitancy in such individuals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Engage in hesitancy related conversations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respond to patrons' vaccine hesitancy related concerns and beliefs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Administer the influenza vaccine in healthy adults	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Administer the influenza vaccine in special populations (e.g. pregnant women, elderly etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Manage anaphylactic reactions following vaccination	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[If NOT certified to administer vaccines]

37. Thinking back to the previous influenza seasons, rate your ability in each of the following:

	1	2	3	4	5
Identify a vaccine hesitant individual	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determine the cause of hesitancy in such individuals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Engage in hesitancy related conversations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Respond to patrons' vaccine hesitancy related concerns and beliefs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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[If certified to administer vaccines]

38. To what extent do each of the following form barriers to effective immunization service delivery in your community pharmacy?

	1	2	3	4	5
Time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of compensation to the immunizer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Regular workflow	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Privacy for patrons	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Current pharmacy staffing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Confidence in ability to administer vaccinations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Quality of available immunization training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of vaccine hesitancy support resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

39. If we were to design an initiative targeted at practicing community pharmacists to support them in effectively managing vaccine hesitancy, which of the following would best suit their needs?

[Rank the options in decreasing order of preference, 1 being the most preferred and 9 the least. Drag and drop the options to re-arrange. Click and move an option to begin ranking]

- _____ Communication frameworks
- _____ Online continuing education program
- _____ In-person regional workshop
- _____ E-game based learning
- _____ Promotional materials (e.g. vignettes, posters) for display in work-place
- _____ Education resources for the health care professional
- _____ Additional training on vaccine hesitancy incorporated into existing programs
- _____ Simulation based training
- _____ Others

Appendix B

Participant demographics in relation to the Ontario pharmacist population at large

Characteristics	Survey respondents n = 885 n (%)	Ontario pharmacists in 2016 N = 14,952 n (%)
Sex		
Male	190 (48.5%)	6,299 (42.1%)
Female	202 (51.5%)	8,653 (57.9%)
Location		
Rural	25 (2.9%)	969 (6.9%)
Urban	841 (97.1%)	13,106 (93.1%)
Position		
Pharmacy Owner/Manger	422 (48.2%)	4,232 (29.6%)
Staff pharmacist	447 (51.1%)	9,128 (63.9%)
Other		919 (6.4%)
Years of Practice		
0-10	107 (27.3%)	4,450 (29.8%)
11-20	84 (21.4%)	3,625 (24.2%)
>20	201 (51.3%)	6,877 (46.0%)

Reference:

1. Canadian Institute for Health Information. Pharmacists in Canada, 2016. December 2017. Available from https://secure.cihi.ca/free_products/PHARM-2016-data-tables-en-web.xlsx. Accessed December 6, 2019.

Appendix C

Semi structured interview guide

- Welcome and introduction
- Brief description of the purpose of study
- Guidance on questions and how to respond to them: open dialogue, no judgement on what is said.
- Assurance on data management: anonymity/confidentiality, data analysis and reporting.
- Consent (written or recorded)
- Respondent shares demographic data

Demographics

City/Town/Village of practice (name):

Gender: Male Female Gender queer

Injection trained?

Yes No

Received the influenza vaccine in 2015-16 influenza season?

Yes No

Volume of prescriptions filled at primary site of practice?

_____Rx/day

Workplace setup:

- Chain
- Independent
- Franchise
- Banner
- Mass merchandiser/Food store
- Other, please specify _____

Confirm for any additional queries before starting

Thank you for agreeing to this interview and completing the consent forms. As a reminder, the information that you share will remain confidential, there are no right answers and there shall be no judgement on what you say. Unless there are any questions, let's begin.

[Provide VH definition as a primer]

1. In general, thinking of vaccine hesitancy and your work-place, what are the first thoughts that come to your mind?

2. Do you come across vaccine hesitant individuals in your practice?

- Do you think it is important for the pharmacist to be concerned about vaccine hesitancy? (Why / Why not)

How involved are the pharmacists in the space of vaccine hesitancy? (Is it sufficient – Why/Why not)

3. What approaches that you have utilized to manage vaccine hesitant individuals?

- Are they effective?

4. Can you describe your most vivid experience with a vaccine hesitant individual at the pharmacy?

- Reasons stated

- Assessment of the individual?

- Approach taken

- Outcome

5. In your opinion what could be the role of the pharmacist when engaging with a hesitant individual at his/her workplace?

- What is working?

- What's not working?

6. If there were one or two key things (tools/approaches/resources/techniques/modifications) that could lead to improvement in your ability to better handle those hesitant, what would they be?

Closing

A. Is there anything you would like to add regarding the topics we have just discussed?

B. Any last questions regarding this research?

Debrief

Summarize the interview – provide chance for clarification/revision.

Reiterate use of data and anonymity.

Explain ways to access the final report, if interested.

Thank the pharmacist for time and consideration.

Appendix D
Semi structured interviews
Coding table

#	<u>Name</u>
1	Pharmacists in vaccination
1.1	<u>Advocates of pharmacist administered injection service</u>
1.1.1	Additional vaccinations
1.1.2	Convenience
1.1.3	Enhanced Rx-Pt. relationship
1.1.4	Pandemic preparedness
1.1.5	Win-win
1.2	<u>Critical of pharmacists' administered injection service</u>
1.2.1	Conflict of interest
1.2.2	Critical of UIIP
1.2.3	Inefficient
1.2.4	Poor implementation
1.2.5	Technical task
1.3	<u>Perceived role in immunizations</u>
1.3.1	Education
1.3.2	Enhancing public health
1.3.3	Increasing accessibility
1.3.4	Pandemic preparedness
1.4	<u>Vaccination delivery process</u>
2	Pharmacists' attitudes to influenza vaccine and vaccine hesitancy
2.1	<u>Attitudes towards vaccine hesitancy and those hesitant</u>
2.1.1	Dead end
2.1.2	Patient autonomy
2.1.3	Perceived severity
2.2	<u>Conflation of binary vaccine decision making</u>
2.3	<u>Meaning of hesitancy</u>
2.4	<u>Perceived impact on a hesitant individual's vaccination decision</u>
2.4.1	Open mind
2.4.2	Outcome
	Poor outcome
	Positive outcome
	Pre-made decision
2.5	<u>Perceived role in vaccine hesitancy</u>
2.5.1	Opportunity

- 2.5.2 Patient education
- 2.5.3 Self-preparedness
- 2.6 Perception of vaccine hesitancy continuum
- 2.6.1 Continuum in practice
- 2.6.2 Outcome
- 2.6.3 Role of multiple HCPs
- 2.6.4 Types of vaccination decisions
- 2.7 Personal influenza vaccine attitudes
- 2.7.1 Vaccine adopters
- 2.7.2 Vaccine hesitant
 - Credibility of information
- 3 **Pharmacists' experience of influenza vaccine hesitancy**
- 3.1 Description of a vaccine hesitant
- 3.2 Experience anecdotes
- 3.2.1 Anecdote - Negative outcome
- 3.2.2 Anecdote - Positive outcome
- 3.3 Frequency of vaccine hesitancy
- 3.4 Pharmacists' experience of vaccine hesitancy
- 3.5 Reasons for vaccine hesitancy
- 3.5.1 Reasons for vaccine hesitancy - Other HCPs
- 3.5.2 Reasons for vaccine hesitancy - Patrons
 - Complacency
 - Fear of needles
 - Foreign agents
 - Misinformation
 - Influenza from vaccine
 - Religion
 - Seeking info.
 - Willingness to pay - NOT INFLUENZA
- 4 **Patient engagement on influenza vaccinations**
- 4.1 Business aspect
- 4.2 Engagement style
- 4.3 Passive engagement
- 4.4 Rx-Pt relationship
- 4.5 Technicality of engagement
- 5 **Addressing influenza vaccine hesitancy at the community pharmacy**
- 5.1 Barriers
- 5.1.1 Barrier - Impact of corporates
 - Push for 'walk-in'
 - Volume

- 5.1.2 Barrier - Pharmacy specific
 - Competing with other HCPs
 - Existing workflow
 - Manpower
 - Not barriers - Space and Privacy
 - Space
 - Time
- 5.1.3 Barrier - Remuneration
 - Compared to other HCPs
 - Immunization - Loss maker
 - Pay for pharmacist
- 5.1.4 Barriers - System, policy or regulatory
 - Contradicting info.
 - Paperwork
 - Stock
- 5.2 Current strategies
- 5.2.1 Engagement
- 5.2.2 Patient education
- 5.2.5 Personal anecdote
- 5.2.4 Promotional communication
- 5.2.5 Self-reflection
- 5.2.6 Social protection - Guilt
- 5.3 Proposed strategies
- 5.3.1 Communication tools
- 5.3.2 Education for pharmacist
- 5.3.3 Fiscal incentive
- 5.3.4 Improved product access - Pre-filled syringes
- 5.3.5 Proactive patient engagement
- 5.3.6 Resource provision - Manpower
- 5.3.7 Vaccine info. & promotion material
- 5.4 Promoters for engagement in vaccinations
- 5.4.1 Additional training
- 5.4.2 Manpower
- 5.4.3 Patient satisfaction
- 5.4.4 Remuneration
- 5.4.5 Time
- 5.4.6 Tools

Appendix E

Survey - Participant recruitment mail



UNIVERSITY OF WATERLOO
FACULTY OF SCIENCE
School of Pharmacy

Dear Pharmacist,

You are being contacted as you have previously indicated interest in participation in research purposes to OCP. The Ontario Pharmacist Research Collaboration (OPEN) is conducting a study to understand the knowledge, attitude and behaviour of community pharmacists towards influenza vaccine hesitancy in Ontario. OPEN has signed a data use agreement with OCP that enables researchers to contact potential participants through e-mail. The information from this study will help the investigators to provide recommendations and inform the development of tailored tools to address influenza vaccine hesitancy in the community pharmacy.

In order to accomplish this, we are requesting your participation in an **anonymous online survey**, wherein you will not be asked for your name or any identifying information. This survey, intended for practicing community pharmacists of Ontario will take approximately **15-20 minutes** to complete. It will contain questions of general demographics (your professional/site of practice characteristics), followed by your experience of influenza vaccine hesitancy at the community pharmacy.

By clicking the link below, you will find a document that will inform you of your rights as a participant. Upon reviewing this information and providing consent, you will be redirected to the survey.

[*Survey link*](#)

Should you have any questions concerning the study, or have any problems accessing or completing it, please feel free to contact Gokul Raj Pullagura at 519-573-4040 (ext. 21371); grpullag@uwaterloo.ca or Nancy Waite at 519-888-4484; nmwaite@uwaterloo.ca.

We sincerely thank you for considering participation and appreciate the value of your time.

Warm regards,

Study investigators:

Gokul Raj Pullagura, PharmD
MSc. Candidate,
Ontario Pharmacy Research Collaboration (OPEN),
School of Pharmacy,
University of Waterloo

Dr. Nancy Waite, PharmD, FCCP
Professor,
Co-lead OPEN program,
School of Pharmacy,
University of Waterloo

Appendix F

Survey - Participant information and consent letter



Title of the study:

Ontario community pharmacists' knowledge, attitude and behaviour towards influenza vaccine hesitancy – An exploratory study

You are invited to participate in a research study conducted by Gokul Raj Pullagura for a Master's degree through the Ontario Pharmacist Research Collaboration (OPEN). OPEN is a multi-institutional research program funded by the government of Ontario that spans 4 universities and one research institution. The objectives of this research study are *to explore Ontario pharmacist's experience of influenza vaccine hesitancy at the community pharmacy*.

This survey, intended for practicing community pharmacists of Ontario will take approximately **15-20 minutes** to complete. Your participation is voluntary and you may decline to answer any questions or withdraw your participation at any time. There are no known or anticipated risks from participating in this study. The survey begins with demographic questions including details of your qualifications, and location of practice. The subsequent sections focus on your experience with influenza vaccine hesitancy at the community pharmacy.

It is important for you to know that any **information that you provide will be confidential and anonymous**, such that no name or identifying information shall be collected. All of the data will be summarized and no individual responses will be identifiable from these aggregate results.

Although all efforts will be maintained, confidentiality may not be guaranteed when information is transmitted over the internet. University of Waterloo practices are to turn off functions that collect

machine identifiers such as IP addresses. The host of the system collecting the data such as Qualtrics™ may collect this information without our knowledge and make it accessible to us. Such information will not be used or saved without your consent. If you prefer not to submit your survey responses through this host, please contact one of the researchers (information provided below) so you can participate using an alternative method such as an e-mail or paper-based questionnaire. The alternate method may decrease anonymity but confidentiality will be maintained.

The data collected from this study will be maintained on a password-protected computer database in a restricted access area of the university. As well, the data will be electronically archived after completion of the study and maintained for seven years and then erased.

Should you have any questions about the study, please contact either *Gokul Raj Pullagura* (grpullag@uwaterloo.ca) or *Nancy Waite* (nmwaite@uwaterloo.ca). Further, if you would like to receive a copy of the results of this study, please contact either investigator.

I would like to assure you that this study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee. However, the final decision about participation is yours. If you have any comments or concerns resulting from your participation in this study, please contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567, ext. 36005 or ore-ceo@uwaterloo.ca.

Thank you for considering participation in this study.

With full knowledge of all foregoing, I agree, of my own free will, to participate in this study.

- I agree to participate

- I do not wish to participate (you may close your web browser now)

Appendix G

Survey - Participant thank you letter



Dear Pharmacist,

We would like to thank you for your participation in this study titled *Ontario community pharmacists' knowledge, attitude and behaviour towards influenza vaccine hesitancy – An exploratory study*.

As a reminder, the purpose of this study is to investigate the community pharmacists' experience and perception of influenza vaccine hesitancy in regular practice.

The data collected during the survey will contribute to a better understanding of the manifestation of vaccine hesitancy in the community pharmacy and shall help comprehend your needs to better address this issue in regular practice. Thereby, enabling a better and practical immunization service delivery that meets your requirements.

Please remember that any data pertaining to you as an individual participant is anonymous and kept confidential. Once data is collected and analyzed, the aggregate information will be shared with the research community through seminar(s), conference(s), presentation(s), and journal article(s). If you are interested in receiving more information regarding the results of this study, or would like a summary of the results, please reach out to a study investigator and when the results become available (anticipated by Spring 2017), the information shall be sent to you. In the meanwhile, if you have any questions about the study, please do not hesitate to contact the researcher by email or telephone (contact information provided below). As with all University of Waterloo projects involving human participants, this project was reviewed by, and received ethics clearance through a University of Waterloo Research Ethics Committee. Should you have any comments or concerns resulting from your participation in this study, please contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567, ext. 36005 or ore-ceo@uwaterloo.ca.

Regards,

Gokul Raj Pullagura, PharmD

MSc. Candidate,
School of Pharmacy,
University of Waterloo,
gpullag@uwaterloo.ca;
(519)-888-4567 Ext. 21371

Dr. Nancy Waite, PharmD, FCCP

Professor,
School of Pharmacy,
University of Waterloo,
nmwaite@uwaterloo.ca
(519)-888-4485

Appendix H

Interview - Interest form



UNIVERSITY OF WATERLOO
FACULTY OF SCIENCE
School of Pharmacy

Interview interest form

Ontario community pharmacists' knowledge, attitude and behaviour towards influenza vaccine hesitancy – An exploratory study

All responses on this form are completely detached and cannot be linked back to your survey

Name:

E-mail address:

Telephone number:

A study researcher will contact you soon to confirm your interest and set-up the interview date, time and location.

Appendix I

Survey – Reminder email



Dear Pharmacist,

This is a gentle reminder requesting your participation in a research study being conducted by the Ontario Pharmacy Research Collaboration (OPEN) that aims to explore your experience with influenza vaccine hesitancy at the community pharmacy and identify your requirements for the development of tailored tools to address this issue.

[Please note: If you have already started the survey, you may resume it from the point of last complete response by clicking the link below]

You are being contacted as you have previously indicated interest in participation in research purposes to OCP. OPEN has signed a data use agreement with OCP that enables researchers to contact potential participants through e-mail. The information from this study will help us to provide recommendations and inform the development of tailored tools to address influenza vaccine hesitancy in the community pharmacy.

In order to accomplish this, we are requesting your participation in an **anonymous online survey**, wherein you will not be asked for your name or any identifying information. This survey, intended for practicing community pharmacists of Ontario will take approximately **10-15 minutes** to complete. It will contain questions on general demographics (your professional/site of practice characteristics), followed by your experience of influenza vaccine hesitancy at the community pharmacy.

By clicking the link below, you will find a document that will inform you of your rights as a participant. Upon reviewing this information and providing consent, you will be redirected to the survey.

Follow this link to the Survey:

Or copy and paste the URL below into your internet browser:

[*Survey link*](#)

Should you have any questions concerning the study, or have any problems accessing or completing it, please feel free to contact Gokul Raj Pullagura at 519-573-4040 (ext. 21371); grpullag@uwaterloo.ca or Nancy Waite at 519-888-4484; nmwaite@uwaterloo.ca.

We sincerely thank you for considering participation and appreciate the value of your time.

Warm regards,

Nancy Waite, PharmD, FCCP

Associate Director, Clinical Education,
Ontario College of Pharmacists Professor in Pharmacy Innovation,
Professor, School of Pharmacy,
University of Waterloo

Gokul Raj Pullagura, PharmD

MSc. Candidate,
Ontario Pharmacy Research Collaboration (OPEN),
School of Pharmacy,
University of Waterloo

Appendix J

Interview - Participant information package



Title of the study: Ontario community pharmacists' knowledge, attitude and behaviour towards influenza vaccine hesitancy – An exploratory study

Dear Pharmacist,

We at the Ontario Pharmacist Research Collaboration (OPEN) are conducting a research to understand influenza vaccine hesitancy at the community pharmacy. The goal of the study is to comprehend influenza vaccine hesitancy from the community pharmacists' perspective and identify their requirements for the development of tailored tools to address this issue.

Despite provision of free and accessible influenza vaccine to the public of Ontario, vaccine coverage has remained below target. Vaccine hesitancy has been identified as a barrier to vaccine uptake, however, very little is known about its manifestation in a community pharmacy. This study will try to explore and understand the factors that drive and differentiate influenza vaccine hesitancy at a community pharmacy setting. Researchers will produce recommendations that could potentially, utilizing the participants' input result in an improved pharmacist-patient engagement and outcomes on influenza vaccine hesitancy at the community pharmacy.

If you agree, you will be asked to participate in a one-time interview that will take approximately 25-30 minutes of your time. However, you should feel free to end the interview at any time you choose. As well, you may not feel obligated to answer any question that you prefer not to and may indicate that you do not wish to respond to a question at any time. If you choose to answer, brief demographic information such as location of practice, gender, workplace setup etc. shall be collected alongside the interview. With your permission, the interview will be digitally audio recorded to facilitate collection of information, and

transcription at a later stage for analysis. All information you provide is considered completely confidential. Your name will not appear in any reports resulting from this study, however, with your permission anonymous quotations may be used. The digital audio file of your interview will be in a password protected computer accessible only to authorized personnel. If you would like to receive a copy of the report, please indicate this to the researcher and you will be forwarded one upon completion of the study.

This project has been reviewed by, and received ethics clearance through a University of Waterloo Research Ethics Committee. If you have any comments or concerns resulting from your participation in this study, please contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567, ext. 36005 or ore-ceo@uwaterloo.ca.

Thank you for your willingness to share your experience and expertise. Your inputs help us learn more about influenza vaccine hesitancy at community pharmacies in Ontario. If you have further questions or concerns about the present research assignment, please feel free to contact *Gokul Raj Pullagura* (grpullag@uwaterloo.ca) or *Nancy Waite* (nmwaite.uwaterloo.ca).

Sincerely,

Gokul Raj Pullagura, PharmD
MSc. Candidate,
Ontario Pharmacy Research Collaboration (OPEN),
School of Pharmacy,
University of Waterloo

Dr. Nancy Waite, PharmD, FCCP
Professor,
Co-lead OPEN program,
School of Pharmacy,
University of Waterloo

Appendix K

Interview – Consent forms



Written consent of participation

By signing this consent form, you are not waiving your legal rights or releasing the investigator(s) or involved institution(s) from their legal and professional responsibilities.

I have read the information presented in the information letter about a research study titled 'Ontario community pharmacists knowledge, attitude and behaviour towards influenza vaccine hesitancy – An exploratory study', being conducted by Gokul Raj Pullagura under the supervision of Dr. Nancy Waite of the School of Pharmacy at the University of Waterloo. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions related to this study, to receive satisfactory answers to my questions, and any additional details I wanted. I am aware that I may withdraw from the study without penalty at any time by advising the researchers of this decision.

I am aware that I have the option of allowing my interview to be audio recorded to ensure an accurate recording of my responses.

I am also aware that excerpts from the interview may be included in the thesis and/or publications to come from this research, with the understanding that the quotations will be anonymous.

I was informed that I may withdraw my consent at any time without penalty by advising the researcher.

This project has been reviewed by, and received ethics clearance through a University of Waterloo research ethics committee. I was informed that any comments or concerns resulting from my participation in this study can be directed to the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567, ext. 36005 or [ore-ceo@uwaterloo.ca](mailto:ceo@uwaterloo.ca)

With full knowledge of all foregoing:

Do you agree, of your own free will, to participate in this study?

YES NO

Do you agree to have your interview audio recorded?

YES NO

Do you agree to the use of anonymous quotations in any academic poster, presentation or publication that comes out of this research?

YES NO

Print name

Date and location: _____

Signature of the participant

Witnessed: _____



Verbal consent of participation

By indicating your consent, you are not waiving your legal rights or releasing the investigator(s) or involved institution(s) from their legal and professional responsibilities.

I have been presented with information about a research study titled ‘Ontario community pharmacists knowledge, attitude and behaviour towards influenza vaccine hesitancy – An exploratory study’, being conducted by Gokul Raj Pullagura under the supervision of Dr. Nancy Waite of the School of Pharmacy at the University of Waterloo. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions related to this study, to receive satisfactory answers to my questions, and any additional details I wanted. I am aware that I may withdraw from the study without penalty at any time by advising the researchers of this decision.

I am aware that I have the option of allowing my interview to be audio recorded to ensure an accurate recording of my responses.

I have been informed that excerpts from the interview may be included in the thesis and/or publications to come from this research, with the understanding that the quotations will be anonymous.

I have been informed that I may withdraw my consent at any time without penalty by advising the researcher.

I have been informed that this project has been reviewed by, and received ethics clearance through a University of Waterloo research ethics committee. I have also been informed that any comments or concerns resulting from my participation in this study can be directed to the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567, ext. 36005 or ore-ceo@uwaterloo.ca

With full knowledge of all foregoing:

Do you agree, of your own free will, to participate in this study?

YES NO

Do you agree to have your interview audio recorded?

YES NO

Do you agree to the use of anonymous quotations in any academic poster, presentation or publication that comes out of this research?

YES NO

Please state the following:

 First and last name
 Date and location: _____
 Time: _____

 Signature of the person obtaining consent

Appendix L

Interview - Participant thank you letter



Dear Pharmacist,

We would like to thank you for your participation in this study titled *Ontario community pharmacists' knowledge, attitude and behaviour towards influenza vaccine hesitancy – An exploratory study*.

As a reminder, the purpose of this study is to investigate the community pharmacists' experience and perception of influenza vaccine hesitancy in regular practice.

The data collected during the interview will contribute to a better understanding of the manifestation of vaccine hesitancy in the community pharmacy and shall help comprehend your needs to better address this issue in regular practice. Thereby, enabling a better and practical immunization service delivery that meets your requirements.

Please remember that any data pertaining to you as an individual participant will be kept confidential. Once data is collected and analyzed, the information will be shared with the research community through seminar(s), conference(s), presentation(s), and journal article(s). If you are interested in receiving more information regarding the results of this study, or would like a summary of the results, please reach out to a study investigator and when the results become available (anticipated by Spring 2017), the information shall be sent to you. In the meanwhile, if you have any questions about the study, please do not hesitate to contact the researcher by email or telephone (contact information provided below). As with all University of Waterloo projects involving human participants, this project was reviewed by, and received ethics clearance through a University of Waterloo Research Ethics Committee. If you have any comments or concerns resulting from your participation in this study, please contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567, ext. 36005 or ore-ceo@uwaterloo.ca.

Regards,

Gokul Raj Pullagura, PharmD

MSc. Candidate,
School of Pharmacy,
University of Waterloo
gpullag@uwaterloo.ca
(519)-888-4567 Ext21371

Dr. Nancy Waite, PharmD, FCCP

Professor,
School of Pharmacy,
University of Waterloo
nmwaite@uwaterloo.ca
(519)-888-4485