ATTITUDES TOWARDS INFLUENZA VACCINATION DURING "WAIT TIMES" IN THE EMERGENCY DEPARTMENT

by

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Abstract

Influenza is a burdensome and preventable infectious disease. Lack of time was the reported reason 15% of Canadians did not receive their influenza vaccine in 2016/2017. Meanwhile, emergency department (ED) wait times are escalating. Offering the influenza vaccine during ED wait times could improve ease of access. The following cross-sectional study aimed to gauge public interest, health care provider (HCP) support, perceived barriers and facilitators to influenza vaccine availability at the Queen Elizabeth II Health Sciences Centre (QEII) ED in Halifax, NS. Anonymous questionnaires were completed by a convenience sample of low-acuity adult clients (n=150) and a convenience sample of ED nurses, physicians, and paramedics (n=82). Of the unvaccinated clients, 34.6% were willing to be vaccinated in the ED. Among HCPs, 82% support ED vaccination if time and resources were unlimited. However, this study revealed additional barriers that need to be addressed to effectively launch such a program.

List of Abbreviations Used

ACP	Advanced care paramedic
ADEM	Academic Department of Emergency Medicine
AMMI	Association of Medical Microbiology and Infectious Disease Canada
BC	British Columbia
CAEP	Canadian Association of Emergency Physicians
CCHS	Canadian Community Health Survey
CDC	Centers for Disease Control and Prevention
CIHI	Canadian Institute for Health Information
COPD	Chronic obstructive pulmonary disease
CTAS	Canadian Triage and Acuity Scale
DPC	Data processing clerk
ED	Emergency department
EDIS	Emergency department information system
EP	Emergency physician
FP	Family physician
H	Hemagglutinin
HBM	Health belief model
HCP	Health care provider
ICU	Intensive care unit
ISAR	Identification of Seniors At Risk
IWK	Izaak Walton Killam Health Centre
JGH	Mortimer B. Davis Jewish General Hospital
LAIV	Live-attenuated vaccine

LTC	Long term care
LWBS	Left without being seen
Man.	Manitoba
MD	Medical Doctor (Latin: *Medicinae Doctor*)
N	Neuraminidase
NACI	National Advisory Committee on Immunization
NAI	Neuraminidase inhibitors
NB	New Brunswick
NHSA	Nova Scotia Health Authority
NIICS	National Influenza Immunization Coverage Survey
NP	Nurse practitioner
NS	Nova Scotia
NSDHW	Nova Scotia Department of Health and Wellness
Nu	Nunavut
NWT	Northwest Territories
NYGH	North York General Hospital
Ont.	Ontario
PACV	Parental Attitudes About Childhood Vaccinations
PARiHS	Promoting Action on Research Implementation in Health Services
PES	Psychiatric Emergency Services
PGRH	Prince George Regional Hospital
PHAC	Public Health Agency of Canada
PIA	Physician Initial Assessment

QEII	Queen Elizabeth II Health Sciences Centre
QIV	Quadravalent vaccine
Que.	Quebec
RA	Research assistant
RAU	Rapid assessment unit
SIVCCS	Seasonal Influenza Vaccine Coverage in Canada Survey
TD	Tetanus, diphtheria vaccine
Tdap	Tetanus, diphtheria, pertussis vaccine
TIV	Trivalent vaccine
US	United States of America
VGH	Vancouver General Hospital

Glossary

Adaptive immunity	The human body's pathogen-specific defense system
Antibodies	Proteins created by the adaptive immune system to recognize antigens
Antigen	Something that causes the body's immune system to react
Endocytosis	A method of bringing molecules into a cell in which the cell's membrane envelopes the molecule to bring it into the cell
FluWatch	Canada's national tracking system for influenza and influenza-like illness
Hemagglutinin	A surface protein on influenza viruses
Herd immunity	Population level immunity to a particular disease sufficient to prevent transmission even to those who are not personally immune to said disease
Identification of seniors at risk (ISAR) tool	A screening tool for assessing older adult risk factors
Influenza-associated death/hospitalization	Cases of deaths or hospitalization in which the patient had a laboratory-confirmed case of influenza irrespective of whether influenza was the cause of the death or hospitalization
Innate immunity	The human body's non-specific defense system against pathogens
Live-attenuated vaccine	A vaccine that contains a live virus that can replicate but not cause illness
Medical directive	A type of order in which a controlled act, such as giving a particular medication or drawing certain blood work, is delegated in a particular situation
Minor treatment record	An alternate form used by nurses and paramedics to document their assessment and care of ED clients with minor injuries and illnesses not necessitating the same level of detail as the nursing note

Neuraminidase	A surface protein on influenza viruses
Neuraminidase inhibitors	A class of antiviral medications used to prevent and treat influenza
Nursing note	A component of an ED client's medical record on which nursing staff chart their primary assessment of an ED client, their vital signs, fluid intake and output, etc. Nurses currently screen QEII ED patients for allergies, falls risk status and acute mental health concerns (i.e. thoughts of self-harm/suicide) on this chart
Physician initial assessment	The time at which a physician first assesses a patient
Physician note	A component of an ED client's medical record on which physicians, residents and clinical clerks chart their primary assessment of a client's condition, ongoing assessment and orders for patient care. It also contains a paper copy of the triage note, the date of the patient's last QEII ED visit and the number of visits in the preceding year
Physician order	Instructions from a physician to other health care providers (i.e. nurses, paramedics) regarding what kind of care to provide (i.e. medications that must be administered, blood tests, etc.)
Pre-printed order	A form on which orders that may be applicable to a certain clinical condition are pre-written for a physician or nurse practitioner to order as appropriate for a particular patient
Quadrivalent influenza vaccine	An inactivated vaccine that contains 4 inactive strands of influenza (2 Influenza A strands, 2 influenza B strands)
Respiratory Watch	Nova Scotia's provincial tracking system for influenza and influenza-like illness
Standard precautions	A set of health care precautions implemented to decrease the risk of infectious disease transmission via contact
Triage	The process of sorting patients by the severity of their clinical condition in emergency situations
Triage note	An electronic component of an ED client's medical record stored on EDIS in which the patient's reason for presenting to the emergency

	department, initial vital signs and condition are recorded.
Trivalent influenza vaccine	An inactivated vaccine that contains 3 inactive strands of influenza (2 Influenza A strands, 1 influenza B strand)

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Chapter 1: Introduction

1.1 Background

Influenza is one of several viral illnesses known to cause upper respiratory symptoms, such as a cough, sore throat, and sinus congestion. These illnesses are commonly transmitted in Canada during the fall and winter seasons (National Advisory Committee on Immunization [NACI], 2017). In many clinical presentations, influenza infection can be distinguished from more minor illnesses like the common cold by the presentation of: a sudden onset of high fever, headache, muscle aches, weakness/extreme fatigue, and chest discomfort (Public Health Agency of Canada [PHAC], 2017). Estimates of latency and infectious periods vary. Generally, once a person is exposed to the virus, symptoms will manifest after an average of 1.4 days and that person will remain infectious for up to 3 days thereafter (Cori et al., 2012). For most healthy (i.e. non-high risk) individuals, symptoms last 7-10 days (NACI, 2017).

In addition to the primary symptoms of influenza, infection can lead to pneumonia (NACI, 2017). Influenza can also exacerbate chronic health conditions, such as chronic obstructive pulmonary disease (COPD) and asthma (Rothberg & Haessler, 2010). These complications may further lead to hospitalization and even death (Rothberg & Haessler, 2010). Combined, influenza and pneumonia are among the top ten leading causes of deaths for Canadians of all ages (Statistics Canada, 2019). The 2017/2018 influenza season involved 64,403 laboratory-confirmed cases of influenza and 5,176 influenza-associated hospitalizations (PHAC, 2018b). According to the NACI people considered to be at highest risk of complications include: people who are pregnant, people over 65 years of age or under 60 months of age, Indigenous Peoples, adults with

certain chronic health conditions, and people who reside in long term care (LTC) facilities (NACI, 2017).

Some of these groups are at risk due to their immune systems. A person's immune system is composed of two subsystems: innate and adaptive immunity (Kindt, Goldsby, & Osborne, 2007a). The innate immune system is the body's non-specific defense against pathogens. It includes barriers like the skin, mucous membranes and stomach acid (Kindt et al., 2007a). It also includes molecules and cells that attack substances that do not belong to the human body (Kindt et al., 2007a). The adaptive immune system, in contrast, identifies specific pathogens (antigens) that the body has previously encountered and target a defense response against them (Kindt et al., 2007a). People who are pregnant are an example of a high-risk group at risk due to immune system changes. During pregnancy, there is a general suppression of the adaptive immune system, thus increasing a pregnant women's risk of infection (Chow, J, Ateah, C.A., Scott, S.D., Ricci, S.S., & Kyle, 2012). In addition, age related changes in the immune system increases the risk for infection for older adults (Day, Paul, Williams, Smeltzer, & Bare, 2007). In the 2017/2018 influenza season, 44% of influenza associated adult intensive care unit (ICU) admissions and 85% of deaths were in adults over 65, with 302 adult deaths overall (PHAC, 2018b).

Other groups are considered at higher risk due to increased incidences/burden of disease, often for a variety of complex reasons; for example young children are often more susceptible to complications, including febrile seizures (NACI, 2012). There is also a higher rate of influenza associated hospitalizations and death among Indigenous people in Canada when compared with the general population, though this may be attributable to

a variety of factors including delayed health care access, and housing conditions (NACI, 2011). As introduced above, many chronic health conditions, including cancer, cardiac, respiratory and neuromuscular disorders, can be exacerbated by influenza infection (NACI, 2017). Those who reside in LTC facilities often have multiple chronic health conditions, living in an institutional setting further increases their risk of influenza exposure from other residents (NACI, 2017).

Influenza viruses are categorized by their surface antigens as either Influenza A, B, or C. Influenza A is the most common and is the cause of seasonal and pandemic influenza outbreaks in humans. It is further categorized into sub-types based on the proteins that extend from the virus' outer envelope, glycoproteins called hemagglutinin (H) and neuraminidase (N), which the Influenza A virus uses to attach to the cells of an infected person (Kindt, Goldsby, & Osborne, 2007c). These sub-types allow even further classification based on the combination of specific H and N subtypes (i.e. H1N1 or H3N2). Influenza B also occurs seasonally, and is classified by lineage, as either Yamagata or Victoria. Influenza C causes only mild illness in humans, is not a cause of seasonal outbreaks, and is beyond the scope of this proposal (Kindt et al., 2007c). Influenza A and B viruses regularly undergo small changes in their genomes as genetic material is replicated, and eventually these small changes can result in a strain that is antigenically distinct from previous strains; a process called antigenic drift (Centers for Disease Control and Prevention [CDC], 2017). A person's adaptive immune system will therefore no longer recognize the changed virus, hence the need for yearly influenza vaccination. In Influenza A viruses, there can also occur a more rapid change called an antigenic shift; in this case the change is so sudden most people are not immune to the

new subtype and a pandemic strain results (CDC, 2017). The most recent influenza pandemic was in 2009 when the H1N1 (Swine Flu) resulted in more severe disease symptoms and primarily affected children and young adults. Rothberg & Haessler (2010) suggest that many adults over the age of 60 years previously achieved immunity from influenza strains that had circulated in the past.

As with many infectious diseases, standard precautions, such as hand washing and disinfection of equipment, help mitigate the spread of disease. Three additional strategies to prevent widespread influenza infection are: active surveillance and subsequent isolation, anti-viral prophylaxis, and vaccination.

Active surveillance refers to screening patients for symptoms that may indicate an acute respiratory illness. Symptoms commonly included are: new onset of a fever/chills, shortness of breath and/or a cough (Provincial Infectious Diseases Advisory Committee, 2013). Patients who exhibit these symptoms in a health care setting are then given a mask to wear, or are isolated in a room under droplet precautions. All visitors or health care providers (HCP) are instructed to wear a mask when coming in contact with them. A large retrospective study at North York General Hospital (NYGH) in Toronto by researchers Coleman et al. (2017) investigated in-hospital influenza transmission and its relationship to current NYGH prevention policies. Coleman et al found that 1 in 6 patients with confirmed influenza were diagnosed only after health care staff and other patients had been exposed to the infected patients for more than 24 hours. Less than 70% of laboratory-confirmed influenza cases met the screening conditions. This led Coleman et al. to conclude that donning masks when in close proximity to only those patients would not be sufficient protection for unvaccinated staff.

In an attempt to create an empirically derived model of influenza transmission, researchers Cori et al. (2012) used the viral excretion profiles from 150 people artificially infected with influenza (from 12 different studies). They found that a person must be isolated within the first 16 hours of symptoms in order to prevent half of the potential transmissions of the virus to other people. Cori et al. further concluded that four days of isolation would be sufficient in most cases of influenza. Thus, while active surveillance and isolation have a role in influenza prevention, it is difficult to identify and isolate patients early enough to completely prevent transmission of the virus.

Anti-viral prophylaxis is a drug therapy initiated either seasonally, after exposure to a person with a known viral illness, or during an outbreak of a viral illness, as a method to prevent further influenza illness. There is a dearth of literature related to the practice of seasonal prophylaxis for influenza. Moreover, seasonal prophylaxis is not among the Association of Medical Microbiology and Infectious Disease Canada (AMMI) recommendations on anti-viral prescription, thus only post-exposure and outbreak prophylaxis will be discussed (Aoki, Allen, Stiver, & Evans, 2013). A class of drugs called neuraminidase inhibitors (NAI) are the main method of anti-viral prophylaxis used in Canada (Aoki et al., 2013). They include oseltamivir (Brand name: Tamiflu) and zanamivir (Brand name: Relenza). Amantadine, although approved for use in Canada, is not widely used due to the fact that the circulating influenza strains are resistant to it (Aoki et al., 2013). NAIs are thought to work by making it difficult for influenza viruses to exit host cells, therefore reducing the viral load, spread, and ability to release cytokines (Jefferson et al., 2014). The result is a potential reduction in transmission and complications of influenza (Jefferson et al., 2014). The AMMI considers the infectious

period of a patient to be one day before symptom onset until 24 hours after the end of their fever (Aoki et al., 2013). The AMMI does generally not recommend post-exposure prophylaxis in asymptomatic persons, as it may increase the incidences of oseltamivir resistance. However, it is recommended in cases where a person resides or works in an LTC or residential care facility during an outbreak (Aoki et al., 2013). Post-exposure prophylaxis is also recommended if there is a potential mismatch between influenza strains included in the vaccine and those circulating that season (Allen, Aoki, Evans, & Laverdière, 2017). For those exposed to influenza and showing symptoms of influenza-like illness, treatment lasts 5 days (Aoki et al., 2013) or until 7 days after symptom onset of the last if the patient lives in an LTC or other residential care facility during an outbreak (Nova Scotia Department of Health and Wellness [NSDHW], 2017). In Nova Scotia (NS), each individual 75mg dose of oseltamivir costs $3.11 ($31.10 for a 5-day course of twice-daily therapy), and an individual 5mg dose of zanamivir costs $7.43 ($148.60 for a 5-day, 10mg twice daily, course of therapy; NSDHW, 2018). A 2014 Cochrane review of NAI use in adults found that compared to a placebo, both oseltamivir and zanamivir reduce the risk of symptomatic influenza, with no effect found on asymptomatic influenza (Jefferson et al., 2014). Variation in the definitions of pneumonia used within reviewed studies limited the researchers' ability to directly compare studies and therefore, also limited the conclusions they could make about the role of anti-viral prophylaxis in preventing pneumonia complications. Unfortunately, no comparisons of anti-viral prophylaxis vs. vaccination were included in this review. Ultimately the conclusions of the review were that like active-surveillance and subsequent isolation, anti-viral prophylaxis is neither a sufficient nor cost-effective way to prevent widespread

influenza infection. They are usually used in Canada as supplements to widespread influenza vaccination, and to reduce symptoms after infection (Aoki et al., 2013).

The final influenza prevention strategy to be discussed is influenza vaccination. There are two main influenza vaccines, inactive and live-attenuated vaccine (LAIV). Inactive vaccines are modified such that their surface antigens are intact and able to be recognized by cells, but are no longer capable of replication (Kindt, Goldsby, & Osborne, 2007b). The trivalent vaccine (TIV) is the most commonly used preparation; it is an inactive vaccine in which the "tri" refers to the fact that it contains three inactivated strains: Influenza A H1N1 and H3N3 strains, and an influenza B strain (Martin, Brauner, & Plouffe, 2008; NACI, 2017). Seqirus, Glasko Smith Kline, Sanofi-Pasteur, and Mylan EPD (part of BGP Pharma ULC) are the manufacturers of the formulations approved for use in Canada (NACI, 2017). There also exists a quadrivalent vaccine (QIV), which in addition to the strains described above includes a second strain of Influenza B (hence "quad") and is manufactured only by Seqirus in Canada (NACI, 2017). Both the TIV and QIV are administered by intramuscular injection and most formulations are approved for Canadians over 6 months of age. The LAIV contains live virus that has been modified such that it cannot cause an influenza illness, same as the inactive vaccines, but also so that it will replicate in the cooler environment of the nasal mucosa, as it is administered intra-nasally (NACI, 2017). The only LAIV approved for use in Canada is manufactured by AstraZeneca and is available for those patients aged 2 to 59 years (NACI, 2017).

Influenza vaccine purchasing in Canada is done via a contract awarded to vaccine manufacturers, paid out in large (i.e. multi-million dollar) payments throughout the year (Government of Canada, 2018). It is unclear how much each individual vaccine costs as

the government only reports the gross amount of the contract, rather than the cost per unit of vaccine. The CDC in the United States (US) pays $11.35-15.11 per influenza vaccine dose (CDC, 2018). In British Columbia (BC), where the vaccine is not universally available, patients are advised to expect a cost of $25-30 for the influenza vaccine (Immunize BC, 2017). Thus, even at a conservative estimate at $30 per dose, the influenza vaccine is cheaper than the most inexpensive course of anti-viral prophylaxis. In terms of cost-effectiveness, a recent systemic review of 31 high quality studies of the cost-effectiveness of different influenza vaccination programs found universal vaccination programs to be generally cost-effective (Ting, Sander, & Ungar, 2017). Another evaluation by researchers Van Buynder et al. (2015) assessed the impact of the BC Fraser Health Authority's vaccinate or mask policy, first implemented in the 2012/2013 influenza season, on the absenteeism rates of all 10,079 full-time health care staff. Van Buynder et al.'s retrospective review of scheduled hours and sick time found that vaccinated staff had significantly lower rates of absenteeism, even when baseline differences were controlled for. The Fraser Health Authority reported an added cost of $40,000 to implement additional vaccination clinics as a result of the vaccinate or mask policy, and a savings of over 1 million dollars due to improved work attendance rates following implementation (Van Buynder et al., 2015). For all of these reasons, the influenza vaccine is the best preventative measure available for influenza.

1.2 Research Problem

Canada's goal for influenza coverage is 80% of adults over 65 years of age, those with chronic health conditions, and HCPs (PHAC, 2018a). Furthermore, the rate needed to protect people who cannot be vaccinated is 80% (Plans-Rubió, 2012, as cited in Meyer

& Lum, 2017). Yet despite its widespread availability, only 36% of Canadian adults report they were vaccinated against influenza during the 2016/2017 influenza season (NACI, 2017). For the same season, 37.8% of NS residents were vaccinated against influenza (Statistics Canada, 2017). Influenza vaccination uptake in NS is currently inadequate to provide "herd immunity" protection to those unable to be vaccinated, prompting the need for new strategies to increase vaccination uptake. The National Influenza Immunization Coverage Survey (NIICS) asks unvaccinated Canadians why they did not receive their influenza immunization in the last year (PHAC, 2018a). In the 2016/2017 season, 15% of Canadians who did not get the influenza vaccine reported it was because they did not have the time needed to get vaccinated (PHAC, 2018a). Although there are multiple reasons people chose not to get vaccinated (further discussion on this topic in Chapter 2), this particular concern surrounding lack of time presents an opportunity for a new public health intervention.

Many clients in the emergency department (ED) currently experience long waits to see an HCP. These long waits are a result of long-standing and complex issues within the Canadian health care system, the most relevant of which will be discussed further in Chapter 2. Regardless of the cause, patients are waiting longer than recommended for even those with the least acute concerns (Canadian Association of Emergency Physicians [CAEP], 2013). Thus, the ED may be a good setting in which to combine the task of influenza prevention with an improvement to service delivery. For example at the Queen Elizabeth II Health Sciences Centre (QEII) ED in Halifax, NS, time to assessment by an emergency physician (EP) is, on average, about 4.6 hours (Canadian Institute for Health Information [CIHI], 2018). Offering the influenza vaccine to clients with low-acuity

health care needs while waiting to be seen could provide a convenient way for clients to access to health services.

1.3 Research Objectives

The objective of this research proposal is to gauge public interest in, and HCP support for, a potential ED influenza vaccination program at the QEII, as a strategy to increase vaccination uptake for low-acuity clients using the ED. A secondary objective is to determine perceived barriers and facilitators to influenza immunization as expressed by low-acuity clients and HCPs who work at the QEII ED.

1.4 Research Questions

These objectives will be explored with the following questions: (1) Would making the influenza vaccine available at the QEII ED to adult ED clients triaged as Canadian Triage and Acuity Score (CTAS) 4/5 (low acuity) change the planned influenza vaccination behaviour of these clients? (2) What are the opinions of HCPs employed at the QEII ED with respect to the merit and feasibility of providing influenza vaccines to adult ED clients triaged as CTAS 4/5 during wait times?

1.5 Significance

Offering the flu vaccine during long ED wait times could potentially increase convenient access to public health services. This has been done successfully in the past, where Canadian ED Influenza vaccination programs resulted in successful vaccination of 43% to 65% of eligible unvaccinated patients (Chiasson & Rowe, 2000; Flemming, Campbell, Fry, Isenor, & Van Zoost, 2018; Pearson, Lang, Colacone, Farooki, & Afilalo, 2005). Support has been found in surveys of Canadian ED patients as well, with willingness to receive influenza vaccination in the ED expressed by 20-59.3% of eligible,

unvaccinated patients (Kapur & Tenenbein, 2000; J. A. Taylor, Vu, Angelica, Elizalde, & Li-Brubacher, 2018). However, while all Canadian studies elicited information about client amenability, and most additionally reported client reasoning for refusal (Flemming et al., 2018; Kapur & Tenenbein, 2000; Pearson et al., 2005; J. A. Taylor et al., 2018), only two studies also investigated physician willingness to order influenza vaccination for their patients (Kapur & Tenenbein, 2000; Pearson et al., 2005). To the best of my knowledge, no previous Canadian study collected information on nurse, or paramedic perceptions of an ED influenza vaccination program. This is a large gap in the literature. Nursing support is essential in uptake of ED interventions, as they are responsible for screening for and prioritizing new interventions within an already busy workload (Venkat et al., 2012). Furthermore, paramedics are a component of the ED care team at the QEII. The proposed study will lay the groundwork for what potential sustainable interventions can be used in the ED to make use of patient "wait times" more effectively. Specifically, the aim of this chapter is to highlight the opportunity for vaccination that can be found in overcrowded EDs and communicate how a survey of ED clients and HCP at the QEII ED is the first step in the creation of a potential vaccination scheme that can assist in both of these issues.

The next chapter will review the existing literature on the physiology and pathology of influenza, the burden of influenza on Canadian society, the current state of the Canadian health care system, the relationship between primary care and the ED, current influenza vaccination programs, vaccination behaviour, attitudes and influencers for Canadians, and the theoretical base for this research. The third chapter of this thesis will detail the proposed methods including research design, sampling, data collection,

instrumentation, and ethical considerations. The fourth chapter will report the results of both surveys. The fifth and final chapter will discuss the results in the context of the research objectives, questions and theoretical basis, and also discuss the limitations of this study and suggestions for future research.

Chapter 2: Literature Review

For the following review, the PubMed database was searched between January 1, 2017 and August 31, 2018 for topics that included: burden of influenza, Canadian health care system, attitudes towards influenza vaccination, Canadian vaccination behaviour, primary care and the ED. Search terms included combinations of the following items: "influenza program", "vaccine hesitancy", anti-vaccination, Canada, discourse, emergency, influenza, nurse, perception, uptake, ED, etc. The citations from the resulting studies were mined for additional studies, and articles were also located using the "Cited by" and "Related articles" functions of PubMed. A review of the theoretical constructs of the Health Belief Model (HBM) and Promoting Action Research in Health Services (PARiHS) framework will be included in this review as well. Statistics Canada, the PHAC, the Nova Scotia Department of Health and Wellness (NSDHW) and the Canadian Institute for Health Information (CIHI) datasets were the primary source of Canadian-specific wait time metrics, influenza prevalence, and influenza vaccination rates. The focus of this literature review was on Canadian literature, though international literature was used when an equivalent Canadian study could not be found. The findings of the literature review are described in the following sections.

2.1 Physiology & Pathology

Influenza is a preventable seasonal infection that is a burden to Canadians and their health care system. Having an understanding of the pathology and transmission of influenza infection is important when considering the strategies used to prevent influenza infection. Influenza viruses are small (90-100 nm), round particles that enter the body through the respiratory mucosa (Kindt et al., 2007c). The surface proteins of virus cells

attach to cells in the host's body, allowing the virus to enter the cell (Driver, 2012). Once inside a cell, the influenza virus replicates its DNA in the cell's nucleolus to make more virus particles, which then spread to infect other cells. Fever, muscle aches, weakness/extreme fatigue and other symptoms that accompany influenza are caused by the virus's replication and the inflammatory response of the host to the virus (Driver, 2012).

Transmission of influenza occurs through direct contact, such as being sneezed or coughed on by an infected person (NACI, 2017). Viruses are transmitted in both large droplet particles and small aerosols (Milton, Fabian, Cowling, Grantham, & McDevitt, 2013). Wearing a surgical mask interrupts this stage of transmission, by acting as a physical barrier that filters some viral particles. In one study by Milton et al. (2013), patients infected with confirmed-influenza shed 3.4 times fewer viral particles when wearing a surgical mask compared to not wearing one. Transmission can also occur through indirect contact with a surface that has been contaminated by infectious respiratory secretions from a sneeze or cough (i.e. a doorknob, tissues, etc.; NACI, 2017). Influenza viruses can last up to 24 hours on surfaces like stainless steel (Thomas, 2016); they are not however, able to survive as long on porous surfaces or on hands (Thomas, 2016). These infectious secretions enter a new host via the respiratory mucosa and then causes infection (Driver, 2012). Standard precautions such as hand washing and regular cleaning/disinfection of surfaces interrupts indirect transmission by removing the viral particles prior to contact with respiratory mucosa.

As described in Chapter 1, the body's adaptive immune system learns to recognize specific surface proteins (called antigens) and generates antibodies that

specifically attack them. When a person's immune system already has antibodies that recognize the influenza surface antigens, it is then able to destroy the virus quickly, thus reducing the risk of the host acquiring the infection (Kindt, Goldsby, & Osborne, 2007a; NACI, 2017). This ability to recognize influenza can be acquired by a person either through experiencing influenza infection or through vaccination.

2.2 Burden of Influenza on Canadian Society

2.2.1 Prevalence

Local, national and international monitoring of influenza prevalence is essential for tracking the impact of the disease at a population level. This information is then used to monitor and prioritize public health strategies. Currently, influenza's seasonal prevalence in Canada is monitored by "FluWatch": Canada's national influenza and influenza-like-illness surveillance system (PHAC, 2016a). FluWatch collects data on the incidences of laboratory-confirmed influenza from across the country, reporting weekly during "flu season" and monthly in the interim periods (PHAC, 2018b). The influenza "year" begins in the 35th week of the year (i.e. end of August yearly) and runs until the following August. In Nova Scotia (NS), "Respiratory Watch" preforms the same function at a provincial level and reports its data to the national FluWatch system. FluWatch also shares data on laboratory-detected, circulating influenza strains with the World Health Organization to help guide vaccine selections. The impact of influenza is greater in years in which a pandemic strain is circulating, such as the 2009 H1N1 (Swine flu) (Rothberg & Haessler, 2010). However, as previously discussed in Chapter 1, seasonal influenza will be the focus of this proposal.

A review by researchers Thommes, Kruse, Kohli, Sharma, and Noorduyn (2017), which included eleven years of laboratory confirmed influenza data from FluWatch, reported a varying number of annual influenza cases, from a low of 2,953 in 2002/2003, to 31,737 in 2012/2013. Thommes et al.'s review was limited in that it did not discuss the cases in relation to the size of the Canadian population at that time, or the number of respiratory virus panel screens run. However, archived data on the number of laboratory tests from past influenza seasons is available from the PHAC. In the 2002/2003 season, there were 60,725 tests run, 6% of which were positive (PHAC, 2005), and in 2012/2013, tests 190376, 16.7% of which were positive (PHAC, 2013). There are several types of tests for influenza used in Canada: viral cultures, rapid influenza tests, and serological testing (Infection Prevention and Control Canada, 2018). Unfortunately it is not made clear which of these tests are being referred to when laboratory-confirmed influenza is reported, or whether the accuracy of testing has improved in later years (Infection Prevention and Control Canada, 2018). If the range of years included in Thommes et al.'s review were updated to include the years leading up to as well as the most recent influenza season, the 2017/2018 season would be at the top end of the range, with 64327 cases reported to date (PHAC, 2018c). In the 2017/2018 season 318,139 laboratory tests were run in total, 20.2% of which were positive (PHAC, 2018c), a continuing upward trend in the number of influenza cases in Canada.

The widespread prevalence of influenza in Canada, when considered in conjunction with low Canadian vaccination rates speaks to the urgent need for continued innovation in prevention strategies. Though the influenza vaccine's efficacy at preventing influenza varies with each season, with such a large number of cases there remains

tremendous merit for the Canadian population even at low levels of efficacy. Unfortunately, when only 36% of Canadians chose to receive the vaccine, as in the 2016/2017 season (PHAC, 2018a), the estimated 42% effectiveness of the 2016/2017 vaccine (Skowronski et al., 2017) could only potentially leave 15.1% of the population protected. Continued creation of novel strategies to improve vaccine uptake are an achievable means to decrease the prevalence of influenza.

2.2.2 Morbidity and mortality

Influenza is notable for not just the number of cases, but the severity of complications experienced by some groups of Canadians. A major complication of influenza is pneumonia. Pneumonia is an acute infection of the lower respiratory tract, more specifically the alveoli. It is important to note that this illness is named based on the location of the infection, but can be caused by multiple pathogens. Influenza can progress to pneumonia either by infecting the lower respiratory tract in addition to the upper airway (primary viral pneumonia), or by co-infection with bacteria (Driver, 2012). Influenza infection facilitates bacterial infection by promoting the bacteria's ability to enter host cells (Rothberg & Haessler, 2010). Bacteria can also increase viral replication, further facilitating influenza infection (Rothberg & Haessler, 2010).

Influenza also exacerbates many chronic diseases, and puts those patients at higher risk for complications, as evidenced by higher rates of death and stays in the intensive care unit (ICU) among those with lung, heart, kidney, metabolic, or brain/neurodevelopmental disorders, as well as patients with hemaglobinopathy or morbid obesity (NACI, 2017). For example the inflammatory response caused by influenza infection can increase sensitivity of patients with lung diseases like asthma and

chronic obstructive pulmonary disease (COPD), to acute exacerbations (Rothberg & Haessler, 2010). For people with brain and neurodevelopmental conditions, infection with influenza puts them at a greater risk of aspiration, along with an increased risk of febrile seizures (NACI, 2017).

Data sources for Canadian influenza related deaths include FluWatch, Statistics Canada and at a provincial level, NS Vital Statistics. FluWatch reports *influenza-associated deaths*; deaths in which the patient had a laboratory-confirmed case of influenza irrespective of whether influenza was the cause of the death. Deaths are reported by FluWatch September to August to align with the flu season (rather than with the calendar year), and adults are defined as persons over 16 years of age. About 595 influenza-associated deaths, among people of all ages, were reported by FluWatch in 2015 (PHAC, 2015a, 2015b, 2016b). By contrast, Statistics Canada reports the number of deaths caused by a certain etiology (ex: malignant neoplasms, diseases of heart). Though Statistics Canada's top ten causes of death table considers influenza and pneumonia as one category (Statistics Canada, 2019), they also report the discrete number of deaths caused by influenza. In 2015, 547 deaths were recorded as due to identified influenza; a similar number as captured by FluWatch (Statistics Canada, 2015b). A further 1,072 deaths were recorded as being caused by influenza, but without laboratory confirmation of the specific virus (Statistics Canada, 2015b). If these deaths are included, the total number of deaths caused by influenza in 2015 would be 1,619; a much higher number than reported by FluWatch. In Nova Scotia, with influenza and pneumonia combined, there were 256 deaths reported in 2015, 2.7% of the total number of deaths in NS for that year (S. Galloway, personal communication, July 5, 2018; Open Data Nova Scotia,

2018). This is a similar proportion of deaths as reported nationwide; in 2015 2.9% of Canadian deaths were due to influenza and pneumonia (Statistics Canada, 2019). By any of these metrics, deaths due to influenza do not comprise a large proportion of deaths in Canada when compared to cancer or cardiovascular causes (Service Nova Scotia and Municipal Relations., 2013; Statistics Canada, 2019). However, influenza is the only infectious disease that is a leading cause of death (Statistics Canada, 2019). Furthermore, though it can be argued that other leading causes are preventable (with early preventative care, good chronic management and a healthy lifestyle), influenza is the only leading cause for which we have a universally available, inexpensive vaccination program that is capable of preventing it.

2.2.3 Economic and resource use costs

For Canadians, influenza has both an economic and illness-based impact. The number of Canadians whose hospital stays are associated with influenza vary yearly, with rates as low as 3.9 to as high as 340 per 100,000 (Thommes et al., 2016). There were 4,090 adult hospitalizations in Canada during the 2017/2018 influenza season and 326 adult ICU admissions (PHAC, 2018b). A review of 2,943 admissions of Canadians over 16 years of age with a laboratory-confirmed influenza was conducted by Ng et al. (2018) to estimate the average cost of influenza hospitalization. The authors found an average cost of $14,612 per case of influenza requiring an ICU stay; $10,840 for admissions that did not require the intensive care unit. If Ng et al.'s estimate is applied to the 2017/2018 Canadian influenza season results in an estimated cost of $44,335,600 for the regular inpatient admissions, and $4,763,512 for the ICU admissions. These admissions represent significant and preventable costs to the health care system.

Unfortunately, it was not made explicit by FluWatch if the reported ICU admissions associated with influenza are included within the reported total number of hospitalizations. As well, FluWatch does not receive hospitalization or ICU data from Nunavut (NU), Ontario (Ont), British Columba (BC) or Quebec (Que), and only receives ICU admissions data from Saskatchewan (PHAC, 2018b). The number of influenza-associated hospitalizations and their associated costs is therefore likely being underestimated by these figures. At the QEII, the most recent data available is from the 2016/2017 fiscal year, in which hospital administrators reported 16 cases of influenza/acute respiratory infections (i.e. 16 admissions), at a total cost of $91,458 (Shayko, 2018). There were additionally a total of 131 cases of viral and bacterial pneumonia, both common complications of influenza (Shayko, 2018). Aspiration pneumonia, which is of a different etiology, is not included in this case volume. The reported total cost of these pneumonia cases was $1,101,800 (Shayko, 2018). Though some cases of pneumonia may be related to other etiology, the burden of influenza at the QEII is nevertheless evident.

Costs also occur when people visit the ED for influenza-like-illness. A 2003 analysis of anonymized records for approximately 650,000 residents of Winnipeg, Manitoba (Man) from 1995 to 1999 compared trends in health care use during the yearly influenza season vs. the interim season (Menec, Black, MacWilliam, & Aoki, 2003). They found that influenza and pneumonia accounted for 42 more ED visits per 100,000 patients aged 15-64, and 190 more ED visits for patients aged 65 and over during the flu season when compared with the interim season (Menec et al., 2003). A large sample size and comprehensive access to Winnipeg MD billing data are two major strengths of this

study. Unfortunately, this study only reported influenza/pneumonia visit rate per 100,000 people, and not the total number of ED visits or ED visit rate. This makes it difficult to discern if there was an overall increase in ED visits (and therefore resource use) during the influenza season, or if there was merely a shift in the reasons people visited the ED. It is further limited by vague presentations of statistics and not controlling for family-wise error (i.e. a potentially inflated false positive rate due to running multiple statistical tests) (Menec et al., 2003). At the QEII ED, there were 76 patients whose discharge diagnosis was influenza in 2017; most (n=72) were sent home, while four were admitted to the hospital (D. Urquhart, personal communication, July 7, 2018). This is a small portion of the QEII's patient volumes, but it is difficult to capture which patients diagnosed with other illnesses such as pneumonia, or COPD exacerbation (one of the top ten most common diagnoses in 2017) were complications of influenza (D. Urquhart, personal communication, July 7, 2018).

The economic burden of influenza extends beyond direct health care costs as people often have to take time off work due to illness or stay home to care for sick family members. Schanzer, Zheng, & Gilmore (2011) used eleven years of seasonal influenza FluWatch data and the Statistics Canada Labour Force survey to create a regression model estimating the amount of absenteeism and lost work hours. Seasonal influenza is estimated to be responsible for 11.5% of Canadian work absences during the influenza season (Schanzer et al., 2011). Employees missed an average of 14 hours of work, representing 0.08% of total potential work hours annually (Schanzer et al., 2011). Pandemic influenza is responsible for a similar number of work absences (13%) however, employees missed 25 hours of work on average, representing 0.2% of potential work

hours (Schanzer et al., 2011). These work absences, when considered with the number of ED visits, and the number and costs of hospital admissions further emphasizes the multifactorial impact of influenza on Canadian society.

2.2.4 Cost-effectiveness of prevention

A proxy measure for the financial impact of influenza can be found in economic evaluations of influenza prevention strategies. A systematic review of 31 high-quality economic evaluations of the influenza vaccine found it to be cost effective for children and high risk groups (including people who were pregnant or post-partum and adults over 65) (Ting et al., 2017). Ting et al. found mixed results in regards to the cost effectiveness of vaccinating healthy working adults, with the exception of health care providers [HCP]. For HCPs, vaccination was cost effective prevention even when considered only in the context of protecting HCPs (i.e. without the consideration of the indirect costs of potential HCP transmission of influenza to patients). This review was limited by the wide variety of quality of life outcome measures in included studies, which limited the Ting et al.'s ability to compare studies. For example, some studies in Ting et al.'s review used laboratory-confirmed influenza as an outcome measure, but others used broader categories, such as influenza-like illness or upper respiratory tract infections (which may not have been caused by the influenza virus). Likely as a result of this, the authors did not include a meta-analysis (Ting et al., 2017).

An indirect way to analyze resource use related to influenza is to assess the impact of influenza prevention on health care service use. Though vaccination is a key component of influenza prevention, a retrospective analysis by Groll and Henry (2002) of five years of ED visits data from five Ont tertiary care EDs found no significant

correlation between provincial influenza vaccination rates and ED volumes. Upon a review of discharge diagnoses for the ED in Kingston, Ont, multiple linear regression failed to support a significant relationship between a diagnosis of influenza and volumes at the ED (Groll & Henry, 2002). However, a major limitation is that the study compared five years of data prior to universal influenza vaccination with a mere six months of data following the legislative change enabling universal vaccination coverage. Furthermore, they did not compare data regarding the influenza vaccination status of those presenting to the ED, which were all large, urban, tertiary hospitals. This means the results are not necessarily generalizable to the Ont population (Groll & Henry, 2002). As well, their analysis was completed before the influenza vaccination rates for the post-universal vaccination legislation year were available and therefore, they could not comment if there had been a change in provincial vaccination rates at all (Groll & Henry, 2002). The inability of Groll & Henry (2002) to find a relationship between ED visits and influenza vaccination rates should not diminish the robust findings of Ting et al.'s (2017) more recent review that supported influenza vaccination as a generally cost-effective prevention measure.

2.3 Canadian Health Care System

2.3.1 Funding, administration and legislation

A review of a Canadian health care problem necessitates a discussion of Canada's health care system to contextualize it. Canada's health care system is publicly funded by federal funds, but delivered through provincially/territorially administered health insurance plans (Health Canada, 2016). The Canada Health Act requires that health insurance plans be publicly administered, comprehensive, universal, portable, and

accessible (Health Canada, 2016), but provinces and territories independently legislate the details of how this relates to service provision for most Canadians. Some Canadians, including active members of the Canadian Forces, members of certain Inuit communities, and people who are status First Nations have their health care administered directly by the federal government (Health Canada, 2016). Regardless, there is regional variation in service coverage. For example, as of September 2017, influenza vaccination is available for free to the general public in all areas of Canada except BC, Que, and New Brunswick (NB) (PHAC, The Canadian Nurses Coalition on Immunization, & The Canadian Immunization Committee, 2017). In these provinces it is offered to most high risk groups as identified by the NACI or those likely to transmit influenza to a person at high risk of complications. Another variation pertains to the HCPs who are able to give influenza immunizations; for example in most Canadian provinces, pharmacists may administer seasonal influenza vaccinations. In Que, Yukon, Northwest Territories (NWT) and NU however, this does not fall within their scope of practice (Buchan et al., 2017).

2.3.2 Primary care

Within the health care system, there are several levels of care available to Canadians, based on the urgency and complexity of their health care needs. Primary health care, delivered by family physicians (FP) or nurse practitioners (NP), is intended to be the first point of contact with the health care system (Health Canada, 2016). Primary care providers are the coordinators of care, organize visits to specialists, and provide preventative care personalized to their patients. They also coordinated non-urgent diagnostic tests, and out-patients specialist referrals. Walk-in clinics exist for those needing non-urgent medical attention. In some areas, there are also urgent care

departments. This service is intended for patients with non-life threatening injuries and illnesses that still require timely intervention by a health professional, such as large lacerations. Having a consistent primary care provider, and being able to make a same or next-day appointment with that provider are two metrics that are used to monitor the accessibility of primary care for Canadians (Premji & Bridget, 2018).

Unfortunately, in NS and across Canada, there is an issue with the accessibility of primary care. The CIHI collects information from multiple reporting bodies on Canadian health care outcome targets; their most recent data for primary care providers is from the 2015/2016 CHCS, when 89.2% of Nova Scotians reported primary care provider; a proportion actually higher than the reported Canadian average of 83.6% (CIHI, 2018a). There are slight differences in the figures reported by the 2016 Commonwealth Fund's 2016 International Health Policy Survey of Adults, a telephone survey that included 4547 Canadians (253 Nova Scotians). Results from this survey indicated that 93% of Canadians and 85% of Nova Scotians self-reported having either a regular FP or regular place of care (CIHI, 2017). In spring 2016, the number of Nova Scotians actively looking for a primary care provider who were unable to find one increased dramatically for reasons that have not yet been determined, though research is currently in progress to investigate the cause (Maritime SPOR SUPPORT Unit, 2018). As of May 1, 2018, 47,669 Nova Scotians (5.2% of the population) are on the provincial registry indicating they are searching for a primary care provider (Nova Scotia Health Authority [NHSA], 2018b). This number likely does not capture the total number of those who do not have a primary care provider. Furthermore, only 34% of Nova Scotians reported being able to obtain an appointment with their primary care provider for the same or following day,

and only 26% found it very or somewhat easy to access care after hours without going to a hospital ED; fewer than the Canadian or international average (CIHI, 2017). This statistic appears to highlight an issue with accessing primary care, but it has been argued that same day/next day appointment access is not necessarily an indicator of patient satisfaction. In a 2013/2014 Ont cross-sectional survey of 1698 primary care patients, only 32% of patients waited less than one day for an appointment with a FP, yet 96% considered their appointment easy to schedule (Premji & Bridget, 2018). Furthermore, 87% of respondents indicated their appointment was scheduled as soon as they wanted (Premji & Bridget, 2018). Nevertheless, improving access to primary care in NS remains a key priority at the NSDHW (NSDHW, 2018a).

2.3.3 Emergency care

Emergency care exists to provide care for life-threatening illnesses and injuries in an ED. However, depending on the availability of primary, walk-in and urgent care, they may take on other functions. This is a problem, as EDs were not designed to address these kinds of concerns. EDs prioritize patients primarily by the seriousness of their condition, not by the order of arrival. All patients who arrive in Canadian EDs, no matter their method of arrival, are sorted by their level of acuity in a process called “triage”. Nurses assign a score of 1 to 5 to each patient based on the criteria set out in the Canadian Triage and Acuity Scale (CTAS), a scoring system created by Canadian Association of Emergency Physicians (CAEP). Please refer to Appendix A for a summary of CTAS scoring. CTAS scores are based on a combination of factors including vital signs, the nature of the patient’s complaint, current symptoms, pain level, risk factors, and the nurse’s clinical judgement (CAEP, 2013). CTAS 1 (“Resuscitation”)

patients are the most acutely ill and include those patients who are at immediate risk of death or permanent disability, such as major traumas, cardiac arrests, recent onset cerebrovascular accidents etc. (CAEP, 2013). CTAS 2 ("Emergent") patients are the next most acutely ill patients and include those who have a potential life-threatening or debilitating condition, such as severe chest pain and sudden severe headaches (CAEP, 2013). CTAS 3 ("Urgent") patients are again less acute, and include those patients who may potentially progress to have a serious concern but currently are stable, such as mild to moderate pain, vomiting/nausea, asymptomatic hypotension, etc. (CAEP, 2013). These patients comprise the largest component of ED patient volumes at the QEII, 50-52% of all patients in 2016 (Capital Zone Emergency Services Council [CZESC], 2016b, 2016d, 2016a, 2016c). CTAS 4 ("Less Urgent") and 5 ("Non-Urgent") patients are generally defined as low-acuity, and include those patients with stable vital signs and minor concerns such as urinary tract infections, simple cuts that may require stitches, prescription renewals, etc. (CAEP, 2013).

The ED that forms the setting of this proposed study is at the QEII, an urban teaching hospital located in central Halifax. The QEII's ED, officially named "The Charles V. Keating Emergency and Trauma Centre" (though this proposal will continue to refer to it as the QEII ED) is located in the new Halifax Infirmary building. In 2017, the QEII ED served an annual census of over 75,000 (NHSA, 2018a). Patient volumes in the ED have been steadily growing; with a 25% volume increase between 2007 and 2014, and a further 4% increase between 2014 and 2017 (Academic Department of Emergency Medicine [ADEM], 2014; NHSA, 2018a). Like many ED's across Canada, the QEII ED experiences chronic overcrowding often highlighted in local news stories and a recent

union report (Nova Scotia Government & General Employees Union, 2017). The department is divided physically into five "Pods", and two associated units: the "Rapid Assessment Unit" (RAU) and Psychiatric Emergency Services (PES).

Pod 1 is staffed by registered nurses (RNs), and a primary care paramedic. The RNs bring patients in from the waiting room, complete an initial assessment, and potentially coordinate early management for a patient. In theory, these care spots are meant for low-acuity (CTAS 4/5) patients, and CTAS 3 patients who are less ill. When necessary, CTAS 2 patients are assessed and managed in this area until transfer to an alternate Pod is possible. Pod 1 beds do not have cardiac monitors.

Pod 2 is staffed by RNs who take care of the most acutely ill patients; all beds have cardiac monitors and the nurse to patient ratio is lower due to the high level of acuity of the patients. In addition, there is a critical care paramedic ("the department medic") who works throughout the department as needed for transfers of acutely ill patients, airway management, procedures such as cardioversion, etc. Pods 3 and 4 have cardiac monitors and are staffed by RNs. When staffing permits, a care team assistant (CTA) is available for help with personal care and tasks such as vital signs and blood glucose checks. Pod 5 is staffed by advanced care paramedics (ACP) who assess patients with minor concerns. The majority of low-acuity (CTAS 4/5) patients are seen here, though this pod is not open between 0300-0630h.

Presently, the RAU is open during the day and evenings for patients consulted to specialty inpatient services (i.e. those other than Internal Medicine). There are plans to extend the opening hours of the RAU to be 24/7 and to expand the patient population to include internal medicine consults. PES consists of four mental health interview rooms

for mental health patients who have been medically cleared (i.e. the EP has determined they have no acute physical illnesses). PES is staffed by mental health nurses, and patients are usually awaiting assessment by Psychiatry.

Like many Canadian EDs, the QEII must report certain quality indicators to the province as proxy measures for the quality and efficiency of the care provided in the ED. Wait times are one of the most widely discussed metrics of ED care, in both the literature as well as the media. The guidelines set out by CAEP for how long a patient should wait are stratified by CTAS level. In general, when ED "wait times" are being discussed, the outcome indicator that is being referenced is 90th percentile physician initial assessment time (PIA), which is the length of time within which 90% of patients presenting to the emergency are initially seen by an MD. CTAS 1 level patients require immediate MD attention, whereas CTAS 4 and 5 patients are generally defined as low-acuity, and ideally receiving an MD assessment within 60 and 120 minutes, respectively (CAEP, 2013).

Across Canada, there is varying coverage in terms of ED outcome measures being reported. At the time of this writing, Alberta and Ont have all hospitals reporting their outcome measures to the CIHI while other regions have no hospitals sharing this data (NB, Newfoundland and Labrador, the NWT, NU. and Que) and the remaining areas, including NS, report data only from some hospitals (CIHI, 2018b). Based on these varying levels of data, the average 90th percentile PIA is 3.1 hours across Canada, and 4.2 hours within the Central Zone (Halifax Regional Municipality and West Hants); data averaged across all NS hospitals is not currently available (CIHI, 2018b). For the QEII, the average PIA is 4.6 hours (CIHI, 2018b). These wait times are unfortunately not stratified by level of acuity within the available CIHI datasets for NS.

Another outcome measure used to assess quality in the ED is how often patients leave after being triaged, but without being assessed by an MD. This is also called "leaving without being seen" (LWBS). Rates of LWBS is considered an indicator of patient frustrations with wait times. At the QEII ED in 2016, 5-6% of patients LWBS, higher than the 2-3% target (CZESC, 2016d, 2016c, 2016b, 2016a).

2.4 Primary care and the Emergency Department

2.4.1 Primary care provider access

In large part, escalating ED wait times are secondary to system wide issues that delay patient transfers and discharges (ADEM, 2014). Moreover, there have been steady volume increases in the number of patients presenting to EDs in recent years, and one factor that affects these volumes are primary care providers (Van den Berg, Van Loenen, & Westert, 2016). When patients are unable to access their primary care provider, the ED becomes an alternative source of care. A large international study (n=60,991; 31 European countries, Canada, New Zealand and Australia) by Van den Berg, Van Loenen, and Westert (2016) looked at the relationship between ED use and primary care. The Canadian sample size was reported as being "nationally representative" but the exact number of Canadian participants was not given. While most Canadians in this study reported their ED visit was related to an issue their primary care provider was not able to treat, 25% indicated it was because their primary care provider was not available, 5% because they expected a reduced wait time, and 4% due to more convenient ability to access the ED (Van den Berg et al., 2016). The researchers conducted a multilevel regression analysis of the relationship between multiple aspects of primary care access and whether a patient visited and ED in the past year, and found a significant negative

relationship between ED visits and a regular primary care MD who knew their medical history and living situation (Van den Berg et al., 2016). A similar survey was conducted in 2005 at the QEII ED by researchers Field and Lantz (2006). Field and Lantz surveyed 235 low-acuity (Canadian Triage and Acuity Scale [CTAS] 4/5) patients presenting to the QEII about what motivated them to seek ED care over other less acute options. 23% of respondents presented to the ED for care due to an inability to access their primary care provider, and a further 3% did not have one (Field & Lantz, 2006). This number is a similar proportion to those facing access issues, as reported in Van den Berg's study. Both studies highlight the interrelated nature of emergency and primary care. Furthermore, since primary health care providers remain the main immunizers against influenza (NSDHW, 2017a; PHAC, 2018a), lack of access may be an issue contributing to low vaccination rates.

Primary care providers also impact ED access because they enable patients to see an HCP early in their course of illness rather than later. Many illnesses, such as infections, can be treated and resolved without a hospital visit when assessed and treated when symptoms begin. A retrospective cohort review of administrative data from a six-month consecutive sample of long term care resident's use of Ont EDs in 2005 found that almost one quarter of all provincial residents used the ED at least once during that time, 24.6% of which were for conditions that were preventable with timely primary care and 11.0% of which were low-acuity (Gruneir et al., 2010). More locally, researchers Hudec, MacDougall, and Rankin (2010) in Cape Breton, NS, compared MD income, patient-reported satisfaction with care, and non-urgent ED visits following implementation of 60% of daily primary care provider visits being left open for same day appointments. The

new appointment booking model was implemented at three primary care provider clinics. An additional clinic that was already using this model of booking was also included in the study. Prior to the intervention, patients in Cape Breton often had a four day wait for a primary care provider appointment (Hudec et al., 2010). Hudec et al. found a 28% reduction in low-acuity visits to the local ED by patients of the primary care provider practices included in the study, though it was not reported if there was a change in the total number of ED visits by these patients. Furthermore, patient and provider satisfaction improved, and MDs saw either no change or an increase in their income (Hudec et al., 2010). Unfortunately, it is unclear from the published study whether satisfaction at one practice was being compared before and after implementation or if practices using different models were being compared, though it appears the satisfaction survey was completed only at one point in time. Thus, primary care provider access certainly has an impact on low-acuity ED presentations, and furthermore represents an opportunity for timely intervention and follow-up to prevent higher acuity visits. In a health care system that is struggling with identifying, isolating and resolving the specific problems in primary care, a reciprocal role exists for the ED to compensate for current primary and public health gaps.

2.4.2 Tetanus prophylaxis

Despite concern among MDs and nurses that primary care is "not the role" of the ED (Kapur & Tenenbein, 2000; Venkat et al., 2012), there are primary care interventions that have become a routine part of ED practice. For example, tetanus prophylaxis is a routine part of emergency care for wounds in departments across Canada. At the QEII ED specifically, there is a medical directive that permits nurses to give tetanus

immunizations, and it is part of the post-entry to practice competencies for ACPs (Capital Health, 2008, 2011). The tetanus toxoid vaccine has been available since 1940 and has been a part of wound care in an emergency setting internationally since at least the 1970s (Martin et al., 2008), though Canadian-specific literature is sparse on the specifics of its origins. In contrast to influenza, which was associated with 302 deaths in the 2017/2018 season (PHAC, 2018b), no one has died of tetanus in Canada since 2010 (PHAC, 2014).

An unpublished study conducted in Prince Edward Island by Hansen, Sibley, MacSwain, Morrison, and Rowswell (2018), attempted to add further value to the current tetanus vaccination practices by offering the Tdap vaccine (Tetanus, diphtheria, pertussis) rather than the standard TD vaccine (which protects against tetanus and diphtheria only). Researchers assigned a consecutive sample of patients presenting over fifteen week days (between 0730 and 1530) to either the control group, and two intervention groups in which patients were screened at triage for Tdap eligibility and then offered the vaccination while in the ED or referred to the public health department for later vaccination (Hansen et al., 2018). They were able to immunize 66% (n=81) of eligible patients in the ED vaccination group, significantly more than the 21% (n=20) immunized by the public health department as a result of referrals, $p<0.00001$, though the public health department immunized 10 participants with an additional vaccine during their visits (Hansen et al., 2018). Triage times were tracked and were shorter in the control group by an average of 52 seconds and 1 minute, 30 seconds, for the ED and public health vaccination groups respectively, a difference that was not considered clinically significant (Hansen et al., 2018). The higher vaccination rates that were achieved in the group who were vaccinated in the ED lends further support for ED waits potentially

serving to provide a convenient opportunity for those who have not had time to receive needed adult vaccinations.

2.5 Accessibility of the Influenza Vaccine

As with all vaccinations, the efficaciousness of influenza vaccinations is dependent on uptake at a population level. The NACI recommends all Canadians receive the influenza vaccination, with a special emphasis on those at high risk of influenza complications, those capable of transmitting influenza to someone at high risk, and "others" including community workers and those working in the poultry industry (NACI, 2017). Influenza vaccines are contraindicated in those under six months of age, and in persons who have experienced a life-threatening allergic reaction to an influenza vaccine or one of its components in the past (NACI, 2017). The NACI advises caution when vaccinating patients who have had oculorespiratory syndrome with lower respiratory symptoms in past, as well as those who have experienced Guillain-Barré syndrome in the six weeks following a previous influenza vaccine. In these cases the NACI advices expert consultation as needed to assist in weighing the risks of complications of the vaccine with the risks of complications of influenza for these patients (NACI, 2017). Ultimately, if these groups are not able to be vaccinated, protection is ideally conferred through other people being vaccinated (i.e., herd immunity) such that they are not ever exposed to the influenza virus. With mass vaccination a public health priority, it is not surprising that there are multiple places Canadians can access influenza immunizations. Primary health care providers, public health immunization clinics, and community pharmacies (in some provinces) are the three main vaccination locations to be discussed below, with an

additional discussion on past implementation studies of ED influenza vaccination programs.

2.5.1 Primary care practices

In Nova Scotia, 60.7% of those vaccinated during the 2016/2017 influenza season received their vaccine from an MD (NSDHW, 2017a). This differs from the results of the National Influenza Immunization Coverage Survey (NIICS), in which 32.7% (95% CI:29.1-36.2) of respondents received their vaccine at an MD's office, and a further 10.2% (95% CI:8.0-12.4) received it from an interdisciplinary primary health practice. It is important to note that the NS data identifies only the profession of the vaccinator, based on billing records or mandatory reporting forms submitted by the provider (NSDHW, 2017b), whereas the national data collects the self-reported location of vaccination. As well, the NS data is taken from a total data set of 345,434, whereas the NIICS survey was only a sample size of 2024 adults. These methodological differences likely account for the discrepancy. In both data sets, MDs/primary care practices accounted for the majority of influenza vaccinations. Furthermore, 21-22% of patients refusing ED influenza vaccination in past implementation studies or surveys have identified a desire to first speak with their primary health care provider as their reason for refusal (Kapur & Tenenbein, 2000; Pearson et al., 2005). Thus, primary care providers are an important part of the influenza vaccination process. Other aspects of the influenza vaccination decision making process will be discussed later in the chapter.

2.5.2 Community pharmacy

Legislation supporting pharmacist vaccination is relatively new to Canada, and currently exists in all provinces except Que and the territories (Buchan et al., 2017).

Legislation allowing pharmacists to give influenza vaccinations was enacted in NS in 2013 (Buchan et al., 2017). 30.4% of Nova Scotians vaccinated during the 2016/2017 influenza season received their vaccine from a pharmacist (NSDHW, 2017a), a similar proportion to the 27.9% (95% CI:24.4-31.4) who received the vaccine reported by the NIICS (PHAC, 2018a). A recent study by Isenor et al. (2016) compared influenza vaccination rates in NS with influenza vaccination rates during five influenza seasons; three before pharmacists provided immunizations and two after this was permitted. They found an overall increase in the number of Nova Scotians who received the vaccine in the influenza seasons during which pharmacists participated as immunizers (Isenor et al., 2016). Though there was a decrease in the number of influenza immunizations given by MDs, it was a trend that began prior to introduction of the *pharmacists as immunizers* legislation. This further supports Isenor et al.'s conclusion that there was more than just a shift from vaccinations being given by MDs to pharmacists. The strengths of the study included the researcher's use of NS billing data, included the type of provider giving the immunization and was somewhat able to control for age (pharmacists cannot immunize children under five years) (Isenor et al., 2016). Isenor et al.'s conclusions were unfortunately weakened by the use of correlational data, and having only a small number of influenza seasons compared. As well, Isenor et al. reported that they used the chi square test but failed to report chi square values or significance. A larger analysis of the Canada-wide impact of pharmacists as immunizers based on a secondary analysis of eleven cycles of the annual Canadian Community Health Survey (CCHS) (2007-2014 cycles) compared provincial and territorial vaccination rates (Buchan et al., 2017). In this study, confounders and covariates such as pharmacists as immunizer legislation,

universal funding of the vaccine, age, sex, rural residence, and primary care provider status, were included in the analysis (Buchan et al., 2017). Que, the only jurisdiction in Canada to have neither legislation allowing pharmacists to vaccinate patients against influenza, nor universal funding covering influenza vaccination, was used as the reference group (Buchan et al., 2017). Despite declining influenza vaccination rates overall during the study years, researchers found that pharmacists as immunizers is associated with a 2.2% increase in self-reported provincial/territorial vaccination rates (Buchan et al., 2017). Residents of provinces with universal vaccination funding were more likely to be vaccinated, whether or not pharmacists were able to immunize against influenza (Buchan et al., 2017). These studies both lend support to the argument that an expansion of influenza vaccine availability will result in meaningful improvements to vaccination rates, rather than merely a shift in the location at which people received their vaccines.

2.5.3 Other locations

In NS, only 8.9% of those vaccinated during the 2016/2017 influenza season received their vaccine from a public health clinic or other provider (NSDHW, 2017a). This is similar to the nationwide results from the NIICS, in which 11.4% (95% CI:8.9-13.9) of respondents reported receiving their influenza vaccine from a "temporary vaccination clinic. A further 8.9% (95% CI:6.6-11.2) of NIICS respondents reported receiving that vaccine at work, 6.7% (95% CI:4.7-8.7) at the hospital and 2.1% (95% CI:1.2-3.1) at another location.

Though the influenza vaccination in the ED is not currently a routine practice, several implementation studies have been completed. In an attempt to find and compare

all past Canadian ED influenza vaccination programs, the PubMed database was searched using the terms “emergency department”, “vaccination program” and “Canada”. This search yielded two implementation studies of Canadian ED influenza vaccination programs. Studies describing two additional recent Canadian ED vaccination programs were found after discussion with QEII staff. The earliest program ran from November 6 – December 10, 1997, at Prince George Regional Hospital (PGRH), in Prince George, BC (Chiasson & Rowe, 2000). This program vaccinated 43% (n=49) of eligible (high risk) clients against influenza (Chiasson & Rowe, 2000). The next most recent program took place from November 1 – 30, 2001, during which time Pearson, Lang, Colacone, Farooki, and Afilalo, (2005) screened all clients at the Sir Mortimer B. Davis Jewish General Hospital (JGH) in Montreal, Que, for their eligibility (based on risk factors) for both the influenza and pneumococcal vaccine. 55% of clients (n=187) who were eligible for vaccination were vaccinated in the ED (Pearson, Lang, Colacone, Farooki, & Afilalo, 2005). However, both programs’ success involved a dedicated study nurse administering the vaccine (Chiasson & Rowe, 2000; Pearson et al., 2005). Taylor, Vu, Angelica, Elizalde, and Li-Brubacher (2018) implemented an influenza vaccination program following surveying a convenience sample of patients presenting from May 1 to August 31, 2015 at Vancouver General Hospital (VGH), in Vancouver, BC. Taylor et al. found that 83% patients surveyed were at high risk for complications of influenza, and that 53% of patients surveyed (55% among high risk patients) would accept influenza vaccination in the ED. In this program, EPs were required to screen patients and order the influenza vaccine, which nurses then administered, but Taylor et al.'s published paper focused on the pre-implementation survey and ED influenza vaccination rates were not reported. The

most recent study, entitled “HaliVax”, was completed by Flemming, Campbell, Fry, Isenor, and Van Zoost (2018) at QEII ED among a convenience sample of clients in contact with the ED pharmacy team between November 2015 and January 2016. 33% (n=28) of the ED clients approached were unvaccinated (Flemming et al., 2018). From this group, 64% (n=18) were subsequently vaccinated by the pharmacist (Flemming et al., 2018). However, vaccination screening was completed by the pharmacy team which currently does not work overnight, only has one pharmacist, and does not typically administer vaccines in the ED. None of these programs reported the number of people they vaccinated as a proportion of the overall provincial population, likely because volumes were so low. For example, the pharmacist participating in the HaliVax study administered 18 influenza vaccines, whereas in the Central Zone of NS 40,451 influenza vaccines were administered by pharmacists in the 2015/2016 influenza season (NSDHW, 2016).

2.6 Canadian Influenza Vaccination Behaviour

2.6.1 Lay public behaviour

National data on influenza vaccination status is collected through two Statistics Canada programs: The CCHS and the NIICS. The CCHS is a cross-sectional self-report survey of a sample of 130,000 Canadians over the age of 12, representative to the health region level (Statistics Canada, 2015a). The NIICS is a telephone survey of about 2000 adults (PHAC, 2018a). Despite public health authority dispensation of the vaccine, and support from HCPs and the public alike, no national data of absolute administration rates exists (MacDougall et al., 2015). At a provincial level, the NSDHW releases a yearly influenza immunization report based on provincial billing data for MDs and pharmacists,

as well as data from public health agencies, compared against 2011 census population data, NS Vital Statistics and NHSA/IWK records to calculate immunization rates (NSDHW, 2017a). Understandably, due to the varying sample sizes and data, discrepancies among the rates reported by each of these sources exist. The NIVCS report did not stratify immunization rates by province, but the CCHS did, reporting the NS vaccination rate as 48.5% (Statistics Canada, 2017), whereas the NSDHW (2017) reported the rate as 37.8% for the same season. As the sample size is much larger and not reliant on self-reports, provincial level data will be reported from the NSDHW data within this review.

As introduced in Chapter 1, 35.8% (95% CI: 33.5–38.1) of Canadians reported receiving their influenza immunization in the 2016/2017 influenza season (PHAC, 2018a). People who were pregnant were not among the high-risk groups highlighted in the 2016/2017 NIICS, but in NS only 17.5% of this group were vaccinated for this season (NSDHW, 2017a). Nationally, 69.5% (95% CI: 65.5–73.4) of those over 65 were immunized (PHAC, 2018a), slightly higher than the 64.1% of Nova Scotians over 65 years of age who were immunized (NSDHW, 2017a). At the other extreme of age, 26.5% (95% CI: 20.1–32.9) of Canadian children aged 6-59 months, and 37.8% of Nova Scotian children this age were immunized (NSDHW, 2017a; PHAC, 2018a). Neither the NIICS nor the NSDHW reported coverage rates for Canadians who are Indigenous, though a total of 1,498 Nova Scotians who live on reserve were vaccinated (NSDHW, 2017a). This number is thought to underestimate total coverage rates (NSDHW, 2017a). Among adults 18 to 64 years of age, with co-morbidities, the rate was 37.0% (95% CI:31.9–42.1), similarly to the rate in the total population (PHAC, 2018a). The rates for this high-risk

group were not reported by the NSDHW. Finally, among people who reside in long term care (LTC) facilities, no rate was reported by the NIICS however, in NS, 91.9% of LTC residents were immunized (NSDHW, 2017a). This was the only group for which the target rate for influenza vaccination was met (NACI, 2017).

2.6.2 Health care provider behaviour

The NACI asserts that if HCPs do not have a contraindication to the vaccine, the failure of HCPs to become vaccinated "implies failure in their duty of care to patients" (NACI, 2017, p. 26). Unfortunately, this attitude is not reflected within the actual vaccination rates of HCPs. In NS, only 43.5% of acute care staff and 48.1 % of long-term care staff & volunteers were vaccinated against influenza during the 2016-2017 influenza season (NSDHW, 2017a). The QEII ED is located within the Central Zone of the NSHA, where only 41.9% of staff were immunized, significantly lower ($p<0.05$) than the provincial average for HCP staff (NSDHW, 2017a). The QEII does not publicly report its immunization rates, and the provincial data is not stratified by health profession (i.e. there is no rate for acute care nurses, paramedics, physicians, etc. reported), thus those rates cannot be included in this review.

It is also prudent to discuss the vaccine administration behaviour of HCPs as well. In addition to surveys and focus groups with the public, MacDougall et al. (2015) surveyed 1167 Canadian HCPs regarding their attitudes and practices towards adult vaccine preventable diseases, including influenza. This survey included 202 nurses (10 from NS), 500 FP (18 from NS), 65 internists (3 from NS) and 400 pharmacists (22 from NS). It was not specified by MacDougall et al. whether they included registered nurses, licenced practical nurses or both in their study. As well, responses from FPs and internists

were reported in one category by MacDougall et al. Most HCPs offered the influenza vaccine (86.6% of nurses, 98.4% of MDs and 73.3% of pharmacists), although few had a systematic approach for identifying adults in need of vaccination (34.7% of nurses, 34.0% of MDs and 11.3% of pharmacists). In addition, few HCPs used children's appointments as a tool to vaccinate the adults who accompanied them (30.7% of nurses, 39.3% of MDs and 21.0% of pharmacists). In a survey of 38 Winnipeg ED MDs, the majority (56.8%) never offered influenza vaccination to their patients (Kapur & Tenenbein, 2000). From the research findings discussed in this section, it is clear that there are gaps in HCP behaviour both in terms of personal vaccine acceptance and in their roles as immunizers. This underscores why this proposed study plans to include both a client and HCP survey; both groups are essential to facilitating an improvement in influenza vaccination rates.

2.7 Attitudes Toward Vaccination

2.7.1 Lay opinion & reported influences

It is tempting to present the public discourse surrounding vaccination as a dichotomy between the Canadian health care system promoting evidence-based vaccines and a "naturalist" movement focused on opposing them, but it is not as simple as that. While a preference for a "natural" approach to immunity (i.e. immunity gained through becoming personally incidentally infected with a virulent strain of influenza) certainly composes a large part of this conversation (Bettinger, Greyson, & Money, 2016; MacDougall et al., 2015; Meyer & Lum, 2017), it is not the only perspective of Canadians who are hesitant to review vaccines. Upon review of the literature, several different perspectives regarding vaccine related decision-making arose. MacDougall et al.

(2015) hosted focus groups on influenza vaccination with 62 participants. Within these focus groups, three main themes were identified: trust vs. mistrust of vaccines, the importance of individual autonomy vs. one's duty to society, and logistical issues involved in getting vaccinated (MacDougall et al., 2015). Bettinger et al. (2016) conducted both surveys and focus groups with 34 pregnant and post-partum mothers. A major theme that arose in Bettinger et al.'s focus groups was risk; the idea of the flu as not being a risk to one's health and the vaccine containing risks, whether they be known side-effects or an unknown level of risk when compared to the "known" level of risk associated with acquiring influenza. Other ideas included the influential role of HCPs on client decision-making surrounding the matter, both in terms of supporting influenza vaccination or increasing hesitation, and frustration with the confusing/inconsistent messages guiding vaccination decisions (Bettinger et al., 2016).

In addition to the focus group results discussed above, MacDougall et al. (2015) surveyed 4023 Canadian adults on their vaccine decision making processes. Most adults surveyed believed that influenza had an important impact on adult health (84%), though only 60.1% believed that in could be prevented by a vaccine (MacDougall et al., 2015). The majority (77.4%) of those surveyed by MacDougall et al. had been offered an influenza vaccine, about half (52.8%) reported it was recommended by their HCP and 56.2% reported actually being immunized. Meyer and Lum (2017) conducted a large telephone and web-survey in the Waterloo region of Ont, and analysed the responses of the 304 respondents who did not receive their influenza vaccine in the previous year against the framework of the Conceptual Model of Vaccine Hesitancy, a multifactorial model of vaccine hesitancy that includes knowledge, past experiences, beliefs and other

contextual factors (Meyer & Lum, 2017) . The majority of respondents (57.2%, n=174) reported not prioritizing influenza vaccination as their reasoning for not being immunized. Religious and moral convictions (23.7%, n=72) and previous negative experiences with the vaccine (17.8%, n=54) comprise the other top reasons. The NIICS also asks patients their reasoning behind refusal of influenza vaccination. For all adults (n=1149), the top three explanations were: believing it was unnecessary for them, 48% (95% CI: 45.2-51.8); considering the vaccine ineffective: 19.2% (95% CI: 16.6-21.7); and a lack of time 15.1% (95% CI:12.5-17.6) (PHAC, 2018a). The NIICS allowed respondents to report multiple reasons for vaccine refusal but unfortunately only gave the responses as a percent of the total and only listed the top three responses. Of interest in this report was the perception that the vaccine was not recommended for them being the top reason for being unimmunized, even when NIICS responses from high risk adults: those chronic medical conditions (n=237) and/or over age 65 (n=174) were considered separately (PHAC, 2018a). Top motivating factors that prompted vaccination among all adults (n=848) were prevention of infection (44.6%, 95% CI: 40.8-48.5), workplace requirements (16.0%, 95% CI: 12.8-19.2), and habitual yearly vaccination (13.3%, 95% CI: 10.9-15.7) (PHAC, 2018a).

Of the four ED influenza vaccination programs discussed in section 2.5.3, only the JGH, VGH and QEII programs asked patients why they had not received their influenza vaccine that season (Flemming et al., 2018; Pearson et al., 2005; J. A. Taylor et al., 2018). Only the JGH program surveyed clients regarding program satisfaction following vaccination (Pearson et al., 2005). The VGH program was preceded by a survey in which a convenience sample of 254 were surveyed about their risk factors for

influenza and willingness to receive an influenza vaccine in the ED (J. A. Taylor et al., 2018). Of the patients surveyed, 83% were of high risk for complications of influenza, and only 53% of those patients would accept influenza vaccination in the ED, should it become available. An additional study was completed at a group of four Winnipeg, Man hospitals, in which a convenience sample of 473 clients were surveyed regarding their willingness to be vaccinated in the ED, as well as their reasons for refusal (Kapur & Tenenbein, 2000). 59.3% of those unvaccinated patients surveyed by Kapur & Tenenbien were willing to receive the influenza vaccine in the ED. When responses explaining influenza vaccine refusal are pooled across four surveys, the top reasons were the perception that they did not need the influenza vaccine or were not high risk (34%, n=92), a concern regarding potential side effects (23%, n=61), a reason not specified (20%, n=55), feeling unwell (13%, n=35) and a desire to discuss the influenza vaccine with their primary care provider (11%, n=29) (Flemming et al., 2018; Kapur & Tenenbein, 2000; Pearson et al., 2005; J. A. Taylor et al., 2018). A major limitation is that the JGH, VGH, and Winnipeg studies only asked clients who were unwilling to be vaccinated in the ED their reasoning for refusal, missing the opportunity to capture a full picture of the rationale behind their unvaccinated status. It is once again important to highlight the discrepancy between perception of risk and high risk status. In the Winnipeg and JGH studies, high risk status was part of the inclusion criteria for vaccination status screening (thus all responses explaining reason for vaccine refusal were from patients at high risk of influenza complications) (Kapur & Tenenbein, 2000; Pearson et al., 2005). In the more recent VGH and HaliVax studies, 83-88% of all patients surveyed were high risk for influenza (Flemming et al., 2018; J. A. Taylor et al., 2018).

A content analysis of nine years of Ont newspaper coverage by Meyer et al. (2016) for risk messages regarding the influenza vaccine found that the most common messages communicated were that the vaccine was ineffective, not scientifically well-understood, and that it caused harm. Interestingly, Meyer et al. found that there was a significant positive correlation ($r = .691$, $p < .05$) between the frequency of risk messages and influenza vaccination rates for Ont though one would expect risk message about the vaccine to be associated with fewer vaccinations. However, the top self-reported sources of information about the influenza vaccine reported to the NIICS were HCPs (46.9%, 95% CI: 42.9-50.9), friends (21.1%, 95% CI: 17.7–24.4), and co-workers/employer (17.3%, 95% CI: 14.1–20.5). Thus despite the correlation, it is difficult to make conclusions regarding the true impact of the media on vaccination rates.

Though not a highly reported reason for vaccine refusal in the studies discussed above, discomfort from the injection can also be a barrier to immunization. 5.9% (n=7) of those refusing influenza vaccination rates at the VGH ED stated it was because receiving immunizations were uncomfortable. Furthermore, concerns regarding pain and discomfort may be buried within other reasons. In the previously discussed survey of 304 Ont adults by Meyer and Lum (2017), unspecified "past experience with a previous vaccination" composed 14.5% (n=54) of responses explaining lack of influenza vaccination. A survey of a convenience sample of 883 adults and 1024 children at the Ont Science Centre also found that 24% of adults and 63% of children surveyed were afraid of needles (Taddio et al., 2012). This was the main reason for avoidance of immunizations in 7% of adults and 8% of children (Taddio et al., 2012). Though this survey was not specific to influenza immunizations, the results nevertheless add to

understanding of the complex reasons influencing vaccination attitudes and behaviour. These varied motivators and barriers expressed by the public will be integrated into the proposed survey for the client group, to be discussed in detail in Chapter 3 of this proposal.

2.7.2 Health care provider opinion

Several of the studies assessing public influenza vaccination attitudes discussed in the previous section also elicited HCP opinions. In MacDougall et al. (2015)'s survey results of HCP respondents, almost all HCPs believed influenza had an important impact on adult health (96-99.1% of respondents). Among MacDougall et al.'s results there was a difference of opinion regarding the belief that influenza could be prevented by a vaccination, with 94.3% of MDs and 87.8% of pharmacists but only 76.7 % of nurses agreed with this statement. There was variation as well in HCP opinion of reimbursement; the largest proportion of responses among MDs and pharmacists (43.7% and 52.3% respectively) either agreed or strongly agreed they were not sufficiently reimbursed to justify offering adult immunization (MacDougall et al., 2015). In contrast, 45% of nurses either disagreed or strongly disagreed, and a further 42.6% felt neutral towards their level of compensation for vaccination (MacDougall et al., 2015). Time available for vaccination was another source of variation in MacDougall et al.'s results. More than half of nurses and MDs reported they had enough time to vaccinate adults, but only 30.8% of pharmacists reported the same. Additionally, 45 HCPs participated in focus groups, and the same themes of trust vs. mistrust of vaccines, the importance of individual autonomy vs. one's duty to society, and logistical issues involved in getting the vaccine emerged in the HCP focus groups as emerged in MacDougall et al.'s public

focus groups. Some HCPs reported the perception that the NACI guidelines for adult vaccination were based on opinion, rather than peer-reviewed research (MacDougall et al., 2015). The dissent in opinion between different professions noted in MacDougal et al.'s results is the reason why the proposed study will survey MDs, RNs and paramedics at the QEII ED.

Of the four implementation studies and one survey of Canadian ED influenza vaccination, only the JGH program and Winnipeg survey solicited MD opinions on the role of the ED in Influenza vaccine programs. None solicited opinions from nurses or paramedics. Due to this gap, this review was expanded to include literature from the United States of America (US). A survey of nurses' opinions following the implementation of an influenza vaccination program from October 1-25, 2009 at Allegheny General Hospital, Pittsburgh, Pennsylvania was completed (Venkat et al., 2012). Venkat et al. (2012) present their study as the only one investigating ED nurses' experiences in implementing an influenza vaccine program. One theme that emerged from both MDs and nurses was the idea of time constraints (Kapur & Tenenbein, 2000; Venkat et al., 2012) and the idea that a preventative intervention is "not the role" of an ED (Kapur & Tenenbein, 2000; Venkat et al., 2012). Other concerns that have arisen among EPs regarding prescribing the Influenza vaccine are discomfort with potential side effects (Kapur & Tenenbein, 2000; Pearson et al., 2005) and concerns regarding the potential to repeat vaccination in someone who has already been vaccinated (Kapur & Tenenbein, 2000). Of the 38 EPs surveyed by Kapur and Tenenbein, (2000), 76.3% would be willing to order influenza vaccination for their patients. Among nurses specifically, there were concerns about having extra work put upon them by the screening

process (Venkat et al., 2012). This study's findings provide some insight into issues that may arise among nurses in a Canadian ED context, but with so many significant differences between the Canadian and US health systems, the importance of initiating Canadian research on this topic is stressed. Within the studies completed in Canada, there are large gaps in both HCP and client perceptions of influenza vaccination programs. It is interesting to note that while ED HCPs expressed concern that there was inadequate time for vaccination, the same concern was expressed by primary health care providers in explaining why they do not routinely discuss vaccination with their patients (MacDougall et al., 2015).

This proposed study hopes to fill the gap in Canadian literature regarding nurse and paramedic opinions of ED influenza vaccination programs. It is evident that a lack of time is a general concern shared by HCPs in several settings (Kapur & Tenenbein, 2000; MacDougall et al., 2015; Venkat et al., 2012). However, the nuance behind this concern is largely absent. ED nurses, paramedics and EPs complete many tasks in the course of their busy shifts and furthermore, find time to integrate tetanus prophylaxis as needed. The HCP surveys for this proposed study will focus on HCP evaluation of both the merits of the ED influenza vaccination as an idea, but also separately consider it's feasibility at the QEII, to be discussed in further detail in Chapter 3

2.8 Theoretical Underpinnings

2.8.1 Health Belief Model

Two different theories underlie this proposed research; the Health Belief Model (HBM) and the Promoting Action Research in Health Sciences (PARiHS) framework. The HBM was initially developed by Irwin M. Rosenstock in 1966 to help specify

several constructs that facilitate HCPs to better understand why the public may or may not undertake particular preventative health behaviour. In its original form, the HBM has six major components: perceived seriousness, susceptibility, benefits vs. barriers, modifying factors, and cues to action (Rosenstock, 1966). The constructs of perceived seriousness of a condition and perceived susceptibility to said ailment combine to inform the "perceived threat" a particular disease has to a person (Rosenstock, 1966). The level of threat of a particular disease perceived by a client is further informed by such modifying factors as demographics (i.e. age, gender, etc.) and sociopsychological variables (socioeconomic status, social norms, etc.) (Rosenstock, 1966). It is also influenced by "cues to action"; such as the media or a conversation with an HCP. Modifying factors additionally inform a person's understanding of the barriers vs. benefits of taking action (Rosenstock, 1966). Both barriers vs. benefits and perceived threat of disease are what the HBM considers to then influence a person's likelihood of actually taking the preventative action (Rosenstock, 1966). In the context of this proposal, preventative action would entail receiving their influenza vaccination. In 1975, researchers Becker and Maiman proposed some modifications to the HBM by expanding on the concepts of perceived susceptibility/seriousness as well as perceived benefits vs. barriers. These ideas were reorganized under the heading of "readiness to undertake recommended compliance behaviour", and re-named as: "motivations", "value of Illness threat reduction", and "probability that compliant behaviour will reduce the threat" (Becker & Maiman, 1975). "Readiness" factors were considered to interact dynamically with an expanded list of "modifying and enabling factors" (Becker & Maiman, 1975). These "modifying and enabling factors" then determine how likely a person would be to

undertake a particular health behaviour (Becker & Maiman, 1975). Finally, the concept of "self-efficacy" was added later by Rosenstock, Strecher, & Becker (1988) and refers to one's confidence in their ability to successfully preform a particular behaviour. Please see Appendix B for a visual representation of the original and modified HBM.

The HBM was chosen to guide the client portion of this research because it focuses on personal health behaviour choice and posits that a cue to action such as ED influenza availability, has the potential to be an influence on health behaviour. Perceived susceptibility to and severity of influenza, as well as perceived barriers to vaccination have been found to be the aspects of the HBM most predictive of influenza vaccine behaviour (Santos, Kislaya, Machado, & Nunes, 2017). These constructs furthermore encompass much of the reasoning for not getting an influenza vaccination as reported by the Canadian public within the literature discussed in Chapter 2.

2.8.2 Promoting Action on Research Implementation in Health Services Framework

The PARiHS framework is the second conceptual framework that underlies this proposed research. It was initially developed in 1998 by United Kingdom nurse researchers Kitson, Harvey, and McCormack as an approach to guide successful implementation of evidence based practice into the clinical setting. It is considered a practical and conceptually valid model of organizational change (Kitson et al., 2008). PARiHS considers successful implementation of change, such as a novel influenza vaccination program to be a result of the quality of the supporting evidence, context of the setting, and of the way the change is introduced (Kitson et al., 1998). This approach was in contrast to its contemporary models of organizational change, which focused on

the strength of the evidence as the primary influence (Kitson et al., 1998). Within this proposed research the PARiHS framework is being used in conjunction with the HBM. Similar to the HBM, the PARiHS framework considers behaviour change. However, unlike the HBM's focus on personal health behaviour change, the PARiHS framework instead deconstructs the factors influencing or impeding HCPs from professional behaviour change, namely integrating a new health intervention into their clinical practice. Please see Appendix C for a visual representation of the PARiHS framework.

As introduced above, the three main constructs of the PARiHS framework are evidence, context and facilitation. An evaluation of the strength of the evidence and receptiveness of the context as either weak or strong, will be used to identify the method of facilitating change best suited to introduce the change one is trying to achieve (Kitson et al., 2008). Within this framework, evidence is defined broadly to include empirical evidence, clinician opinion, and client preferences (Kitson et al., 1998). In reference to empirical evidence, "strong" evidence refers to randomized controlled trials/systematic reviews. In reference to clinician opinion, "strong" evidence would be a consensus of opinion among clinicians. Finally, in terms of client preferences, "strong" evidence refers to an initiative created in partnership with clients (Kitson et al., 1998). The existing empirical evidence for this proposed research has already been discussed in Chapter 2. The responses provided on parts of the HCP questionnaire will provide the clinician opinion aspect of the evidence. The results of the client questionnaires will provide the client preference piece. The context aspect of the framework is more complex, as within the original PARiHS model, it is defined to include culture, leadership and measurement (Kitson et al., 1998). Measurement has was renamed evaluation during a revision of the

framework (McCormack et al., 2002). A “strong” context is one that is receptive to change, and requires a culture of clearly defined roles and a focus on values over tasks (McCormack et al., 2002). It also encompasses leadership that supports effective team work and inclusive decision making, and multiple methods of evaluation at the individual, team and hospital level (McCormack et al., 2002). A thorough assessment of the culture at the QEII ED is beyond the scope of this research; however, the HCP questionnaire will provide information on some aspects of this, specifically defining roles and willingness to change. This, and other specifics of design, sampling and methodology, will be discussed in further detail in the next chapter.

Chapter 3: Design and Methods

3.1 Design

The study involved a prospective, cross-sectional survey design to assess interest and feasibility of an ED influenza vaccination program as a way to increase influenza vaccination uptake among low acuity clients at the QEII. Data was collected via two short (fifteen to sixteen question), anonymous, self-administered questionnaires; one tailored for ED clients and the other for ED HCPs. The study period was planned for October 15 – December 14, 2018. The study length was chosen to ensure an adequate length of time to recruit a meaningful sample size, though modifications occurred due to the limitations of when ethics approval was obtained as well as RA availability (discussed in further detail later in this chapter). The timing was chosen as it is prior to the beginning of the annual Canadian flu season.

As previously described in the study objectives (see Chapter 1), each questionnaire was designed to capture the perceived barriers and facilitators to influenza vaccination of low acuity ED clients. As discussed in Chapter 2, the Health Belief Model (HBM) and Promoting Action on Research Implementation in Health Services (PARiHS) framework will provide the theoretical basis for this research. The HBM is a theory that attempts to explain reasoning behind health behaviour uptake at a personal level and will subsequently be used to guide the aspects that focus on ED client opinions. The PARiHS framework, a model assessing organizational readiness for change, will be used to guide aspects focused on the HCPs in the QEII ED. The HBM and the PARiHS framework, in combination, be used in Chapter 5 to assess readiness for change and perceived value/support of change. This chapter will discuss the inclusion/exclusion criteria,

expected sample size, details of planned data collection, instrumentation, planned data analysis, , and ethical considerations.

3.2 Inclusion/Exclusion Criteria and Sample Size

3.2.1 Client participants

Client participants were recruited from a convenience sample of patients who registered at the QEII ED from October 28 – December 12, 2018, between the hours of 9am and 5pm. No data was collected on December 10 or 11 due to a technical issue that caused RedCap to shut down. This study had funding for an RA to be present eight hours per day for data collection, and these hours, on average, are the busiest [D. Urquhart, personal communication, August 8, 2018]. Inclusion criteria for clients included: presenting to the ED within the study period with a low-acuity concern, as defined by a Canadian Triage and Acuity Scale (CTAS) score of 4 or 5, age 18 years or over, and able to communicate in English. Clients who were returning for a second low-acuity presentation within the study period were excluded. As defined by the Canadian Association of Emergency Physicians (CAEP) (2013) CTAS guide, patients scored as 4 or 5 should be medically stable and free of severe acute pain (i.e. pain self-rated as 8/10 or greater). As well, to receive a CTAS score of 4 or 5 patients must also have normal vital signs; they may have a fever or elevated blood pressure as long as they are otherwise free of abnormal signs and symptoms (i.e. if they have a fever or high blood pressure, they are free from severe headache, general malaise, decreased level of consciousness etc.) (CAEP, 2013).

The QEII ED received 207 visits per day on average in 2017 (NSHA, 2018a). Based on visit data from July 2005 to July 2017, 46.93% of patients present between

0900 and 1700h [D. Urquhart, personal communication, August 8, 2018]; an average of 97 patients daily during these hours. Further assuming that 24% of clients (23 per day) would be low-acuity (as in the fall of 2016) (CZESC, 2016), it was estimated 1403 patients would be eligible for inclusion in this study. Based on the low response rates generally expected from questionnaires (Polit & Beck, 2017), the goal was a 50% response rate; a sample size of about 700. Though similar ED questionnaires (discussed in Chapter 2), ranged from 67-76% (Field & Lantz, 2006; Kapur & Tenenbein, 2000; J. A. Taylor et al., 2018), the usual expected response rates for surveys are much lower. The actual number of low-acuity clients who presented during the 42-day actual study period was 666, 15 clients per day. This, as well as the actual response rate will be discussed in further detail in Chapters 4 and 5. Demographic data collected in the questionnaire will be used to ensure the sample population is comparable to the overall low-acuity ED population (Chapter 5).

3.2.2 Health care provider participants

HCP participants were a convenience sample of HCPs who currently work at the QEII ED. Inclusion criteria included: employment as a physician (staff EP, Royal College of Physicians and Surgeons Emergency Resident or Canadian College of Family Physicians Emergency Medicine Certificate residents), registered nurse (RN), or paramedic (primary, advanced or critical care) in the QEII ED during the study period. Learners, such as resident physicians from other services, nursing students and paramedic students, were excluded as their tenure is often short and transient. Additionally, the ED pharmacist was not be included as there is only one pharmacist working with the ED and

so, anonymity would be compromised as participants are asked to declare their profession on the questionnaire.

There are approximately 45 EPs, 16 emergency medicine residents,112 registered nurses (full time, part time and casual), and 48 paramedics currently working at the QEII ED, resulting in about 219 potential respondents. A 70% response rate was the goal for the HCP group; a sample size of 153. This goal is based on a study previously discussed in Chapter 2. Kapur and Tenenbein (2000) obtained a 70% response rate to their 1996 mail-in ED influenza vaccination questionnaire of Winnipeg-area EPs. Multiple strategies were used during data collection to try to meet this goal, and are described in detail in a subsequent section of this chapter. The actual response rate for HCPs is presented in Chapter 4.

3.3 Data Collection

3.3.1 Client participants

When clients arrive to the QEII ED, they are first triaged by a triage nurse and then proceed to "Registration", where a data processing clerk (DPC) reviews their contact information and prints their chart for HCP staff to use. After being registered, clients return to the waiting room until they are ready to be seen, with some patients waiting in the main waiting room and most low-acuity patients waiting in an additional waiting area near Pod 5. For the initial 30 days of the study, only registration DPCs were asked to introduce the study to low-acuity clients. However, due to the busy nature of all staff positions at the QEII ED, the proposal was amended (starting day 31) to diffuse the responsibility of recruitment across several staff members who normally interact with low acuity patients. Registration DPCs and Pod 5 paramedic staff were then both asked to

introduce the study to low-acuity clients and provide those who are interested in participating with a coloured card to indicate to the RA that they are interested in participating. Both of these staff roles have access to client CTAS score, age and most recent visit date as part of their regular duties and will not invite patients to participate who do not meet inclusion/exclusion criteria. DPCs introduced the study to low-acuity clients following registration, and Pod 5 paramedic staff introduced the study as appropriate within their interactions with clients. It was essential that multiple staff share the responsibility of recruitment, as different staff roles become prohibitively busy at times when other staff roles are less busy (i.e. if many patients have been triaged and are waiting to be registered, the DPC may feel they do not have time to mention the study, but the Pod 5 paramedics may have fewer patients waiting and would feel they have time to introduce it). The RA then approached patients with an iPad on which they could complete the survey independently. The RA was available to answer any questions participants had. The clients eligible for inclusion then had the opportunity to complete the questionnaire while waiting to be called in for care or reassessment. The questionnaire was planned not hold up treatment or extend visit time. The iPad in use by the RA was set up to directly input data into RedCap. RedCap is a secure online survey tool that stores data on NSHA servers.

3.3.2 Health care provider participants

Multiple data collection strategies were used to collect data from HCP participants. It was made clear on the survey that it is only to be completed once. The first strategy was electronic; HCPs had the questionnaire emailed to them with a cover letter and a link to an online questionnaire stored on RedCap. Additionally paper

questionnaires were made available in the staff-only hallway outside the staff lounge, as this was potentially easier for some busy HCPs who may have been unable to review their emails during the study period. A locked drop box was located in the same area for HCPs to return completed questionnaires. Posters were displayed in staff-only areas of the ED to notify HCPs about the questionnaire. These posters were amended on November 27 to include a link to the online version of the survey, in an effort to boost recruitment. It was planned that an RA would attend a physician meeting (November 14), resident lecture (October 31), an RN education/skills day (October 21) and paramedic education/skills day (Date TBD) with an iPad staff could use to complete the survey electronically on RedCap. Ultimately the RA only collected data during the November 14 physician meeting. Staff will had the opportunity to enter their name in a draw for a small honorarium (one of four $10 Tim Hortons gift card; two for nursing participants and one each for physician and paramedics) as an incentive for participation. Snacks (i.e. a box of cookies) were available at the HCP questionnaire drop box in the final week of the study period as an additional attempt to increase recruitment among staff.

3.4 Instrumentation

3.4.1 Client questionnaires

The client questionnaire contained a mix of fifteen multiple choice, yes/no and Likert-style questions, with one short answer question. It was divided into three sections: demographics, influenza vaccine opinions and influenza vaccine behaviour. A selection of the questions are discussed below. For a full copy of the client group questionnaire, please refer to Appendix D. The first section collected demographics information (gender, age, access to primary care providers, chronic health concerns) similar to what

was collected on previous Canadian ED Influenza vaccine programs and questionnaires (Chiasson & Rowe, 2000; Kapur & Tenenbein, 2000; Pearson et al., 2005). Collecting similar information from the client group in this proposed study was done to make it easier to compare the population to that of past studies, as well as the overall QEII ED population. Question one, which enquires about current gender identity, was modified from the Multidimensional Sex/Gender Measure, a trans-inclusive measure of capturing gender on population questionnaires (Bauer, Braimoh, Scheim, & Dharma, 2017). Question two, which asks about client age, provides age ranges from the Nova Scotia Department of Health and Wellness (NSDHW) data sets (NSDHW, 2018c). The response options for question three, which asked clients to identify their chronic medical conditions, were based on the conditions that increase risk of influenza complications identified by the NACI (2017).

The content of the second section of the client questionnaire aimed to discern if vaccine mistrust, a literature-identified barrier to influenza vaccination (MacDougall et al., 2015), is a barrier for QEII ED clients. This is related to the study's secondary objective to explore barriers and facilitators to influenza vaccination expressed by clients. The questions were modified from the Parental Attitudes About Childhood Vaccinations (PACV) short scale, a validated measure of vaccine hesitancy (Opel et al., 2011). The PACV has been used in the pediatric ED setting to capture parental attitudes regarding the influenza vaccine (Strelitz et al., 2015), and was modified to ask clients about their opinions regarding receiving the influenza vaccine themselves. Clients were asked to rate their agreement with several statements (ex "Adults get more vaccines than they need") on a five-point Likert-type scale.

The final section contained questions focused on both the secondary and primary objectives of the study. This section asked whether clients received last year's influenza vaccine, and what the reasoning behind their decision was. Multiple choice options to explain influenza vaccine decision making were provided. These options were based on the responses given in past ED and general influenza vaccine questionnaires, as previously discussed in Chapter 2. The thirteenth question relates to the primary objective of assessing client interest in ED influenza vaccination. Specifically, the question asked patients if the influenza vaccine were available at the ED, whether they would be willing to get immunized against influenza during their ED visit. The sixteenth and final question gives the respondents a space to include any final comments they have about receiving the influenza vaccine.

3.4.2 Health care provider questionnaires

As described for the client questionnaires, the HCP questionnaires also contained a mix of twelve multiple choice, yes/no, and Likert-style questions, with one short answer question. It was divided into three sections. See Appendix E for the full copy of the HCP questionnaire. The first section of the questionnaire consisted of four questions eliciting professional information, as well as gender. HCPs were asked to identify their professional role at the QEII ED, the number of years they have worked in their profession and the number of years they have worked at the QEII ED. Question four asked HCPs to rate their experience with trying new approaches to clinical care on a 5-point Likert scale from "Very difficult" to "Very easy".

The second section of the questionnaire assessed HCP's evaluation of the evidence both for influenza vaccination in general, and in the ED setting. Questions were

chosen to support both the primary objective of determining the level of support for ED influenza vaccination, as well as the secondary objective of identifying barriers and facilitators. The section began with a short lead-in paragraph that provided the influenza vaccination rate for the general population of NS, vs. what has been achieved in past ED immunization programs. Question five asked HCPs if they received influenza vaccination in the previous year. In question six, respondents were asked to identify which groups they believe should receive the influenza vaccine from a list of target groups. The target groups are based on the NACI (2017) list of groups for whom influenza is particularly recommended (i.e. people who are pregnant, those over the age of 65, etc.). The final question of this section asked staff about their theoretical support for ED influenza vaccination ("If time and resources were not a concern, do you think influenza vaccination should be available to ED patients?").

The third and final section of the HCP questionnaire included questions assessing HCP perceptions of the QEII ED, as a setting for influenza vaccination. Staff were given information about the vaccination rate achieved by the HaliVax PIIE pilot in 2016/2017, then asked to answer several multiple-choice questions related to the logistics of influenza vaccination at the QEII ED. These work-flow questions asked HCP opinion on when to screen clients for immunization status, when to immunize them, and where their vaccination status should be charted. HCPs were also asked about their support for ED influenza vaccination in the context of the QEII ED ("Based on our current staffing and resources, do you think influenza vaccination should be made available to QEII ED patients?").

3.5 Data Analysis

3.5.1 Client participants

Questionnaires collected electronically were input directly into RedCap. Data from RedCap can be exported to Excel. Exported data was stored in an encrypted and password protected files. Descriptive statistics will be calculated using SPSS statistical software version 24. More specifically, the demographic data collected from the client group (age, gender) will be presented with the known demographics of users of the QEII ED overall to ensure the sample is similar to the population. The *a priori* plan for data analysis was a chi square test to compare the proportion of unvaccinated clients who *would* accept influenza vaccination in the ED to those who *would not*. Post-data collection, additional chi square tests were performed comparing the association between 2017/2018 vaccination status and client risk factors, access to primary care, and level of agreement with the vaccine hesitancy statements modified from the PACV short-scale. Frequencies of client-reported motivations to receive or not receive the influenza vaccine will also be reported.

3.5.2 Health care provider participants

Electronically collected data for HCP group was exported from RedCap as described for the client group. As previously noted, all paper questionnaires were entered electronically into RedCap, by the principal investigator (NO) (ongoing throughout data collection). RedCap assigned all responses a "respondent ID" number. Once entered into RedCap, paper questionnaires were marked with their corresponding respondent ID and stored sequentially. The list of respondent IDs that corresponded to paper questionnaires was maintained by (NO). Following initial data entry, secondary checks were completed

on a random sample (chosen by random number generator using respondent IDs) of approximately 10% of questionnaires to ensure accurate data entry. This review was done by an RA comparing the original paper copy of the questionnaire to its electronic entry and making note of data entry errors. If a substantial number of data entry errors were noted, then NO will review the rest of the manually-entered questionnaires. Professional information (frequencies from each profession, years of experience in their profession, years working in the ED, etc.) will be presented alongside departmental information to ensure the sample is similar to the QEII ED population of staff physicians, nurses and paramedics in Chapter 4. Due to the gender disparities in certain professions (i.e. most nurses at the QEII ED are women), that would cause respondents to be potentially identifiable, gender will not be presented in combination with other identifiers (e.g. responses from nurses will not be broken down into those from male vs. female nurses). To answer the second research question of QEII HCP opinion on the merit and feasibility of an ED influenza vaccination program, descriptive statistics will be presented (e.g. number of HCPs who support ED influenza vaccination in general, number who support it at the QEII, etc.). After the data had been collected, an additional chi square test comparing HCP-reported ability to change and support for ED influenza vaccination was run. As well as a chi square test of the logistic preferences for when to vaccinate clients by profession was also run. These HCP opinions will be discussed in the context of the PARiHS framework in Chapter 4

3.6 Ethical Considerations

Ethics approval was obtained through the NSHA Research Ethics Board prior to initiation of the study (ROMEO file #1023927). This study exposed clients to no more

than the usual risk of visiting or working at the ED. There was no direct benefit to participation, but there will be potential future benefits for other ED clients/HCPs should the insights gained improve service delivery. For both groups, the questionnaires were anonymous, and clients had the option of not handing in their questionnaire if they chose not to participate. The principal investigator (NO), and supervising investigator (AS) are casual staff nurses in the QEII ED. Questionnaires were anonymous, and neither NO nor AS administered the questionnaires in person, thereby avoiding a conflict of interest. NO's employment in the QEII ED was made clear on the cover letter of the questionnaires, and many ED staff members were already aware of her enrolment in graduate studies and intention to complete research in the QEII ED. Additionally, neither NO or AS completed a questionnaire.

As described above, electronic data was initially be stored securely in RedCap. When exported for data analysis, the file was encrypted and password protected. These files will be stored on a USB key, in a locked filing cabinet in a locked office at Dalhousie University. Paper questionnaires were stored in locked boxes in the ED during data collection. Once collected for data entry, they were stored in a locked filing cabinet in a locked office at Dalhousie University. As per NSHA Research Ethics Board policy, paper questionnaires will be physically destroyed by (AS) by shredding after the seven year retention period. The USB key will also be physically destroyed by AS after seven years.

Chapter 4: Results

This chapter will present the results for both the client and HCP survey. More specifically, it will present client demographics, level of interest in ED influenza vaccination, and barriers/facilitators to influenza vaccination (including demographic factors, beliefs about influenza, and self-reported reasoning behind influenza vaccination decision making). For the HCP participants, this chapter will present their professional information/demographics, their expressed preferences for/against ED influenza vaccination, and barriers and facilitators to vaccinating ED clients (including ease of making practice changes, logistical preferences for vaccine administration, and knowledge of NACI recommendations).

4.1 Client Results

4.1.1 Demographics (Client Survey)

Of the 666 patients that presented during the study period (October 28-December 12, 2018), there were 151 client responses (response rate 23%). Twenty-five clients were excluded due to age (i.e., under 18 years of age (based on Emergency Department Information System [EDIS] data); there is no record made of the number of clients who were excluded for other reasons, refused to participate, or were not approached at all. The majority of respondents were female (n=80, 53%), aged 20-44 (n=62, 41.1%), currently had a primary care provider (n=114, 75.5%) and identified no chronic health concerns that put them at high risk of complications from influenza (n=117, 77.5%), based on NACI criteria (NACI, 2017). See Table 1 for full summary of client demographics.

Table 1
Demographics of Client Participants

	n	%
Gender		
Female	80	53.0
Male	68	45.0
Something else ex: gender fluid, non-binary	3	2.0
Total (*N*=151)	151	
Age (years)[†]		
18-19	13	8.6
20-44	62	41.1
45-64	51	33.8
65+	22	14.6
Prefer not to answer	3	2.0
Total (*N*=151)	151	
Do you have a main doctor or nurse practitioner you see regularly?		
Yes	114	75.5
No	36	23.8
I do not know	1	0.7
Total (*N*=151)	151	

	n	%
Chronic medical concerns[ǂ]		
No NACI high risk medical concerns	117	77.5
Lung disorders	14	9.3
Metabolic disorders	7	4.6
Immune compromising conditions	5	3.3
Anemia	4	2.6
Heart disorders	4	2.6
Morbid obesity	4	2.6
Brain/Neurodevelopment conditions	3	2.0
Hemoglobinopathy	2	1.3
Kidney disease	0	0.0
Total (*N*=151)	160	

†Age ranges adapted from Nova Scotia Department of Health and Wellness (NSDHW) statistical tables (NSDHW, 2018).

ǂ Clients were allowed to report multiple chronic medical concerns.

4.1.2 Public Interest in ED influenza vaccination

The primary objective of the client survey was to gauge public interest in ED influenza vaccination, as expressed by low-acuity (Canadian Triage and Acuity Scale [CTAS] 4/5) QEII clients. A chi square test was done to compare the proportion of clients who would and would not accept vaccination if it were available during their ED visit, by their 2017/2018 vaccination status (Figure 1). Clients who were vaccinated in 2017/2018

will be referred to simply as "vaccinated" for the purpose of this chapter and the discussion in Chapter 5. Similarly, clients not vaccinated in 2017/2018 will be referred to as "unvaccinated". Additionally, clients who responded "I am not sure" to their vaccination status were grouped with those that were not vaccinated, while clients who responded "I am not sure" to whether or not they were willing to receive the influenza vaccine in the ED, were included with those who would refuse ED influenza vaccination. Appendix F includes a full summary of client reported vaccination status (Table F1), and willingness to accept ED influenza vaccination (Table F2).

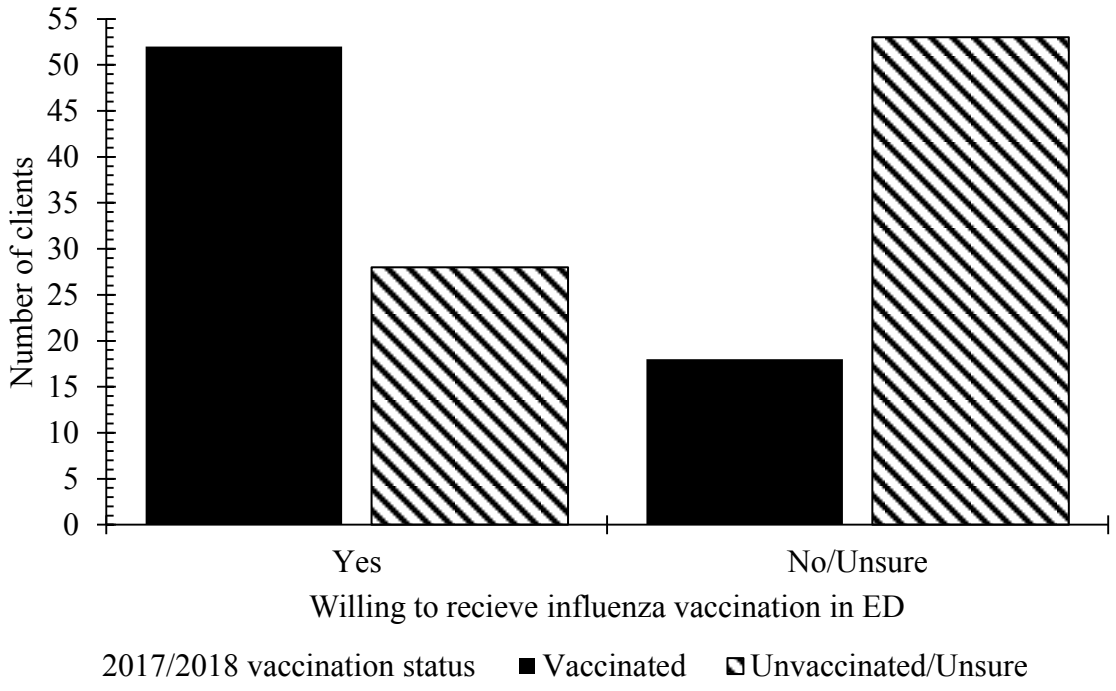

Figure 1. Client willingness to receive influenza vaccination in the ED, by vaccination status

The proportion of clients who *were willing* to receive vaccination in the ED and were unvaccinated (35.0%) was lower than the proportion of people *not willing* to receive vaccination in the ED who were unvaccinated (74.6%), and this was significant

(p<0.0001) (Table 2). Overall, there was a significant[1] association with previous year vaccination status and willingness to receive vaccination in the ED ($\chi^2(1)= 23.778$, p= 0.000001). Cramer's V was also significant at V(1)=0.397, p= 0.000001, indicating a medium effect size. Based on the odds ratio, clients who had been vaccinated in the previous year were 5.38 times more likely to be willing to receive vaccination in the ED than those who were previously unvaccinated.

Table 2
Chi square analysis of willingness to receive influenza vaccination in the ED, by vaccination status

	ED influenza vaccine opinion							
	Willing to receive		Not willing		Total			
2017/18 status	n	%	n	%	n	df	χ^2	p
Vaccinated	52	65.0**	18	25.4**	70			
Unvaccinated	28	35.0**	53	74.6**	81			
Totals	80		71		151	1	23.8	0.000001

Note. Clients who responded "I am not sure" to their previous vaccination status were considered to have not been vaccinated. Clients who responded "I am not sure" to whether or not they were willing to receive the influenza vaccine in the ED were included with those who would refuse ED influenza vaccination.

****** Column proportions for vaccinated and unvaccinated clients within this response are significantly different at the p<0.0001 level

[1] Chi square test results significant at p≤0.005 (Bonferroni correction for Type I error inflation over ten tests).

4.1.3 Barriers and Facilitators to Influenza Vaccination

4.1.3.1 Demographic factors

The two main demographic factors of interest in relation to influenza vaccination status were risk factors for influenza complications, and access to primary care. A chi square analysis was done to compare the number of clients with and without risk factors (age over 65 years and or one or more high-risk chronic medical concern, as discussed in Chapter 1), by vaccination status. Three participants did not identify their age and were therefore, not included in the analysis. There was a significantly higher proportion of *unvaccinated* clients with no risk factors (77.2%) than *vaccinated* clients with no risk factors (58.0%), p=0.012. If a client reported risk factors for complications of influenza, they were 2.5x more likely to be vaccinated than a client who did not, based on the odds ratio. Overall, there was no significant association between risk factors and 2017/2018 vaccination status, $\chi^2(1) = 6.3$, $p = 0.01$ (Table 3).

A chi square analysis was also done comparing access to a primary care provider with vaccination status in the previous year. Only one client was unsure if they had access primary care, and subsequently was included with clients who did not have a primary care provider. The proportion of *vaccinated* clients who had a primary care provider was significantly higher (85.7%) than the proportion of *unvaccinated* clients with a primary care provider (66.7%), p=0.007. If a client had a primary care provider, they were 3.0x more likely to have been vaccinated, than those without access, based on the odds ratio. Overall, there was no significant association between primary care provider access and 2017/2018 vaccination status $\chi^2(2) = 7.4$, $p=0.007$ (Table 3).

Table 3
Chi square analysis of demographic factors by 2017/2018 vaccination status

	Vaccinated		Unvaccinated		Total	Test statistics			Effect size	
Response	n	%	n	%	n	df	$\chi 2$	p	V	p
Risk factors for complications of influenza										
Risk factors	29	42*	18	22.8*	47					
None	40	58*	61	77.2*	101					
Total	69		79		148	1	6.3	0.01	0.206	0.01
Regular access to a primary care provider										
Yes	57	89.1*	29	49.2*	86					
No	7	10.9*	30	50.8*	37					
Total	64		59		123	1	7.4	0.007	0.221	0.007

***** Column proportions for vaccinated and unvaccinated clients within this response are significantly different at the $p<0.05$ level

Note. Clients who responded "I am not sure" to vaccination status were considered unvaccinated. Clients unsure if they had a primary care provider were included with those who did not have one

4.1.3.2 Beliefs about vaccines

Determining perceived barriers and facilitators to ED influenza vaccination was a secondary objective of this survey. As described in Chapter 3, clients were asked to rate their level of agreement with several statements related to vaccines (a full summary of responses is included in Appendix F, Table F3). A series of chi-square tests were run to compare responses between clients who were and were not vaccinated. In order to

facilitate comparison between vaccinated and unvaccinated clients, the original options of "Agree" and "Strongly agree" were combined into one category, as were "Disagree" and "Strongly Disagree". As well, responses indicating neutrality ("Neither agree nor disagree", "Do not know or NA") were also consolidated into one category. Clients who were unsure of their vaccination status were once again included with unvaccinated clients. The association between level of agreement and vaccination status was significant for all statements (Table 4).

Table 4
Chi square analyses for vaccine hesitancy statements, by 2017/2018 vaccination status

	Vaccinated		Unvaccinated		Total	Test statistics			Effect size	
Response	n	%	n	%	n	df	χ2	p	V	p
Statement "The flu shot is effective at preventing the flu""										
Disagreement	1	1.4**	22	27.2**	23					
Neutral	14	20.0*	38	46.9*	52					
Agreement	55	78.6**	21	25.9**	76					
Total	70		81		151	2	44.9	1.8E-10	0.55	1.8E-10
Statement "It is better to develop immunity by getting sick with the flu than to get a flu shot."										
Disagreement	57	81.4**	29	35.8**	86					
Neutral	7	10.0*	30	37.0*	37					
Agreement	6	8.6**	22	27.2**	28					
Total	70		81		151	2	32.2	1.0E-07	0.46	1.0E-07
Statement "I trust the information I receive about the flu shot"										
Disagreement	2	2.9*	16	19.8*	18					
Neutral	7	10.0*	27	33.3*	34					

	Vaccinated		Unvaccinated		Total	Test statistics			Effect size	
Response	n	%	n	%	n	df	$\chi 2$	p	V	p
Agreement	61	87.1**	38	46.9**	99					
Total	70		81		151	2	27.3	1.2E-06	0.43	1.2E-06
Statement "The flu shot is safe"										
Disagreement	3	4.3	10	12.3	13					
Neutral	6	8.6**	26	32.1**	32					
Agreement	61	87.1**	45	55.6**	106					
Total	70		81		151	2	18.0	1.3E-04	0.35	1.3E-04
Statement "Adults get more vaccines (shots) than they need"										
Disagreement	41	58.6*	27	33.3*	68					
Neutral	23	32.9	35	43.2	58					
Agreement	6	8.6*	19	23.5*	25					
Total	70		81		151	2	11.4	0.003	0.28	0.003

***** Column proportions for vaccinated and unvaccinated clients within this response are significantly different at the $p<0.05$ level

****** Column proportions for vaccinated and unvaccinated clients within this response are significantly different at the $p<0.0001$ level

Note. Clients who responded “I am not sure” to their vaccination status were considered unvaccinated. For level of agreement, the original options of “Disagree” and “Strongly Disagree” were combined into "Disagreement", "Neither agree nor disagree” and “Do not know or NA” into “Neutral”, and “Agree” and “Strongly agree” into "Agreement".

The associations with the largest effect sizes were between: vaccination status and level of agreement that the influenza vaccine is effective (*Figure 2*), immunity to influenza is best conferred through infectious processes, and that they trusted information received about the influenza vaccine. The specifics of how a client responds to these three statements as it is associated with their vaccination status will be discussed in more detail in the following paragraph.

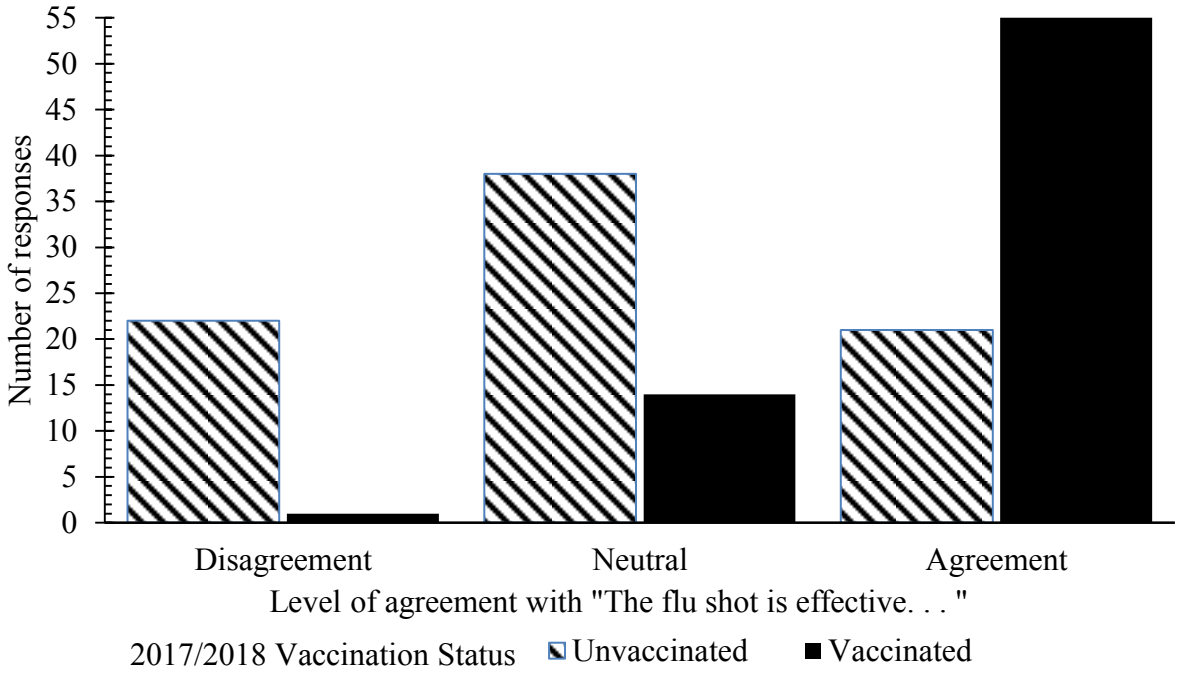

Figure 2. Agreement with "The flu shot is effective at preventing the flu", by vaccination status

For the statement “The flu shot is effective”, a significantly higher proportion of vaccinated clients agreed (78.6%) than unvaccinated clients (25.9%), $p<0.0001$. Overall there was a highly significant association between the level of agreement that the influenza vaccine was effective and whether clients were vaccinated, $\chi^2(2) = 44.9$, $p = 1.8E^{-10}$. Cramer’s V was also significant, $V(2)= 0.545$, $p= 1.8E^{-10}$, indicating a very large

effect size. If a client agreed that the influenza vaccine was effective, based on the odds ratio they were 57.6 times more likely to have been vaccinated in the previous year, when compared to clients who disagreed.

The majority of previously vaccinated clients did not agree that "it is better to develop immunity by getting sick with the flu than to get a flu shot". There were diverse opinions among those who were unvaccinated. Overall there was a highly significant association between the level of agreement "that it was preferable to gain immunity through infectious processes" and whether clients were vaccinated ,$\chi^2(2) = 32.2$, $p = 1.0E^{-7}$. Cramer's V was also significant, $V(2) = 0.46$, $p = 1.0E^{-7}$, indicating a large effect size. When using the odds ratio to compare only those clients who agreed and disagreed (i.e. no neutral responses), if a client disagreed with this statement, they were 7.2 times more likely to have been vaccinated.

Finally, for participants who agreed with the statement "I trust the information I receive about the flu shot", a significantly higher proportion of this group were vaccinated (87.1%) than not (46.9%), $p<0.0001$. Overall, there was a significant association between level of agreement with this statement and vaccination status ($\chi^2(1) = 27.341$, $p=0.000001$). Cramer's V was also significant, $V(2) = 0.426$, $p=0.000001$, indicating a medium effect size. When comparing only those clients who agreed and disagreed (i.e. no neutral responses) using the odds ratio, if a client trusted the information they received about the influenza vaccine, they were 12.84 times more likely to have been vaccinated.

4.1.3.3 Client-reported reasoning

Of the 70 clients (46.4%) who did receive the influenza vaccine, the most common reason provided was to prevent influenza (n=32, 45.7%) and because they received the vaccine annually (n=32, 45.7%). The second most common reason was to prevent transmission of influenza to others, (n=23, 32.9%). A full summary of reasons motivating clients to receive the influenza vaccine is included in Appendix F, Table F4. Clients most commonly received the influenza vaccine at their family MD/NP's office (n=33, 47.1%), followed by a local pharmacy (n=15, 21.4%). Additional locations where client participants received vaccination are summarized in Table F5 of Appendix F. Of the 78 clients who were unvaccinated the most common reason was the perception that they did not need the influenza vaccine (n=21, 27%), followed by a lack of confidence that the influenza vaccine would in fact prevent influenza (n=20, 26%). A full summary of client reasoning behind remaining unvaccinated is included Table F6 in Appendix F.

4.1.3.4 Additional comments

Twelve participants (7.9%) chose to include additional comments, though one was unrelated to influenza vaccination ("Illuminati?"). The most common type of comment (n=3) was elaboration on their vaccination status (e.g. "I have already received the flu shot this fall [2018]"). Two participants expressed the belief that the influenza vaccine gave them influenza/made them sick in past, two expressed misunderstanding regarding the process of immunization (e.g. "The flu shot should still be administered through a large gauge needle directly into the stomach..[maybe] that's for rabies..") and two indicated a desire to be well when they receive influenza vaccine. The remaining two comments expressed personal responsibility for remaining unvaccinated, and concern re: negative societal impacts of vaccination.

4.2 HCP Results

4.2.1 Professional information

There was a total of 82 responses to the HCP questionnaire; 36 RNs (total n=110, response rate 33%), 13 paramedics (total n=48, response rate 27%) and 32 MDs (total n=61, response rate 52%). 81 HCP participants identified their profession; the one participant who did not include their profession was not included in the analysis. Amongst all professions, most HCP respondents to the survey were female (n=46, 57.5%). No HCP participants reported a gender identity outside male or female. The most common years of experience from all professions was 1 to 5 years in their profession (n=28, 34.6%) and 1 to 5 years (n=26, 32.1%) at the QEII ED. In terms of personal vaccine behaviour, the majority of HCPs were vaccinated in the 2017/2018 influenza season (n=73, 90.1%). All HCP responses to current gender identity, and years of experience in their profession/at the QEII ED and vaccination status are summarized in Table 5.

Table 5
Professional Information for HCP Participants

	All		MD		Paramedic		RN	
	n	%	N	%	n	%	n	%
Current Gender Identity								
Female	46	57.5	16	50	4	30.8	26	74.3
Male	34	42.5	16	50	9	69.2	9	25.7
Something else	0	0	0	0	0	0	0	0
Total (*N*=81)	80[†]		32		13		35	

	All		MD		Paramedic		RN	
	n	%	N	%	n	%	n	%
Years of Experience in Profession								
Less than 1 year	2	2.5	2	6.3	0	0	0	0
1 to 5 years	28	34.6	14	43.8	4	30.8	10	27.8
5 to 10 years	19	23.5	7	21.9	3	23.1	9	25
10 to 15 years	6	7.4	2	6.3	0	0	4	11.1
15 to 20 years	11	13.6	2	6.3	3	23.1	6	16.7
More than 20 years	15	18.5	5	15.6	3	23.1	7	19.4
Total (*N*=81)	81		32		13		36	
Years at the QEII ED								
Less than 1 year	15	18.5	6	18.8	0	0	9	25
1 to 5 years	26	32.1	11	34.4	5	38.5	10	27.8
5 to 10 years	14	17.3	6	18.8	4	30.8	4	11.1
10 to 15 years	12	14.8	4	12.5	0	0	8	22.2
15 to 20 years	7	8.6	3	9.4	2	15.4	2	5.6
More than 20 years	7	8.6	2	6.3	2	15.4	3	8.3
Total (*N*=81)	81		32		13		36	
2017/2018 Vaccination status								
Yes	73	91.3	32	100.0	11	84.6	30	85.7
No	7	8.8	0	0.0	2	15.4	5	14.3
I am not sure	0	0.0	0	0.0	0	0.0	0	0.0
Total (*N*=81)	80[b]		32		13		35	

	All		MD		Paramedic		RN	
	n	%	N	%	n	%	n	%

†One HCP participant did not indicate their gender

‡ One HCP participant wrote "Not yet"; this response was excluded

The majority of HCPs received the vaccine at the QEII ED (All n=48, 65.7%; RN n=22, 73.3%; paramedics n=7, 63.6%; MD 19, 59.4%), as summarized in Appendix G, Table G1. Among the eight unvaccinated RNs and paramedics, a lack of confidence that the influenza vaccine would prevent influenza was the most common reason for refusal (All n=3, 3.7%;RN n=2, 5.6%; paramedics n=1, 7.7%), with some nurses also reporting that their personal HCP advised them not to get it (n=2, 5.6%). A full list of reasoning is summarized in Table G2, included in Appendix G.

4.2.2 HCP Support for ED influenza vaccination

The primary objective of this research, as it relates to the HCP group, was to determine the level of QEII ED HCP support for influenza vaccination in the ED. The majority of HCPs from the three professions support making influenza vaccines available to low-acuity patients, if current time/resources were not an issue (All n=68, 85.0%; RN n=27, 77.1%; paramedic n=10, 76.9%; MD n=31, 96.9%). When current levels of staffing and resources are considered, the majority of participants remain supportive of making the influenza vaccine available to low-acuity ED patients (n=48, 59.3%). This support is also present amongst the majority of RN and MD participants (RN n=22, 61.1%; MD n=23, 71.9%). The majority of paramedic participants indicated they did not support influenza

vaccine availability in light of current QEII resources (n=9, 69.2%). See Table G3 in Appendix G for a summary of all responses.

HCP staff were also given space at the end of their questionnaire to include additional comments about their thoughts towards ED influenza vaccination, 26 of whom chose to do so. Thirteen comments were from HCPs who supported ED influenza vaccination based on current resources, 11 from HCPs who did not, and 2 from HCPs who were not sure. Some comments included multiple concerns. Eight of those comments re-expressed their general support for ED influenza vaccination, with an additional three comments re-iterating support for ED influenza vaccination in theory (though not necessarily in light of current QEII ED resources). Five HCPs shared additional thoughts on potential work flow ideas, three of which involved RN staff (e.g. "Liasion RN could use [the] paper room to administer vaccine [or the] Triage [RN] can flag patients") and two of which made suggestions involving other healthcare professionals (e.g. "The pharmacy techs should offer ot [sic] and discuss it with patients"). The remaining comments made by HCPs relate to barriers and facilitators that were not part of other survey questions. These included concerns about a lack of sufficient resources at the QEII ED (n=8), the belief that vaccination is not an ED role (n=5), a concern that vaccine availability will increase patient volumes (n=3), and the assertion that vaccination was becoming an ED role.

4.2.3 Barriers and Facilitators

4.2.3.1 Ease of making practice changes

The secondary objective of this research was to determine barriers and facilitators to ED influenza vaccination. As described in Chapter 3, HCP participants were asked

about their personal ability to make clinical practice changes, which types of clients they endorsed influenza vaccination for and their personal influenza vaccination behaviour/reasoning as a way to identify potential barriers and facilitators. The first potential barrier/facilitator was HCP willingness to change their practice. HCP participants were also asked to identify the ease with which they felt they could implement changes to their professional practice. The response that making changes to their clinical practice was neither easy nor difficult was most common among all HCPs (n=38, 47.5%), as well as RN (n=16, 45.7%) and physician participants (n=18, 56.3). Paramedic participants most commonly responded that is was easy to make changes to their clinical practice (n=5, 38.5%). See Appendix G (

Table G4) for the full summary of responses to this question.

A chi square test between the self-reported ease of making practice changes, and support for ED influenza vaccination in light of current resources was run (Table 6). The original responses that it was "Difficult" or "Very Difficult" to make practice changes were combined into one category, as were the responses for "Easy" and "Very easy". There were no significant differences between the proportions of HCPs who did and did not support ED influenza vaccination based on current QEII resources at any level of self-reported ability to make changes to their practice. Overall there was no significant association between these two variables $\chi 2$ (2) = 0.41, p=0.8.

Table 6
Chi square analysis of ability to make practice changes, by support for ED influenza vaccine availability based on our current resources

	Support for ED vaccination									
	Yes		No		Total	Test statistics			Effect size	
Ability to change practice	n	%	n	%	n	df	$\chi 2$	p	V	p
Difficult	6	12.5	8	24.2	14					
Neutral	23	47.9	16	48.5	39					
Easy	19	39.6	9	27.3	28					
Total	48		33		81	2	0.41	0.8	0.07	0.8

Note. No column proportions significantly differed at the p<0.05 level

The original responses that it was "Difficult" or "Very Difficult" to make practice changes were combined into one category, as were the responses for "Easy" and "Very easy"

4.2.3.2 Knowledge of risk factors

Another potential barrier/facilitator for HCPs was knowledge of influenza vaccine recommendations. In general, the majority of participants recommended influenza vaccination for all high-risk groups identified. Of the groups recommended to receive influenza vaccination by NACI, the two groups with the overall lowest frequency of support for influenza vaccination were: "people in direct contact during culling with poultry infected with avian influenza" (n=62, 75.6%) and people who are pregnant (n=67, 81.7%). For the MD participants, these two groups also had the lowest support (n=25, 78.1% for avian culling, n=29, 90.6% people who are pregnant). However, there were differences in RN and paramedic opinion. RN participants also expressed the least support for vaccinating people in avian culling operations (i.e. people who slaughter chickens, n=27, 77.1%), but people who are pregnant (n=30, 85.7%) and children six months to five years of age (n=30, 85.7%) were tied as the next least supported groups. Finally, for paramedic participants, vaccination was least supported for people who were pregnant (n=8, 61.5%) and people who are Indigenous (n=8, 61.5%), followed by children six months to five years of age (n=9, 69.2%). Table G5, included in Appendix G, summarizes all responses.

4.2.3.3 Logistical preferences by profession

In addition to explicit support (or lack thereof) for ED influenza vaccination, HCPs were asked questions about how ED influenza vaccination might fit into their existing workflow at the QEII ED. A summary of all responses to these logistical questions is included in Table G6, located in Appendix G.

Screening for influenza vaccination status at triage was identified as the preferred time for influenza vaccine screening by the majority of participants (n=46, 56.8%). This

was also the most frequently preferred time for screening within the responses of individual professions (RN n=19, 52.8%; paramedics n=5, 38.5%; MDs n=22, 68.8%). The majority of participants preferred influenza vaccination to be ordered under a medical directive (n=60, 74.1%); once again this remained the preference within individual professions as well (RN n=24, 66.7%; paramedic n=9, 69.2%; MD n=27, 84.4%). In regard to where vaccination status should be charted, the nursing note was the most frequently chosen document (n=38, 46.9%). Most RN participants also preferred vaccination status to be charted on the nursing notes of the patient ED record (n=20, 55.6%). Paramedic participants equally identified the nursing note (n=4, 30.8%), triage note (n=4, 30.8%), and minor treatment record (n=4, 30.8%) as their preference for charting vaccination status. Finally, MD participants primarily preferred vaccination status be charted within the triage note (n=15, 46.9), with the second most common preference being the nursing note (n=14, 43.8%).

The most common preference by all participants was for the influenza vaccine to be delivered in the waiting room after a patient was triaged (n=24, 29.6%), closely followed by immunization after PIA (n=23, 28.4). However, preference in this case varied by profession. MDs most commonly preferred immunization to occur in the waiting room after triage (n=15, 46.9), but RN and paramedic staff most commonly preferred influenza vaccination be completed after physician initial assessment (RN n=12, 33.3%; paramedic n=5, 38.5%). A chi square analysis was done comparing MD and RN preferences (Table 7). There were too few responses from paramedics thus they were not included, nor were those who responded “Do not know” or “No opinion”. The responses indicating a preference for influenza vaccination to be given after physician

initial assessment and those preferring it be given at discharge were combined into once category due to low cell counts.

Table 7
Chi square analysis of preference for when to vaccinate, by profession

	MD		RN		Total		Test statistics		Effect size	
Response	n	%	n	%	n	df	χ2	p	V	p
After triage	15	50.0*	7	20.6*	22					
Before PIA	4	13.3	6	17.6	10					
After PIA	11	36.7*	21	61.8*						
Total	30		34		32	2	6.208	0.045	0.311	0.045

***** Column proportions for vaccinated and unvaccinated clients within this response are significantly different at the $p<0.05$ level

Note. The category "After PIA" is a combination of responses indicating they preferred the influenza vaccine be given either after physician initial assessment or on client discharge.

The proportion of MDs who preferred that vaccination take place in the waiting room after triage (50.0%) was significantly higher that the proportion of RNs who shared this preference (20.6%), p=0 .013. Conversely, the proportion of RNs who preferred vaccination occur after physician initial assessment (61.8%) was significantly higher than the proportion of MDs who shared this preference (36.7%), p=0.045. The MDs surveyed were 4.1x more likely than RNs to prefer immunization after triage over immunization after PIA, based on the odds ratio. Overall, there was no significant level of association between profession and preference for when the influenza vaccine should be given $\chi^2(2) = 6.208$, p=0.045.

The next and final chapter will discuss all the results presented in this chapter and attempt to answer the research questions posed in Chapter 1. The Health Belief Model (HBM) will be used to guide the discussion of client results, and the Promoting Action Research in Health Sciences (PARiHS) Framework will help to guide the discussion of HCP results. Limitations and areas for further study will also be suggested.

Chapter 5: Discussion

This chapter will discuss the results presented in Chapter 4. The demographics of the client sample will be compared with the total number of clients who presented to the QEII ED during the study period, the general NS population, and the participants of past ED influenza vaccination studies, as applicable. The HBM with be used to guide a discussion of the first research question: whether ED vaccine availability will change client behaviour. The HCP group's demographics will be compared to current QEII ED staffing, and with acute care HCPs in NS. The second research question, the opinions of HCPs on ED influenza vaccination, will be presented within the PARiHS framework. The HBM will be integrated into the client opinion portion of the PARiHS framework to discuss the next steps towards making influenza vaccination available in the ED. Limitations and areas for future research will be discussed for each group as well.

5.1 Client group

5.1.1 Demographics

EDIS, the electronic charting system used for some aspects of care at the QEII ED, collects data on client age, gender and primary care provider. The proportion of female clients in the study group (53.0%) was slightly higher than the proportion of female clients who presented during the study period (48.2%), though the difference is minimal (D. Urquhart, personal communication, February 14-21, 2019). Three clients on the survey reported their gender as something other than male or female. In the presenting population, only two clients did not specify their gender when registering for their ED visit. The presence of more clients with a non-binary gender identity in the sample group than in the presenting population is especially interesting given the low

response rate of the study. There is a possibility that the EDIS system may not be fully capturing gender identity of the QEII ED clients, as "male" and "female" are the only options provided by the system. Alternatively, the anonymous nature of the study may have meant clients were more comfortable reporting their gender identity than when registering in-person with the DPCs. Although further exploration of this issued is beyond the scope of this study, this does warrant further investigation.

Clients aged 20-44 were the largest proportion in both the study group (41.1%) and among the client population who presented during the same study period (47.5%; D. Urquhart, personal communication, February 14-21, 2019). The proportion of adults over the age of 65 in the study group (14.6%) was also similar to the proportion in the presenting group (13.7%) (D. Urquhart, personal communication, February 14-21, 2019). The current study had a slightly higher proportion of adults over 65 than the PGRH study (11%; Chiasson & Rowe, 2000), however, the proportion was lower to other ED influenza studies conducted outside the QEII, as those studies ranged from 36.6-87% (Pearson et al., 2005; J. A. Taylor et al., 2018); though the JGH study included anyone over 60 within their age criteria (Pearson et al., 2005). The last aspect of client demographics that can be compared using data from EDIS is primary care provider access. Nearly identical levels of primary care provider access were reported by both the study participants (75.5%) and the total presenting client group (75.4%; D. Urquhart, personal communication, February 14-21, 2019). Interestingly, the proportion of client participants who did not have a regular primary care provider (23.8%) was much higher than the proportion of Nova Scotians in need of a primary care provider (5.2%), based on the provincial "Need a Family Practice" registry (NSHA, 2018c). This finding may be

due in part, to the fact that not all Nova Scotians without access to a primary care provider may be registered on the official waiting list. Another potential explanation is that clients without a primary care provider are more likely to present to the ED with low-acuity concerns. This second explanation is consistent with some past studies (discussed in Chapter 2) that found a relationship between primary care access and ED visits (Hudec et al., 2010; Van den Berg et al., 2016).As previously discussed in Chapter 2, Field and Lantz (2006) did not find this to be similar in their study. However, there may be a discrepancy between the perceived and actual effects of having timely access to primary care for ED clients. In previous studies of ED influenza vaccination, 84.9-98% of surveyed clients had primary care provider access (Chiasson & Rowe, 2000; Flemming et al., 2018; Kapur & Tenenbein, 2000; Pearson et al., 2005; J. A. Taylor et al., 2018); higher than the 75.5% of clients who report a regular primary care provider in this survey. This may be a result of the younger age of this study group compared to past studies, as overall better health status.

The presence of chronic medical concerns and influenza vaccination status were the two other pieces of demographic data collected by the client questionnaire. Unfortunately, EDIS does not contain data about client risk factors, nor is the proportion of the population at high risk for influenza complications due to chronic medical concerns reported by the NSDHW. The client data will instead be compared to the 2017/2018 Seasonal Influenza Vaccine Coverage in Canada Survey (SIVCS, previously discussed in Chapter 2 under it's former name of NIICS). Past ED influenza vaccination studies will be used for comparison as well. In the 2017/2018 SIVCS cycle, 42.7% of a nationally representative sample were at high risk for influenza due to NACI chronic

medical concerns or being over the age of 65 (Public Health Agency of Canada, 2019). In contrast, only 31.1% of clients were at high risk due to age or chronic medical concerns in this study. In most past ED influenza studies, a higher proportion of participants were at high risk of influenza complications as well, with the proportion of high risk participants ranging from 64.5% to 100% (Flemming et al., 2018; Kapur & Tenenbein, 2000; Pearson et al., 2005; J. A. Taylor et al., 2018). The PRGH study was the only outlier, reporting only 27.6% of clients to be at high risk (Chiasson & Rowe, 2000). It is difficult to compare the proportion of clients described as "high risk" to past studies because each study used different criteria to define what constituted high risk. Some studies only included people at personal risk of increased complications, while others also included risk factors for transmission to others at high risk. The lower proportion of high risk clients in this study may be due to the fact that the study did not include NACI risk factors beyond age and chronic medical concerns. Alternatively, considering that proportion of those considered high risk was also lower than in the SIVCS, it may be due to the fact that the low-acuity client population was generally young and healthy.

There is no routinely collected data within EDIS about QEII client influenza vaccination status (this study is trying to determine the need for that), and as such, the study population will be compared first to NS, then to past ED influenza vaccination studies. The vaccination rate of the client population (46.4%) was higher than the NS vaccination rate (36.8%) for 2017/2018 (NSDHW, 2019). However, the influenza vaccination rate for this study was within the range found in past studies of ED influenza vaccination, 35-67%, (Chiasson & Rowe, 2000; Flemming et al., 2018; Kapur & Tenenbein, 2000; Pearson et al., 2005). This may be due in part because the clients who

present to the ED were more likely to be vaccinated in general. Alternatively it may be that clients willing to participate in influenza vaccination studies represent a group that is more willing to be vaccinated than the general ED population. Unfortunately, until EDs begin screening all clients for influenza vaccine status, this will remain a speculation.

5.1.2 Public Interest in ED influenza vaccination

As previously discussed in Chapters 1 and 4, a primary objective of this research was to gauge public interest in ED influenza vaccination. The first research question seeks to meet this objective by asking whether making influenza vaccination available in the ED would change the planned vaccination behaviour of ED clients. As presented in Chapter 4, there were 28 previously unvaccinated clients who were willing to be vaccinated in the ED, which accounts for 34.6% of unvaccinated clients. This is a smaller portion of clients willing to be vaccinated than found in similar Canadian ED surveys and implementation studies of ED influenza vaccination, which ranged from 43-64% of eligible clients (Chiasson & Rowe, 2000; Flemming et al., 2018; Kapur & Tenenbein, 2000; Pearson et al., 2005; J. A. Taylor et al., 2018). However, this survey differed from past influenza vaccination studies in several ways. Firstly, as described in the preceding section, only low-acuity clients were surveyed, and most did not have chronic medical concerns/age-related risk factors for influenza, in contrast to past Canadian influenza vaccination studies. Additionally, the timing of the study may have played a role; as this survey was conducted during the vaccination period for the 2018/2019 influenza season, 2017/2018 vaccination status had to be used as a proxy for vaccination status, and may not reflect 2018/2019 behaviour. Finally, this study was a survey; results may have been different had the influenza vaccine actually been made available to clients.

Ultimately, the 34.6% of unvaccinated clients who were willing to accept ED influenza vaccination represent a group of low-acuity clients who could be vaccinated against influenza who would not otherwise have been. When combined with the 64% of clients willing to be vaccinated in the HaliVax PIIE project (Flemming et al., 2018), this presents a strong case for the willingness of QEII clients to be vaccinated in the ED.

5.1.3 Barriers and Facilitators to ED Influenza Vaccination

The secondary objective of this study was to determine perceived barriers and facilitators to influenza immunization as expressed by low-acuity clients. The HBM was the theory chosen to help guide this discussion. The HBM constructs include: perceived seriousness (i.e. preference for immunity conferred by infectious processes), perceived benefits (i.e. belief that the vaccine is safe and effective), and perceived barriers (i.e. belief adults receive too many vaccines, lack of trust re: information about the vaccine), and were the factors significantly associated with vaccine status for the QEII ED client participants (*Figure 3*). Sociodemographic factors (age over 65/presence of chronic medical conditions) were not found to be significantly associated with vaccination status, nor were cues to action (presence of primary care provider). However, this was partly due to the very conservative Bonferroni correction applied to account for family-wise error that lowered the threshold for what was considered significant. These findings are also consistent with the factors expected to be associated with vaccination status based on past research discussed in Chapter 2 (Bettinger et al., 2016; MacDougall et al., 2015; Meyer & Lum, 2017; Santos et al., 2017).

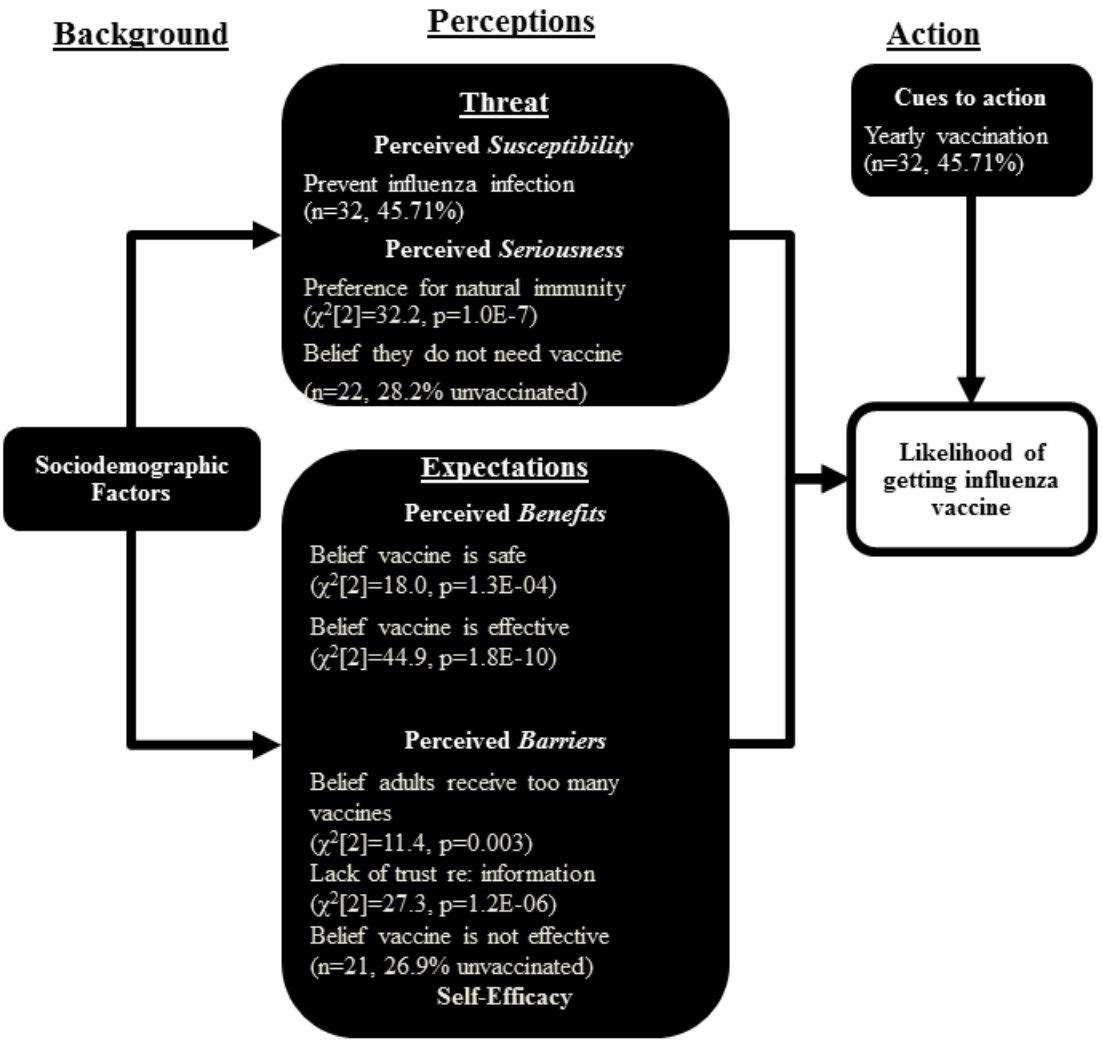

Figure 3. Notable results of the client survey as related to the Health Belief Model

As discussed in the results, clients also had the opportunity to express the reasoning they used to guide their vaccine choices. The most common motivating factors reported were the desire to avoid infection with influenza (perceived susceptibility/severity) and habitual yearly vaccination (cues to action). The second most commonly reported factor was the desire to prevent influenza transmission (perceived severity). These same motivations comprised the top three reasons motivating influenza vaccination reported on the 2017/2018 SIVCS (PHAC, 2019). For those clients who were

unvaccinated, the belief they do not need the vaccine (lack of perceived severity) was the most common reason for not receiving vaccination, and not believing the vaccine will prevent influenza (a lack of perceived benefit) was the second most common reason. These were also the top reasons reported by unvaccinated clients in the 2017/2018 SIVCS (PHAC, 2019).

This information on both the factors associated with client vaccination status and client's self-reported reasoning is essential in adding to our understanding of the health education needs of the QEII ED low-acuity population specifically. None of the other Canadian ED influenza vaccination studies discussed reasons for motivating people who were vaccinated, but as discussed above, the results of this study were similar to the general Canadian population for the same vaccination year. Most Canadian ED studies only asked clients why they would refuse ED influenza vaccination, rather than influenza vaccination in general, with the exception of the HaliVax (Flemming et al., 2018), in which "not getting around to it" and "feeling unwell" were the two most common reasons reported. For the QEII clients in this current study, a lack of time was only the third most common reason and "feeling unwell" was not a reported reason by any client. Similarly to the decreased amenability towards ED influenza vaccination, this may be a result of the healthier population captured in this study when compared to the HaliVax study. Thus within the QEII ED population there may be separate sub populations with different health education needs regarding influenza vaccination that must be considered prior to creating any ED influenza vaccination policy.

5.1.4 Limitations

Non-response bias is a large potential limitation for the client group. One of the major challenges in this study was recruitment, as evidenced by the 23% response rate; much lower than the 70-75% response rates to past ED influenza vaccination surveys (Kapur & Tenenbein, 2000; J. A. Taylor et al., 2018). A potential recruitment limitation anticipated prior to data collection was that clients may have felt they are too unwell to fill out a questionnaire. Though clients must have been both hemodynamically stable and free of severe acute pain to achieve a CTAS score of 4 or 5 (CAEP, 2013), they may have still subjectively felt they were experiencing an acute health crisis. They may also have not been interested in answering questions unrelated to their reason for visiting the ED; though this was not a concern raised in past research completed in a pediatric ED (R. G. Taylor, Hounchell, Ho, & Grupp-Phelan, 2015). Another potential reason for recruitment challenges within the client group was not consulting with DPC staff early enough in the planning stages of the study. As a result, the need for both Pod 5 medics and DPCs to be involved in recruitment was not realized early enough in the study and was not implemented until Day 31. The response rate when just DPCs were involved (Days 1-30) was 19%, whereas the response rate once DPCs and paramedics recruited clients was 33% (Days 31-44). As well, the RA was not initially positioned in the appropriate waiting area to speak with low-acuity staff without disrupting the DPC workflow (this was clarified and corrected by DPC staff Day 1).

Another limitation was the varying level of engagement from DPC staff; ten days had a 0% response rate and one day had a 200% response rate. As the survey was anonymous, there is no way to tell which responses were from clients who met CTAS 4/5

criteria. It is also important to note that all Pod 5 clients must be ambulatory and not acutely unstable. Due to this anonymity, there was also the potential that the same participants may have received a questionnaire twice, though DPCs, paramedics and RAs all screened clients to prevent this. As questionnaires are completely anonymous this remains a small possibility and will be impossible to track without undue effort on the part of the DCPs. Ideally, in future research, the RA should be able to identify eligible clients without QEII ED staff having to assist; this would decrease the burden on staff and likely increase response rates. There were also technical/staffing challenges: the RedCap survey tool was unavailable for two days near end of survey, (those days were not considered "part" of the study) and there were two additional days with RA staffing challenges, during which potential clients may have been missed. Having paper surveys available as a back-up, may have helped mitigate the disruption this caused.

An additional challenge was the timing of data collection. The study was held from the end of October to December, but seasonal influenza vaccination in Canada begins yearly in October (NSDHW, 2017b). The study was held at this time due to the fact that ED client volumes were prohibitively higher than average in the preceding months. In 2017 there were 6480 and 6507 ED visits recorded in September and October respectively, compared to an average of 6250 monthly visits for the same year (NSHA, 2018a). The higher volumes in September and October would have made conducting a questionnaire impractical for staff and could have potentially resulted in an even lower response rate as a result. However, the resulting limitation is that this may have caused confusion for some respondents trying to recall their 2017/2018 vaccination status if they have already received or made the decision not to receive the 2018/2019 vaccine.

5.2 HCP Results

5.2.1 Demographics

At the QEII ED, the nurses make up the largest proportion of the HCP staffing (n=110, when NO/AS excluded, 50%), followed by paramedics (n=48, 22%) and MD (n=61, 28%). In the study population, MDs were overrepresented, comprising about 40% of respondents, while paramedics were underrepresented, comprising about 16% of respondents. As well, there was a higher staff vaccination rate (91.3%) much higher than the rate reported for staff working acute care in the central zone of Nova Scotia (37.2%). This may represent a non-response bias amongst those who are unvaccinated. An alternate possibility is that HCPs felt uncomfortable reporting they were unvaccinated (despite surveys being anonymous).

5.2.2 HCP Support for ED influenza vaccination

The primary objective of this research for the HCP group was to gauge HCP support for a potential ED influenza vaccination program at the QEII, as a strategy to increase vaccination uptake for low-acuity clients using the ED. This objective was investigated with the second research question: What are the opinions of HCPs employed at the QEII ED with respect to the (a) merit and (b) feasibility of providing influenza vaccines to adult ED clients triaged as CTAS 4/5 during wait times? As reported in the results, 85% of all HCPs (n=68) supported the idea of providing influenza vaccination to low-acuity clients, if time and resources were not a concern. The majority of HCPs thus see merit in providing ED influenza vaccination to low-acuity clients.

This number drops to only 59.3% when the current QEII ED resources are taken into consideration by HCPs, approximately two-thirds of the original group supporting it.

As discussed in Chapter 2, only the Canadian surveys conducted in Winnipeg/JGH addressed EP willingness to order influenza vaccination; in this 76.3% (n=29) of EPs were willing (Kapur & Tenenbein, 2000), similar to the 71.9% (n=23) proportion of MDs supportive of ED influenza vaccination in light of QEII ED resources. 8% of unvaccinated clients in the JGH study eligible for influenza vaccination were not vaccinated due to EP concerns regarding side effects/contraindications to vaccination, despite the fact that contraindications to the influenza vaccine were explicit exclusion criteria for the study (Pearson et al., 2005). However, since the details of the specific cases are not discussed it is difficult to compare this to the results of this study.

There were no Canadian studies found surveying ED nurses about ED influenza vaccination programs. This study found 61.1% (n=22) supported QEII ED influenza vaccination in light of current available resources, a higher proportion than the only 41% (n=24) found in a past US study, previously discussed in Chapter 2 (Venkat et al., 2012). As with the response rate, this discrepancy may be accounted for by the fact that the nurses surveyed by Venkat et al. (2012) had just participated in actual intervention and that may have affected their opinion.

To the author's knowledge, there is no literature on paramedic willingness to vaccinate clients against influenza, as this is not a routine role for paramedics. Most paramedics (69.2%) did not support ED influenza vaccination in light of current time and resources, in contrast to the other professions surveyed. In the context of the expanding role of paramedicine towards preventative care in Nova Scotia (Nova Scotia Health Authority, 2018b), this study adds important information to this body of knowledge. Thus there are clearly some concerns amongst staff regarding the feasibility of this idea,

despite the majority remaining supportive of ED influenza vaccination. They will be discussed in further detail in the subsequent section.

5.2.3 Barriers and Facilitators

The secondary objective of this research was to determine perceived barriers and facilitators to influenza immunization as expressed by HCPs who work at the QEII ED. Facilitators include the majority support of ED influenza vaccination (if time and resources not considered), and the shared opinion that screening be done at triage and vaccination be ordered via medical directive. Barriers include the lack of consensus regarding when clients should be vaccinated/where vaccination status should be charted, the decrease in level of support in light of current QEII ED time and resources (especially amongst paramedics), and uncertainty regarding vaccination of some high risk groups. These barriers and facilitators will be mapped onto the clinician opinion portion of the PARHiS framework, which, as discussed in Chapter 2, considers the strength of evidence and context to determine the level of facilitation needed to be successful in implementing health service changes.

5.2.3.1 Evidence

This study focused on the evidence; which includes research, clinician experience and client preference (Kitson et al., 1998). Most of the past research in support of ED influenza vaccination is descriptive statistics, as discussed in Chapter 2. Descriptive research is considered to be weak evidence within this framework, whereas randomized control trials, systemic reviews and evidence-based guidelines are considered strong evidence (Kitson et al., 1998). The trial of offering Tdap at triage vs. at a follow up appointment (Hansen et al., 2018) was the only randomized control trial within the ED

vaccination evidence. Thus, the research evidence in support of influenza vaccination is overall weak/moderate.

The next aspect of evidence is clinician opinion. When clinicians reach a consensus, that is considered strong evidence (Kitson et al., 1998). It is left undefined what proportion of clinicians must agree for consensus to be reached. If current time and resources are not considered, the majority of staff do support influenza vaccination. As discussed previously, this level of support decreases in light of current QEII ED resources. The majority of staff were in agreement that the groups that the NACI especially recommend receive influenza vaccination should receive influenza vaccination. The only groups with less than 85% of HCPs in support of vaccination were people involved in culling operations for poultry infected with avian influenza, people who are pregnant, and children six months to five years of age. The uncertainty about poultry workers was likely due to confusion in the wording of the description making it hard for HCPs to understand what was being described. For the other two groups, neither are the primary population treated at the QEII ED. However, people who are pregnant are seen in Pod 1 early in their pregnancy. As well, were the QEII ED to offer influenza vaccination to adult clients, it would still be important for HCPs to be knowledgeable about vaccine recommendations for all ages, in case clients have general questions. In terms of logistical preferences, the majority prefer influenza vaccination status screening be completed at triage, and that vaccination be ordered by medical directive. There was no clear consensus around when clients should be vaccinated. A diversity of opinion between different professions was not unexpected; in a previously discussed (Chapter 2) survey of non-ED HCPs about influenza and influenza vaccination there were different

opinions between MDs and RNs as to whether influenza was vaccine preventable (MacDougall et al., 2015). The lack of consensus regarding where vaccination status should be charted poses less of a concern than the diverse opinions about when to vaccinate. Due to the mixed electronic and paper charting system at the QEII, some things appear on multiple charts (ex: tetanus vaccination status is charted electronically in the triage note, which then is then printed onto the paper physician's note). Overall, as there is a consensus of opinion for some, but not all, logistical aspects of influenza vaccination, there is a moderate level of clinician opinion supporting QEII ED influenza vaccination.

Client preference is the final aspect of evidence; clients not being involved is considered weak evidence and partnership with clients is considered strong evidence. Based on this survey and the HaliVax (Flemming et al., 2018), there is clearly a group of clients presenting to the QEII ED not otherwise vaccinated who would be willing were it available in the ED. Though this study was not conducted in partnership with clients, this study allowed clients to share not just their willingness to receive ED influenza vaccination, but some of their general beliefs about vaccination and what motivated their behaviour. Overall, there is a moderate/high level of client interest in ED influenza vaccination. When all three aspects of evidence are considered together, there is a moderate amount of evidence in support of ED influenza vaccination.

5.2.3.2 Context

Culture, leadership and evaluation are the components of context within the PARHiS Framework (Kitson et al., 1998). A strong culture is one in which there is learning, continuing education, patient-centredness, that values people (Kitson et al.,

1998). Though these are consistent with the official values of the NHSA (NSHA, n.d.), they were not aspects able to be fully captured by this study. When asked about how easy they found making changes, most staff members responded neutrally (though, as discussed in Chapter 4 this was not significantly associated with support/lack of support for QEII ED influenza vaccination). Thus, more research is needed to further explore the current context for change in the QEII ED.

5.2.3.3 Facilitation

With only a moderate level of evidence in support, and an unclear culture at the QEII ED, strong facilitation would be essential to implementing ED influenza vaccination (Kitson et al., 1998). A practical result of the client findings is the identification of some key concerns that ED HCPs vaccinating ED clients would need to be prepared to discuss, should ED influenza vaccination be made available. The most notable of these health education points are: up-to-date information about vaccine efficacy, the merit of vaccination in the absence of 100% efficacy, and the benefits of vaccination conferred immunity in the reduction influenza complications and transmission to vulnerable populations. As well, the uncertainty about whether or not certain groups should receive vaccination, especially pregnant women, indicates the need for HCP education. Lack of trust in influenza vaccine information is also a challenging concern to address. The approach best suited to educating a population that mistrusts the information they receive is beyond the scope of this study, but a notable area for future research.

5.2.4 Limitations

Similarly to the client group, recruitment challenges occurred within the HCP arm, though overall, the response rate was higher. Response rates varied widely by profession. The MD response rate (52%) was lower than the 70.3% response rate on the Winnipeg survey (Kapur & Tenenbein, 2000). To the best of our knowledge, this was the only other Canadian survey of EPs on this topic, as the JGH study only noted if EPs refused to sign the vaccination order(Pearson et al., 2005). The RN response rate (33%) was lower than the 98% response rate in Venkat et al. (2012)'s survey. However, Venkat et al. surveyed nurses after they participated in ED influenza vaccination, and thus staff were potentially more motivated to provide feedback. The higher level of engagement from MDs may be due to a higher level of engagement with research (as many MDs in the QEII ED conduct research themselves and hold academic appointments at Dalhousie University), or it may be simply due to recruitment methods reaching MDs more effectively than paramedic or RN staff. This study mainly used less active recruitment methods (posters, email) so as not to interrupt the busy days of staff. However, HCPs may have not wanted to fill out questionnaires before/after the beginning of their shift, or during break times. Response rates may have been improved if it were possible for HCPs to be approached with the survey during lulls within their work day; unfortunately these are not necessarily consistent times day-to-day. As well, for paramedics specifically, Pod 5 is physically located at the end of the ED; physically isolated from most other areas. The paramedics who work in Pod 5 have their own fridge and do not always use the staff lounge where paper surveys were set out. There was no boost in recruitment during the last week of the study when treats were made available for HCPs. As well, no MDs put

their name in the draw for a Tim Hortons gift card and thus that card was donated to the ED social worker to provide to a client in need.

Having paper surveys available also resulted in some HCPs creating their own answer options or skipping questions. As presented in the results chapter, this meant some responses to certain questions could not be included. HCP participants were instructed to only fill out the questionnaire once, and only a sufficient number of questionnaires for the number of staff eligible to participate were made available, but like with the client group due to the anonymous nature of the questionnaire there remains a small risk that a participant may have filled out a questionnaire twice. The strength of maintaining anonymity of the questionnaires outweighs the very small risk of duplicate responses.

The results of the questionnaires highlighted a few additional limitations. In light of the differing opinions between staff who may work at triage (RNs/paramedics) and those who never work at triage (MDs) it would have been beneficial to have asked staff if they worked at triage as part of their QEII duties. The uncertainty among some staff whether vaccination of pregnant women, a population of Nova Scotians at high risk for influenza complications that has very low vaccination rates (16.4%; NSDHW, 2019), highlights the limitation that clients were not asked if they were pregnant. However, all clients surveyed were treated in Pod 5, whereas pregnant women are usually seen in Pod 1.

5.3 Conclusion

ED influenza vaccination is a health intervention that has the potential to improve the health of clients of the QEII ED. However, there are education needs of clients and

HCPs surrounding ED influenza vaccination, both of which must be fully addressed in order for this program to move from an idea to a reality. Future areas for research included the best approach for health education of ED clients, and an evaluation of whether the current NSHA education modules for influenza vaccination are appropriate for the learning needs of the QEII ED HCPs and their clients. As well, if influenza vaccination were to become part of routine care during the yearly vaccination season at the QEII ED, it would be essential to have strong supports to facilitate the change, and to evaluate the program regularly for impact on staff workload and effectiveness.

This study adds the perspective of Canadian HCPs whose opinions were not formerly included in past studies of ED influenza vaccination. As RNs and paramedics would be the HCPs actually administering vaccination, and who spend the most time at the bedside with clients, their opinions are an essential piece of this conversation. Additionally, it adds nuance to the MD perspective, which had previously only been explored in a limited fashion in Canadian ED influenza vaccination studies. Finally, this was an RN led study about a potential change in clinical care at the primary investigator (NO)'s workplace, which can now be used by other ED RNs interested in conducting research in their own workplaces to help navigate the associated challenges with research of this nature.

Influenza is an easily preventable expensive burden on the health of Canadians. Vaccination is a generally cost-effective (Ting et al., 2017) prevention method, freely available to Nova Scotians (PHAC, The Canadian Nurses Coalition on Immunization, & The Canadian Immunization Committee, 2017) and within the skillset of QEII ED HCPs. The majority of QEII HCPs surveyed support ED influenza vaccination as an idea. With

the exception of paramedics, most HCPs remain supportive of making influenza vaccination available to low-acuity clients when considering the currently available time and resources at the QEII ED. There is a group of clients, otherwise unvaccinated who would be willing to receive it in the ED. Moving forward from the results of this study towards implementing an ED Influenza vaccination protocol at the QEII ED that meets the needs of clients and HCPs is one step towards increase vaccination uptake, and, ultimately, improving the health of Canadians.

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Appendix A: CTAS Scores

Table A1
Defining Canadian triage and acuity scale scores

Score	***Urgency***	***Description***	***Example***
1	Resuscitation	Immediate risk of loss of life or limb that requires aggressive care immediately	Cardiac arrest
2	Emergent	Potential risk to life, limb or ability to function that requires expedient care	Shortness of breath, Cardiac chest pain
3	Urgent	Medical conditions and injuries that, if not treated, could pose a risk to life, limb or functional ability	7/10 Abdominal pain, Nausea and vomiting with mild dehydration
4	Less-Urgent	Minor illnesses and injuries in hemodynamically stable patients in no more than mild discomfort	UTI, lacerations
5	Non-Urgent	Non-urgent and chronic problems in a patient who is otherwise at their baseline level of wellness	Dressing changes, prescription requests

Adapted from Canadian Association of Emergency Physicians. (2013). The Canadian Triage and Acuity Scale: Combined Adult/Pediatric Educational Program Participant's Manual. Retrieved September 21, 2017, from http://caep.ca/sites/caep.ca/files/caep/participant_manual_v2.5b_november_2013_0.pdf

Appendix B: The Health Belief Model

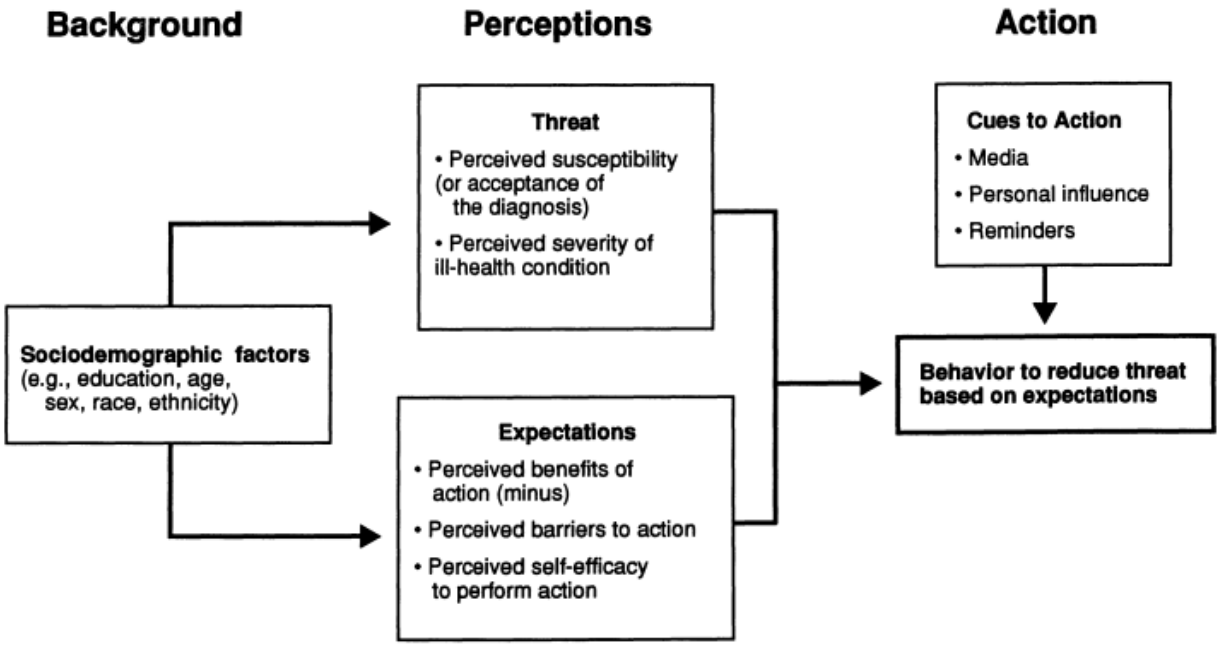

Figure B1. Schematic diagram of the components of the Health Belief Model

From "The Health Belief Model and HIV Risk Behavior Change" by I.M. Rosenstock, V.J. Strecher and M.H. Becker in R.J. DiClemente and J.L. Peterson J.L. (Eds.), *Preventing AIDS. AIDS Prevention and Mental Health* (p.10), 1994, Boston, MA: Springer. Copyright 1994 by Springer Science Business Media. Reprinted with permission.

Appendix C: Promoting Action Research in Health Services Framework

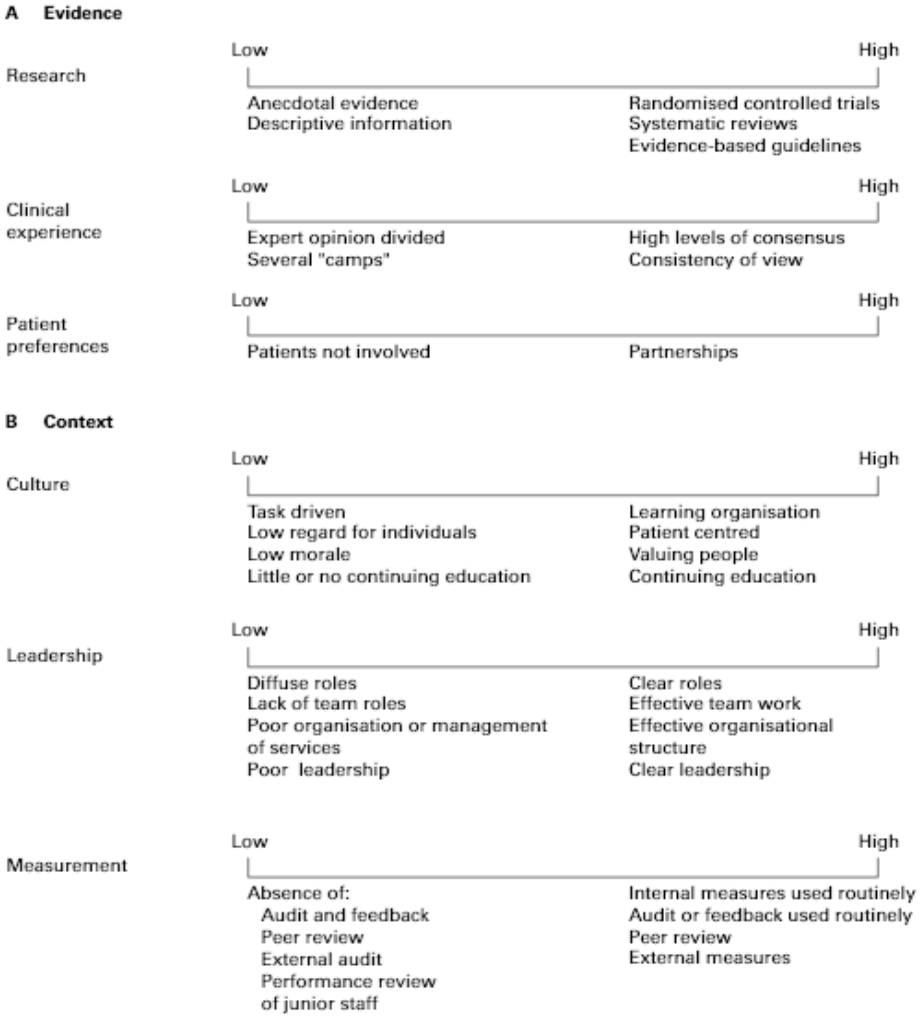

Figure C1. Defining evidence, and context within the PARiHS framework

Adapted from "Enabling the implementation of evidence based practice: a conceptual framework" by A. Kitson, G. Harvey and B. McCormack, 1998, *Quality and Safety in Health Care*, *7*, p.151. Copyright 1998 by BMJ Publishing Group Ltd. Reprinted with permission.

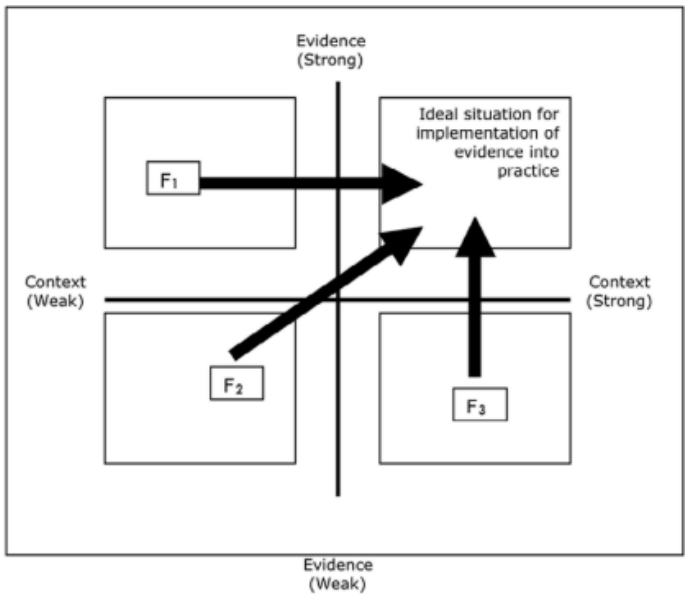

Figure C2. Facilitation based on strength of context/evidence within the PARiHS framework

Adapted from "Evaluating the successful implementation of evidence into practice using the PARiHS framework: theoretical and practical challenges" by A.L. Kitson, J. Rycroft-Malone, G. Harvey, B. McCormack, K. Seers and A. Titchen, 2008, *Implementation Science*, *3*, p.9. CC-BY

Appendix D: Client Group Cover Letter and Questionnaire

CONSENT FORM

Attitudes towards influenza vaccination in the emergency department, client survey

You are invited to take part in a research study being conducted by me, Noelle Ozog, a Masters student at the School of Nursing, and a casual staff nurse at the Queen Elizabeth II Health Sciences Centre emergency department (QEII ED). Research assistants and emergency department staff are assisting to distribute these surveys on my behalf. This study is part of my Master of Science in Nursing degree at Dalhousie University.

The purpose of this research is to ask patients waiting with minor injuries and illnesses their opinions about the flu shot. This survey will also ask whether you did or did not receive your flu shot, and if you would be interested in receiving the flu shot in the emergency department if it was available. The flu shot is not currently available in the emergency department, but can be received from your family doctor/nurse practitioner's office, local pharmacy or the public health unit.

The study is funded by the Dalhousie University Nursing Research and Development Fund and the Nova Scotia Health Research Foundation.

If you choose to participate in this study you will be asked to answer questions in a short anonymous survey that will take less than 10 minutes of your time. All responses will be stored on the secure Nova Scotia Health Authority server and processed using SPSS Statistical software. The survey does not ask for your name or any personal identifiers.

Your participation in this research is entirely your choice. You do not have to answer questions that you do not want to answer, and you are welcome to stop the survey at any time if you no longer want to participate. All you need to do is press "back" on the iPad. By completing this survey you imply your consent to participate. Only my supervisor and I will have access to the survey results and only group results will be presented in future presentations, my thesis and submitted to scientific journals as a publication. As per Dalhousie University policy, all information will be destroyed after7 years.

There are no known risks associated with this study. There will be no direct benefit to you in participating in this study, nor will you receive compensation. The research findings may however contribute to new knowledge on attitudes towards flu shots.

If you have questions, please feel free to contact me (nozog@dal.ca) or my supervisor, Dr. Audrey Steenbeek (a.steenbeek@dal.ca). If you have any questions about your rights as a research participant, contact Patient Relations at (902) 473-2133 or healthcareexperience@nshealth.ca (and reference ROMEO file #1023927)."

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Part I: Demographic Information

For each of the following questions, circle the option, or options, that best describes you.

1. Which best describes your current gender identity?	Female	Male	Something else *Ex: gender fluid, non-binary*

2. How old are you?	18-19	20-44	45-64	65+	Prefer not to answer

3. Do you have a main doctor or nurse practitioner you see regularly?	Yes	No	I don't know

4. Do you have any of the following ongoing chronic health concerns? *Please select all that apply*	Lung disorders *Ex: Asthma*	Kidney disease	Anemia
	Heart disorders *Ex: Heart failure*	Metabolic disorders *Ex: Diabetes*	Hemoglobinopathy *Ex: Sickle cell disease*
☐I have none of these chronic health concerns	Morbid obesity *I.e. Body Mass Index over 40*	Brain/Neurodevelopment conditions *Ex: Seizures*	Immune compromising conditions *Ex: Cancer*

Part II: Flu Shot Opinions

For each of the following, please rate the strength of your agreement with the statement.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know or N/A
5. I trust the information I receive about the flu shot	1	2	3	4	5	99
6. It is better to develop immunity by getting sick with the flu than to get a flu shot.	1	2	3	4	5	99
7. Adults get more vaccines (shots) than they need.	1	2	3	4	5	99
8. The flu shot is safe	1	2	3	4	5	99
9. The flu shot is effective at preventing the flu	1	2	3	4	5	99

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Part III: Flu Shot Behaviour

10. Did you get your flu shot last year? (The 2017/2018 flu season)	Yes	No	I am not sure

11. If you **got your flu shot last year,** why did you chose **to get it**? *Please select all that apply.*	I don't want to get the flu	Required by my workplace	I get the vaccine every year
	To prevent giving other people the flu	I am at risk for the flu because of a chronic health condition	My doctor/nurse/other healthcare professional told me to get it
	Other reason:		

12. If you **got your flu shot last year, where** did you get it? Please only select one answer.	Family doctor/Nurse practitioner	A pharmacy	Hospital
	At my workplace	A flu shot clinic	At school

13. If you **did not get your flu shot last year**, why did you choose **not** to get it? *Please select all that apply.*	I don't need the flu shot	I don't like needles	I did not have time
	I do not think the shot will prevent the flu	I have had a life-threatening reaction to the vaccine/part of the vaccine before	My doctor/nurse/other healthcare professional told me not to get it
	Other reason:		

14. If the flu shot was available at the emergency department, would you be willing to get it during your visit?	Yes	No	I am not sure

15. Please use the space below to share any other comments you have about getting your flu shot.

END OF SURVEY, thank you!

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Appendix E: Health care provider group cover letter and questionnaire

CONSENT FORM

Attitudes towards influenza vaccination in the emergency department, health care provider survey

You are invited to take part in a research study being conducted by me, Noelle Ozog, a Masters student at the Dalhousie University School of Nursing, and a casual staff nurse at the Queen Elizabeth II Health Sciences Centre emergency department (QEII ED). Research assistants and emergency department staff are assisting to distribute these surveys on my behalf. This study is part of my Master of Science in Nursing degree at Dalhousie University.

The purpose of this research is to ask **registered nurses**, **paramedics, ED resident** and **staff physicians** at the QEII, their opinions on having the flu shot available to patients during emergency department wait times, similarly to how the tetanus vaccine is given to patients who have a cut and do not have up to date immunization. This survey will also ask whether you did or did not receive your flu shot, and if you believe making the flu shot available to emergency department patients is appropriate for the QEII ED.

The study is funded by the Dalhousie University Nursing Research and Development Fund and the Nova Scotia Health Research Foundation.

If you choose to participate in this study you will be asked to answer questions in a short anonymous survey that will take less than 10 minutes of your time. This survey can be completed either on paper, or electronically using an iPad, when available. Paper surveys will be stored in a locked box within the emergency department, until they are collected for data entry, at which point they will be stored in a locked filing cabinet at Dalhousie University. All responses will be stored on the secure Nova Scotia Health Authority server and processed using SPSS Statistical software. The survey does not ask for your name or any personal identifiers.

Your participation in this research is entirely your choice. You do not have to answer questions that you do not want to answer, and you are welcome to stop the survey at any time if you no longer want to participate. All you need to do is not hand in the survey. If completing the survey electronically, simply close your browser window or press "back" on the iPad. By completing this survey you imply your consent to participate. Only my supervisor and I will have access to the survey results and only group results will be presented in in presentations, my thesis and scientific journals. As per Dalhousie University policy, all information will be destroyed after7 years.

There are no known risks associated with this study. There will be no direct benefit to you in participating in this study, nor will you receive compensation. The research findings may however contribute to new knowledge on attitudes towards flu shots. As well, participants are invited to enter their name for a chance to win one of four $10 Tim Hortons give cards (one draw for paramedics, one draw for physicians, two draws for nurses). Please put your name in the separate ballot box provided if you wish to enter the draw.

If you have questions, please feel free to contact me (nozog@dal.ca) or my supervisor, Dr. Audrey Steenbeek (a.steenbeek@dal.ca). If you have any questions about your rights as a research participant, contact Patient Relations at (902) 473-2133 or healthcareexperience@nshealth.ca (and reference ROMEO file #1023927).

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Part I: Professional information

For each of the following questions, circle the answer that applies to you.

1. Which best describes your current gender identity?	Female	Male	Something else *Ex: gender fluid, non-binary*			
2. What is your **role** at the QEII ED?	Paramedic	Physician	Nurse	Prefer not to answer		
3. How long have you worked **in your profession**?	Less than **1** year	**1** to **5** years	**5** to **10** years	**10** to **15** years	**15** to **20** years	More than **20** years
4. How long have you worked **at the QEII ED**?	Less than **1** year	**1** to **5** years	**5** to **10** years	**10** to **15** years	**15** to **20** years	More than **20** years
5. Implementing changes to my clinical practice is . . .	Very difficult	Difficult	Neutral	Easy	Very easy	

Part II: Influenza Vaccination

Influenza & pneumonia are among the top ten leading causes of death in Canada. Past emergency department based influenza programs have been able to vaccinate 43-64% of eligible patients against influenza. In contrast, 36.5% of Nova Scotians received their influenza vaccine in 2016/17

6. Which of the following groups do you think **should get** the influenza vaccine? Check all that apply.

People who are pregnant.	
People with chronic health conditions	
People who live in long term care facilities.	
People 65 years of age or older.	
Children 6 months to 5 years of age.	
Indigenous peoples.	
Health care/other care providers in facilities and community settings	
People who live with individuals at high risk of influenza-related complications	
People who provide regular child care to children under 5 years of age	
People who provide services in closed spaces to people at high risk (e.g. ship crew)	
People who provide essential community services.	
People in direct contact during culling with poultry infected with avian influenza.	
I do not think the influenza vaccine is appropriate for any of these groups	

7. Did you get your flu shot last year? (2017/2018 flu season)	Yes	No	I am not sure

8. If you **got your flu shot last year, where** did you get it? Please only select one answer.	Family doctor/ Nurse practitioner	A pharmacy	At work (QEII ED)
	At school	A flu shot clinic	At another workplace

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Part II (continued)

9. If you **did not get your flu shot last year**, why did you choose **not** to get it? *Please select all that apply.*	I don't need the flu shot	I don't like needles	I did not have time
	I do not think the shot will prevent the flu	I have had a life-threatening reaction to the vaccine/part of the vaccine before	My doctor/nurse/other healthcare professional told me not to get it
	Other reason:		

10. If time and resources were **not a concern**, do you think influenza vaccines should be available to low-acuity (CTAS 4/5) ED patients?	Yes	No	I am not sure

Part III: Context at the QEII ED

A small study (n=85) run in the QEII ED between Dec. 2016 and Jan 2017 found 64% of eligible unvaccinated patients were willing to be vaccinated against influenza.

f influenza vaccination was available to low-acuity (CTAS 4/5) patients waiting at the QEII ED. . .

11. When would be the best time to **screen** low-acuity patients for influenza vaccination status? *Please select only one answer.*	At triage (like ISAR)	During the primary assessment (like falls risk)	During the physician assessment	On discharge during discharge instructions	Don't know/ No opinion

12. What would be the most efficient way to **order** influenza vaccination for low-acuity patients? *Please select only one answer.*	Ordered individually as appropriate for particular patients	Pre-printed order to be signed by physician (like narcotic pain management)	Medical directive for nurses and ACPs (like tetanus immunizations)	Don't know/ No opinion

13. When would be the best time to **immunize** low-acuity patients? *Please select only one answer.*	After triage, in the waiting room	Prior to physician initial assessment	After physician initial assessment	On discharge	Don't know/ No opinion
14. Where should influenza vaccination status be **charted** for low acuity patients? *Please select all that apply.*	Triage note	Nursing note	ED physician note	Minor treatment record	Don't know/ No opinion

15. Based on our **current** staffing and resources, do you think influenza vaccination should be made available to low-acuity QEII ED patients?	Yes	No	I am not sure

16. Please use the space below to add any additional comments you have regarding influenza vaccine availability for low-acuity patients in the ED.

_____

END OF SURVEY, THANK YOU FOR YOUR PARTICIPATION!
PLEASE DEPOSIT SURVEY IN [COLOUR] LOCKED BOX IN STAFF HALLWAY OUTSIDE ROOM [ROOM #]

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Appendix F: Client responses

Table F1
Client 2017/2018 influenza vaccination status

Response	n	%
Vaccinated	70	46.4
Unvaccinated	78	51.7
Unsure of status	3	2.0
Total (*N*=151)	151	

Table F2
Client participant willingness to receive influenza vaccination if available in the ED

Response	n	%
Yes	80	53.0
No	49	32.5
I am not sure	22	14.6
Total (*N*=151)	151	

Table F3
Client response to influenza hesitancy statements

	Vaccinated		Unvaccinated / Unsure	
	n	%	n	%
Statement "I trust the information I receive about the flu shot"				
Strongly disagree	1	1.4	5	6.2
Disagree	1	1.4	11	13.6
Neither agree nor disagree	6	8.6	17	21.0

	Vaccinated		Unvaccinated / Unsure	
	n	%	n	%
Agree	31	44.3	31	38.3
Strongly agree	30	42.9	7	8.6
Do not know or N/A	1	1.4	10	12.3
Total (*N*=151)	70		81	
Statement: "It is better to develop immunity by getting sick with the flu than to get a flu shot."				
Strongly disagree	28	40.0	5	6.2
Disagree	29	41.4	24	29.6
Neither agree nor disagree	4	5.7	15	18.5
Agree	2	2.9	24	29.6
Strongly agree	4	5.7	6	7.4
Do not know or N/A	3	4.3	7	8.6
Total (*N*=151)	70		81	
Statement: "Adults get more vaccines (shots) than they need"				
Strongly disagree	17	24.3	2	2.5
Disagree	24	34.3	25	30.9
Neither agree nor disagree	17	24.3	24	29.6
Agree	6	8.6	16	19.8
Strongly agree	0	0.0	3	3.7

	Vaccinated		Unvaccinated / Unsure	
	n	%	n	%
Do not know or N/A	6	8.6	11	13.6
Total (*N*=151)	70		81	
Statement: "The flu shot is safe"				
Strongly disagree	1	1.4	3	3.7
Disagree	2	2.9	7	8.6
Neither agree nor disagree	4	5.7	19	23.5
Agree	37	52.9	38	46.9
Strongly agree	24	34.3	7	8.6
Do not know or N/A	2	2.9	7	8.6
Total (*N*=151)	70		81	
Statement "The flu shot is effective at preventing the flu"				
Strongly disagree	0	0.0	6	7.4
Disagree	1	1.4	16	19.8
Neither agree nor disagree	12	17.1	25	30.9
Agree	37	52.9	18	22.2
Strongly agree	18	25.7	3	3.7
Do not know or N/A	2	2.9	13	16.0
Total (*N*=151)	70		81	

Table F4
Client identified reasons for choosing to receive the influenza vaccine

Response	n	%
I don't want to get the flu	32	45.7
I get the vaccine every year	32	45.7
To prevent giving other people the flu	23	32.9
My doctor/nurse/other healthcare professional told me to get it	16	22.9
Required by my workplace	8	11.4
I am at risk for the flu because of a chronic health condition	6	8.6
Other reason ("I don't want to get sick")	1	1.4
Total (*N*=70)	118	

Note. Clients were allowed to give multiple reasons for being immunized

Table F5
Client location of 2017/2018 influenza vaccination

Response	n	%
Family doctor/Nurse practitioner	33	47.1
A pharmacy	15	21.4
At my workplace	13	18.6
Hospital	3	4.3
A flu shot clinic	3	4.3
At school	3	4.3
Total (*N=70*)	70	

Table F6
Client reason for remaining unvaccinated

Response	n	%
Do not think they need the influenza vaccine	22	28.2
Do not think vaccine will prevent influenza	21	26.9
Did not have time	16	20.5
Do not like needles	7	9.0
Other reason not specified	4	5.1
Belief it made them sick	2	2.6
Do not feel they are at risk of contracting influenza	2	2.6
HCP advised against vaccination	2	2.6
Ambivalence	1	1.3
Do not feel they are at risk of transmitting influenza to high-risk populations	1	1.3
Do not routinely receive influenza vaccine	1	1.3
Lack of FMD/NP	1	1.3
Preference for "natural" immunity	1	1.3
Uncertainty re: vaccine	1	1.3
Past life-threatening reaction to the vaccine/part of the vaccine	0	0.0
Total (*N*=78)	82	

Note. Clients were allowed to give multiple reasons for remaining unvaccinated

Appendix G: HCP Responses

Table G1
HCP location of 2017/2018 influenza vaccination

	All professions		MD		Paramedic		RN	
	n	%	n	%	n	%	n	%
At work (QEII ED)	48	59.3	19	59.4	7	53.8	22	61.1
At another workplace	9	11.1	5	15.6	0	0	4	11.1
A pharmacy	8	9.9	5	15.6	1	7.7	2	5.6
Family doctor/NP	7	8.6	3	9.4	2	15.4	2	5.6
A flu shot clinic	0	0	0	0	0	0	0	0
At school	0	0	0	0	0	0	0	0
Total (*N*=73)	72[†]		32		10		30	

[†]One HCP chose multiple locations; this response was excluded.

Table G2
HCP reason for remaining unvaccinated

	All professions		MD		Paramedic		RN	
Reason	n	%	n	%	N	%	n	%
Do not think vaccine will prevent influenza	3	3.7	0	0	1	7.7	2	5.6
HCP advised against vaccination	2	2.5	0	0	0	0	2	5.6
Belief they do not need influenza vaccine	1	1.2	0	0	1	7.7	0	0
Preference against medicine unless necessary	1	1.2	0	0	0	0	1	2.8
Do not like needles	0	0	0	0	0	0	0	0
Did not have time	0	0	0	0	0	0	0	0
Past life-threatening reaction to the vaccine/part of the vaccine	0	0	0	0	0	0	0	0
TOTAL (*N*=7)	7		0		2		5	

Table G3
HCP Support for ED Influenza Vaccination Availability

	All professions		RN		Paramedic		MD	
	n	%	n	%	n	%	n	%
Support if time and resources were not a concern								
Yes	68	85.0	27	77.1	10	76.9	31	96.9
No	9	11.3	7	20.0	2	15.4	0	0.0
Unsure	3	3.8	1	2.9	1	7.7	1	3.1
Total (*N*=81)	80[†]		35		13		32	
Support in light of current QEII ED resources								
Yes	48	59.3	22	61.1	3	23.1	23	71.9
No	26	32.1	12	33.3	9	69.2	5	15.6
Unsure	7	8.6	2	5.6	1	7.7	4	12.5
Total (*N*=81)	81		36		13		32	

[†]One HCP participant gave multiple answers to this question thus their response was not included

Table G4
HCP Level of difficulty in changing clinical practice

	All professions		MD		Paramedic		RN	
Level of difficulty	n	%	n	%	n	%	n	%
Very difficult	2	2.5	0	0.0	1	7.7	1	2.9
Difficult	12	15.0	3	9.4	3	23.1	6	17.1
Neutral	38	47.5	18	56.3	4	30.8	16	45.7
Easy	27	33.8	11	34.4	5	38.5	11	31.4
Very easy	1	1.3	0	0.0	0	0.0	1	2.9
Total (*N*=81)	80[†]		32		13		35	

[†]One HCP did not answer this question

Table G5
HCP support for influenza vaccination of NACI high risk groups

	All professions		MD		RN		Paramedic	
High risk group	n	%	n	%	n	%	n	%
People who live with individuals at high risk	79	96.3	32	100.0	34	97.1	13	100.0
People who live in LTC.	78	95.1	32	100.0	34	97.1	12	92.3
People with chronic health conditions	77	93.9	32	100.0	33	94.3	12	92.3
People who provide services in closed spaces to people at high	76	92.7	31	96.9	34	97.1	11	84.6

	All professions		MD		RN		Paramedic	
High risk group	n	%	n	%	n	%	n	%
risk (e.g. ship crew)								
Health care/other care providers in facilities and community settings	76	92.7	32	100.0	34	97.1	10	76.9
People 65 years of age or older.	76	92.7	32	100.0	33	94.3	11	84.6
People who provide regular child care to children under 5 years of age	75	91.5	31	96.9	33	94.3	11	84.6
Indigenous peoples.	74	90.2	32	100.0	34	97.1	8	61.5
People who provide essential community services.	73	89.0	32	100.0	31	88.6	10	76.9
Children 6 months to 5 years of age[†]	69	84.1	30	93.8	30	85.7	9	69.2
People who are pregnant	67	81.7	29	90.6	30	85.7	8	61.5
People in direct contact during culling with poultry infected with avian influenza[‡]	62	75.6	25	78.1	27	77.1	10	76.9
"I do not support influenza vaccination for any of these groups"	0	0.0	0	0.0	0	0.0	0	0.0

[†]Two participants wrote “?”/“Unsure” instead of a check; this was counted as a lack of

	All professions		MD		RN		Paramedic	
High risk group	n	%	n	%	n	%	n	%

endorsement

‡One participant wrote "? UNSURE" instead of a check;this was counted as a lack of endorsement

Table G6
HCP Workflow Preferences for ED Influenza Vaccination

	All professions		MD		Paramedic		RN	
	n	%	n	%	n	%	n	%
Screening for vaccination status								
At triage	46	56.8	22	68.8	5	38.5	19	52.8
During primary assessment	18	22.2	6	18.8	2	15.4	10	27.8
On discharge	7	8.6	2	6.3	2	15.4	3	8.3
During MD assessment	6	7.4	1	3.1	2	15.4	3	8.3
Do not know/ No opinion	4	4.9	1	3.1	2	15.4	1	2.8
Total (*N*=81)	81		32		13		36	
Influenza vaccine ordering								
Medical directive	60	74.1	27	84.4	9	69.2	24	66.7
Pre-printed order	12	14.8	4	12.5	1	7.7	7	19.4
Ordered individually	6	7.4	0	0.0	1	7.7	5	13.9
Do not know/ No opinion	3	3.7	1	3.1	2	15.4	0	0.0

	All professions		MD		Paramedic		RN	
	n	%	n	%	n	%	n	%
Total (*N*=81)	81		32		13		36	
When to vaccinate								
After triage, in the waiting room	24	29.6	15	46.9	2	15.4	7	19.4
After MD initial assessment	23	28.4	6	18.8	5	38.5	12	33.3
On discharge	16	19.8	5	15.6	2	15.4	9	25.0
Prior to MD initial assessment	12	14.8	4	12.5	2	15.4	6	16.7
Do not know/ No opinion	6	7.4	2	6.3	2	15.4	2	5.6
Total (*N*=81)	81		32		13		36	
Vaccination status charting location[†]								
Nursing note	38	46.9	14	17.3	4	4.9	20	24.7
Triage note	26	32.1	15	18.5	4	4.9	7	8.6
Minor treatment record	22	27.2	10	12.3	4	4.9	8	9.9
ED MD note	15	18.5	2	2.5	3	3.7	10	12.3
Do not know/ No opinion	8	9.9	5	6.2	2	2.5	1	1.2
Total (*N*=81)	109		46		17		46	

[†]HCPs were allowed to choose multiple preferred locations for charting vaccination status

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