

UNIVERSITY OF CALGARY

An Evaluation of an Online Learning Module to Increase the Confidence and Self-Efficacy of  
Canadian Healthcare Trainees in Vaccine Communication, Advocacy, and Promotion.

by

Emily Jayne Doucette

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES  
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE  
DEGREE OF MASTER OF SCIENCE

GRADUATE PROGRAM IN MEDICAL SCIENCE

CALGARY, ALBERTA

JULY, 2023

© Emily Jayne Doucette 2023

## ABSTRACT

**Introduction:** Vaccine hesitancy is a significant threat to public health. Healthcare providers (HCPs) are well positioned to address vaccine hesitancy, however there are few accessible and multidisciplinary educational tools available to teach HCPs how to engage in challenging vaccine conversations. Based on this need, virtual simulation games (VSGs) were developed to improve the confidence and self-efficacy of HCP learners to prepare them for future roles in vaccine advocacy, delivery, and promotion. The objectives of this thesis were to 1) evaluate the impact of the VSGs on HCP learners' confidence and self-efficacy; and 2) explore HCP learners' previous experiences and qualitatively evaluate the VSGs prior to dissemination.

**Methods:** This study, which utilized a pragmatic sequential embedded mixed-methods design, involved quantitative evaluation of the effectiveness of the VSGs through a pre-post study with 72 HCP learners, followed by qualitative focus groups with a subset of 22 participants. HCP learners in nursing (n=24), pharmacy (n=30), and medicine (n=18) were included from the University of Calgary and the University of Waterloo. Three key themes were identified through pragmatic thematic analysis.

**Results:** No significant differences in baseline confidence and self-efficacy were identified across the three HCP disciplines. Only 54.2% of participants reported previously learning about vaccine communication in their programs. The VSGs significantly improved these attributes in all disciplines ( $P < 0.001$ ). During focus groups, participants expressed 1) their previous education lacked training on holding vaccine conversations, resulting in uncomfortable experiences; 2) the VSGs increased their confidence by providing novel tools and skills; and 3) participants provided feedback to improve the VSGs.

**Conclusions:** This study supports the use of the VSGs as an effective educational tool as HCP learners showed significant improvement in their self-assessed confidence, self-efficacy, and willingness to engage in vaccine conversations. In particular, the VSGs introduced innovative strategies for HCP to initiate these conversations, and participants appreciated the emphasis on resilience and managing emotions. In combination with existing immunization training, these and future VSGs can be designed and implemented to allow HCP to address vaccine hesitancy more effectively to increase vaccine confidence and uptake.

## PREFACE

This thesis is original work by the author, Emily Jayne Doucette, and is based on the following co-authored scientific manuscripts.

Chapter Two of this thesis has been formatted for and will be submitted to *BMC Medical Education* as Doucette, E.J., Fullerton, M.M., Pateman, M., Lip, A., Houle, S.K.D., Kellner, J.D., Leal, J., MacDonald, S.E., McNeil, D., Davidson, S., Constantinescu, C. Development and evaluation of Virtual Simulation Games to increase the confidence and self-efficacy of healthcare learners in vaccine communication, advocacy, and promotion.

Chapter Three of this thesis has been formatted for and will be submitted to *BMC Medical Education* as Doucette, E.J., Pateman, M., Fullerton, M.M., Lip, A., Houle, S.K.D., Kellner, J.D., Leal, J., MacDonald, S.E., McNeil, D., Davidson, S., Constantinescu, C. “You can push these conversations, but don’t push your patient away”: Learner perspectives on Virtual Simulation Games as an educational approach to address vaccine hesitancy.

## ACKNOWLEDGMENTS

I would like to acknowledge and thank my supervisor, Dr. Jim Kellner, for his significant mentorship and guidance throughout both my master's degree and early research career. I greatly appreciate his kindness, support, and knowledge which has allowed me to learn and grow as a researcher. I would also like to acknowledge and thank my co-supervisor, Dr. Cora Constantinescu, for inspiring my interest in vaccine hesitancy, and for lending her expertise and time to the successful completion of this degree. Both individuals contributed significantly to my wonderful graduate school experience. I would also like to express my gratitude for my supervisory committee members Dr. Jenine Leal, Dr. Shannon MacDonald, and Dr. Deborah McNeil, for their guidance and expertise in both qualitative and quantitative methodologies that added a significant amount of knowledge and value to my project. This project would not have been possible without the work from the larger multidisciplinary project team, including but not limited to Margaret Pateman (19 to Zero), Madison Fullerton (19 to Zero), Dr. Sandra Davidson (Nursing), Dr. Alyssa Lip (Medicine), Dr. Sherilyn Houle (Pharmacy), Dr. Kelly Grindrod (Pharmacy), Dr. Jane Tyerman (CAN-Sim), and Dr. Marian Luctkar-Flude (CAN-Sim). I'd also like to thank Joslyn Gray and all other members of the ACHIEVE Research Team at the Alberta Children's Hospital for their support and flexibility in allowing me to complete my degree while working with such a wonderful team. Lastly, I'd like to thank my family and friends (Mom, Dad, Chad, and Roxy) for their patience, love, and support throughout this journey.

## TABLE OF CONTENTS

ABSTRACT.....	i
PREFACE.....	iii
ACKNOWLEDGMENTS.....	iv
TABLE OF CONTENTS.....	v
LIST OF TABLES.....	viii
LIST OF FIGURES.....	ix
CHAPTER ONE: Introduction.....	1
1.1 Introduction and Literature Review.....	1
1.1.1 COVID-19 Pandemic & Vaccine Development.....	1
1.1.2 Vaccine Hesitancy.....	3
1.1.3 Role of Healthcare Providers as Vaccine Champions.....	5
1.1.4 The PrOTCT Framework.....	6
1.1.5 Healthcare Provider Training in Vaccine Communication.....	7
1.1.6 Virtual Simulation and Gamification in Healthcare Education and Training.....	8
1.1.7 Role of Confidence, Self-efficacy, and Self-evaluation in HCP Education.....	9
1.2 Project Overview and Aims.....	10
1.2.1 Aims 1 and 2 - Needs Assessment and Mapping Scopes of Practice.....	11
1.2.2 Aim 3 - Development of the Educational Intervention.....	13
1.2.3 Aim 4 - Validation and Evaluation of the Educational Intervention.....	14
1.3 Thesis Research Question and Objectives.....	14
1.3.1 Research Question.....	14
1.3.2 Research Objectives.....	14
1.4 Summary of Thesis Format.....	15
1.5 Research Methodology.....	16
1.5.1 Study Design.....	16
1.5.2 Research Paradigm.....	16
CHAPTER TWO: Development and Evaluation of Virtual Simulation Games.....	18
2.1 Abstract.....	19
2.2 Introduction.....	21
2.3 Methods.....	23
2.3.1 Virtual Simulation Game Development.....	23
2.3.2 Target Audience and Pilot Participant Recruitment.....	24
2.3.3 Virtual Simulation Game Evaluation using Pre- and Post-Intervention Self-Assessments.....	25
2.3.4 Data Analysis.....	25
2.4 Results.....	26
2.5 Discussion.....	27

2.6	Limitations .....	29
2.7	Conclusions.....	29
2.8	Declarations .....	30
2.8.1	Ethics approval and consent to participate.....	30
2.8.2	Consent for publication.....	30
2.8.3	Availability of data and materials .....	30
2.8.4	Funding.....	30
2.8.5	Authors' contributions.....	30
2.8.6	Acknowledgements.....	31
CHAPTER THREE: Qualitative Inquiry of HCP Learner Perspectives .....		38
3.1	Abstract.....	39
3.2	Introduction.....	41
3.3	Methods.....	42
3.3.1	Study Design.....	42
3.3.2	Participant Recruitment .....	43
3.3.3	Focus Group Guide Development .....	43
3.3.4	Focus Group Moderation/Data Collection.....	43
3.3.5	Qualitative Analysis .....	44
3.4	Findings.....	44
3.4.1	Theme 1: HCP learners' prior education lacked practical training on how to have difficult conversations with patients, resulting in uncomfortable personal experiences discussing vaccines. ....	45
3.4.2	Theme 2: HCP learners felt the educational intervention increased their confidence and self-efficacy in having challenging vaccine conversations by providing useful tools and new and transferable skills. ....	46
3.4.3	Theme 3: HCP learners enjoyed the learning modules and provided actionable feedback on the content, suggestions for future games, and endorsed accreditation. ....	48
3.5	Discussion.....	49
3.6	Limitations .....	51
3.7	Conclusions.....	52
3.8	Declarations .....	52
3.8.1	Ethics approval and consent to participate.....	52
3.8.2	Consent for publication.....	52
3.8.3	Availability of data and materials .....	52
3.8.4	Funding.....	53
3.8.5	Authors' contributions.....	53
3.8.6	Acknowledgements.....	53
CHAPTER FOUR: Conclusions.....		60
4.1	Summary of Findings.....	60
4.2	Study Limitations.....	62

4.2.1	Impact of COVID-19 Pandemic on Development.....	63
4.2.2	Potential Sources of Bias .....	63
4.2.3	Sample Size.....	64
4.2.4	Language Limitations .....	65
4.2.5	Equity, Diversity, and Inclusion Considerations .....	65
4.3	Future Directions .....	65
4.3.1	Dissemination of VSGs.....	66
4.4	Implications of Research.....	67
4.5	Significance of Research.....	68
4.6	Conclusions.....	69
REFERENCES .....		70
APPENDIX A .....		82
I.	Learning Outcomes and Indicators Example (VSG 1) .....	82
II.	Decision Point Map and Rationale Example (VSG 1).....	83
APPENDIX B .....		87
Self-Assessment Rubrics .....		87
I.	VSG 1 - Vaccine Hesitancy - Booster Assessment Rubric .....	87
II.	VSG 2 - Responding to Vaccine Hesitancy Assessment Rubric .....	88
III.	VSG 3 - Self-regulation Assessment Rubric.....	89
APPENDIX C .....		91
Electronic Consent to Participate in Research .....		91
APPENDIX D.....		96
I.	Pre-Intervention Survey .....	96
II.	Post Intervention Survey.....	97
APPENDIX E .....		98
Focus Group Script and Questions .....		98

## LIST OF TABLES

<b>Table 2.1.</b> Participant demographics from pre-intervention survey.....	32
<b>Table 2.2.</b> Self-assessment response overview per VSG by HCP discipline.....	33
<b>Table 3.1.</b> Focus group participant demographics.....	54
<b>Table 3.2.</b> Qualitative focus group themes, subthemes, and representative quotes from each HCP learner discipline.....	55
<b>Table 3.3.</b> Suggested improvements for VSG design and topics of interest for future games....	59

## LIST OF FIGURES

<b>Figure 2.1.</b> Confidence score comparisons between disciplines for each pre- and post-VSG self-assessment.....	35
<b>Figure 2.2.</b> Self-efficacy score comparisons between disciplines for each pre- and post-VSG self-assessment.....	36
<b>Figure 2.3.</b> Pre- and post-intervention self-assessment response distributions.....	37

## CHAPTER ONE: Introduction

### 1.1 Introduction and Literature Review

#### 1.1.1 COVID-19 Pandemic & Vaccine Development

The SARS-CoV-2 virus has caused far-reaching disruptions to individuals, communities, and institutions in all facets of life including health, psychosocial, and economic impacts on Canadians since the COVID-19 pandemic was officially declared in March 2020 (1). The immediate health impacts of SARS-CoV-2 infection are better understood at this point in 2023, with the severity of infection being associated with many factors such as age and existing comorbidities (2). The economic implications of COVID-19 have also been well established, with Statistics Canada reporting high unemployment rates early in the pandemic and lingering economic effects such as rising inflation rates as of June 2022 (1). Although COVID-19 case numbers have declined in many countries, some researchers believe that global pandemics may start to occur more frequently, contributing to increased mortality and morbidity as viruses continue to emerge and evolve (3, 4).

As has been shown through the COVID-19 pandemic, although it is difficult to control the virulence and transmissibility of viruses with the potential to cause another pandemic, one of the most effective public health prevention strategies at our disposal is the use of vaccines (5, 6). The introduction of prophylactic immunizations into routine public health care standards was a significant factor in the eradication of several diseases, such as smallpox and rinderpest (7), and the significantly decreased prevalence of others (*Haemophilus influenzae* type b [Hib], poliovirus, hepatitis, measles, etc.). Vaccine development pipelines prior to the pandemic could take as long as 15 years as potential products moved through preclinical development phases with small-scale production, through multiple phases of clinical trials, evaluation, and regulatory

approvals before moving into mass production and distribution (8). Overall, this rigorous and long process, the expected safety and efficacy, and successful impact on disease prevalence resulted in the overall acceptance of vaccines by the public.

The duration of vaccine development was altered as a by-product of the pandemic although the process itself did not become any less rigorous. The rapid research and subsequent approval of multiple COVID-19 vaccines by the Government of Canada (including Comirnaty/Pfizer BioNTech, SpikeVax/Moderna, Vaxzevria/AstraZeneca) for ages 6 months and older and the ongoing development of others was made possible by many unique factors. Additionally, the research of the mRNA technology used in multiple COVID-19 vaccines had been underway for a decade, and Coronaviruses (the family of viruses which SARS-CoV-2 belongs to) were also well understood by researchers following the SARS outbreak in 2002 (9).

The urgent global spotlight on vaccine research due to the pandemic resulted in the increased focus of academics and pharmaceutical companies, increased funding to facilitate appropriately accelerated clinical trials and participant recruitment, and modifications by regulators to accept rolling submissions for review. In addition, the high level of disease prevalence made the recruitment of participants with and without COVID-19 illness much easier. These factors, which previously had caused delays during the vaccine approval process (9), were able to be avoided during the pandemic and contributed to the rapid development of effective vaccines against SARS-CoV-2. Although the COVID-19 vaccines followed the same regulatory steps for approval and showed promising results, their rapid development contributed to increased questions and apprehension about the safety and efficacy of all types of vaccines amongst the public (10, 11).

### 1.1.2 Vaccine Hesitancy

Vaccine hesitancy has been known and studied for many years prior to the current pandemic (12). The World Health Organization named it one of the top ten global health threats in 2019 (13) and defined it as the “delay in acceptance or refusal of vaccination despite availability of vaccination services” (14). There are three factors that are generally understood to be the source of most forms of vaccine hesitancy, known as the “3C’s model”: *confidence*, *complacency*, and *convenience* (14). Vaccine *confidence* accounts for the trust individuals have in the safety and effectiveness of vaccines, as well as their trust in healthcare services, providers, and policy makers which impacts vaccine uptake (14). *Complacency* contributes to hesitancy in individuals who perceive the risk of vaccine-preventable diseases to be low and therefore vaccines are unnecessary for prevention (14). Lastly, the *convenience* of vaccination describes the general availability, affordability, and accessibility of vaccinations, as these barriers also contribute to the decision to vaccinate (14).

Significant work has been done in efforts to categorize those who are vaccine hesitant more specifically (15-17), including recent research based on COVID-19 vaccine intent. Yeo et al. (18) identified five common archetypes amongst those who are vaccine hesitant: Bubble Dwellers, Worriers and Delayers, Need-for-Normals, Exceptionalists, and Freedom Fighters. Bubble Dwellers are defined as those who do not perceive themselves to be at risk as they follow other public health recommendations. Worriers and Delayers are those who perceive the pandemic to be a threat, however they are concerned with potential side-effects and how rapidly the vaccines were developed. Both Bubble Dwellers and Worriers and Delayers are overall optimistic about vaccines, however they want to wait for more research and others to receive the vaccine before them (18). The Need-for-Normals are those who feel the pandemic is not a significant risk but want to return to how things were prior to the pandemic, which may influence

their likelihood to receive a vaccine. Exceptionalists often hold misconceptions about vaccines due to their personal circumstances and experiences with vaccines, and those of their friends and family, resulting in them rejecting the “one-size-fits all” model used by public health (18). Lastly, the most extreme archetype are the Freedom Fighters, who are often anti-government, against mainstream media, mistrustful of pharmaceutical companies, and emphasize the importance of transparency with regards to information (18).

Vaccine hesitancy is one of several factors contributing to decreases in vaccine uptake. Although 81% of Canadians have completed their primary COVID-19 vaccine series, only 19% have completed their primary series and received a booster dose (19). Childhood routine immunization rates have also decreased both in Alberta (20) and globally (21, 22) following the pandemic. Therefore, a significant need still exists to address those who remain vaccine hesitant through behaviour change methodologies such as targeted tools and information. Unfortunately, pro-vaccine messaging (including posters, handouts, and online resources) alone is generally insufficient in changing the behaviours of those who are vaccine hesitant (23). Targeted attempts to correct myths about vaccines have not significantly increased intention to vaccinate in populations with lower levels of concern, but instead have actually decreased intention to vaccinate in populations with higher levels of concern (24).

Although vaccine hesitancy was initially thought to originate strictly from a patient's lack of information about vaccines, more recent work recognizes that it arises from many different sources. The impact of people’s lived and collective experiences with personal illness, experiences of their close friends and families, and experiences with biomedical institutions, interventions, and injustice can all impact their willingness to be immunized (25), as can fears of blood and needles. A person's individualism and worldview, along with their relationships with the government and scientific community, may result in reactance, or a lower tolerance towards

decisions they feel impact their freedoms (26, 27). This can include messaging promoting community protection through vaccination and herd immunity.

This and other work attempting to categorize vaccine hesitancy highlights the unique spectrum of differing opinions held by those who are commonly combined into the singular overarching category of “vaccine hesitant”. As a result of research on behaviour change models and the diversity of vaccine hesitancy, one of the most commonly suggested solutions is to establish and grow the trust the general public has in healthcare providers (HCPs) (28, 29). As there are many types of people who may experience varying levels of hesitancy, HCPs must be able to tailor their conversations and recommendations to individuals to build rapport and encourage vaccination appropriately.

### *1.1.3 Role of Healthcare Providers as Vaccine Champions*

HCPs are frequently cited as patients' most trusted source of health and immunization information (29-31), which makes conversations with patients one of the most effective ways to directly address vaccine hesitancy. This applies broadly across many different healthcare roles that involve frequent interactions with the public, including nurses, pharmacists, and physicians. Up to 8% of Canadians have refused vaccinations due to a fear of needles, and HCPs can provide essential evidence-based solutions to manage vaccination pain and needle fear in their patients (32). A HCPs knowledge of vaccine efficacy and safety, as well as their personal feelings toward vaccination, have been associated with the likelihood that they recommend immunizations for their patients (31).

For a HCP to have a productive and successful conversation about vaccines with a patient, they must be aware of all the factors that contribute to a patient's hesitancy and use a combination of verbal and nonverbal communication skills, active listening, motivational interviewing techniques, and ensure they recognize and address any denialism (33). An effective

technique during these types of conversations is the use of a *presumptive statement or question*, where the HCP assumes the patient will immunize and shapes their questions around that assumption with positive statements (“When is your next vaccine scheduled for?”). Presumptive statements have been shown to be more effective than *participatory statements and questions* (“Do you want to get your next vaccine?”) as they can reduce the amount of resistance HCPs are met with from the patient regarding vaccinations (34).

#### 1.1.4 The PrOTCT Framework

There are several communication methods HCPs can use to enhance the internal motivations of patients toward certain behaviours based on motivational interviewing techniques (35, 36). The key skills involved in motivational interviewing are summarized by the OARS acronym: Open-ended questions, Affirming, Reflective listening, and Summarizing (37).

One effective method, called the **PrOTCT Framework** (38), was developed in 2020 by the Centre for Effective Practice and Alberta Department of Pediatrics with leadership and expertise from Dr. Constantinescu and colleagues. The framework incorporates several evidence-based vaccine communication techniques including presumptive statements and motivational interviewing (34). It was designed to inform and encourage HCPs to utilize presumptive statements in vaccine conversations with their patients. The framework is a five-step tool to help HCPs approach vaccine conversations:

1. **Presume:** reminds the HCP to use a *presumptive statement* to assume the patient will get the vaccine (34).
2. **Offer:** the HCP can offer to share their knowledge and expertise about the vaccine to build trust following the OARS principles (37, 39).
3. **Tailor:** involves customizing the vaccine recommendation and discussion around the patient's specific health concern (40, 41).

4. **Concerns:** is when the HCP would address any specific concerns or misinformation the patient may hold while focusing on the overall positive messaging about vaccines (39).
5. **Talk through a plan:** is when the HCP can provide a specific plan about where and when the patient can get immunized (39).

#### *1.1.5 Healthcare Provider Training in Vaccine Communication*

The overall preparedness and experience of a HCP has been shown to be an important factor in their willingness to engage in challenging conversations with patients, especially those who express hesitancy with regards to immunizations (31). Therefore, newer HCPs or learners may feel less prepared and less confident due to their lack of experience, and as a result they may avoid these difficult conversations altogether. Despite this, a 2010 survey of Canadian nursing, medical, and pharmacy schools called THE VAXED PROJECT highlighted the wide variability of vaccine-related content that learners receive across programs, with medians of 12, 23, and 13 hours for nursing, medicine, and pharmacy schools respectively (42). There was also significant variation and a lack of standardization between programs, with nursing schools reporting the largest variation of between <1 and 52 hours of vaccine education depending on the school. The vaccine related content that was taught mainly focused on providing information about vaccine preventable diseases and immunization practice, but rarely included teaching or consistent evaluation of vaccine communication skills in clinical settings. As a result, the study found 74% of learners did not feel comfortable discussing vaccines and their side effects with patients and parents and called for an interprofessional immunization education program to be developed to address these gaps (42).

Globally, the vaccine education provided to healthcare learners is similar to what Pelly et al. observed in Canada with a lack of focus on communication with patients, and what little time is dedicated to vaccination training being spent on clinical skills and administration (42). In

nursing, challenges of vaccine education included issues such as poor communication skills, insufficient practical skills, and inadequate training on managing vaccination complications, including assessment for anaphylaxis risk (43). In pharmacy, learners and practicing pharmacists who took on a new role as vaccinators when their scope of practice was expanded found it difficult to manage needle fear, needle pain, and hesitancy due to time constraints (44), which has likely only been amplified following the COVID-19 pandemic and the significant role pharmacists played in immunization rollouts. It was found that medical learners, who were identified to have the largest amount of vaccine-related training (42), received little training on pain management as it was often incorporated into other lessons rather than being taught as a dedicated pain medicine module (45).

#### *1.1.6 Virtual Simulation and Gamification in Healthcare Education and Training*

Virtual simulation has been used in clinical nursing education for many years (46), but has become much more common since the COVID-19 pandemic restricted in-person learning beginning in 2020 (47). The Canadian Alliance of Nurse Educators Using Simulations (CAN-Sim) is a leading organization involved with the development of virtual simulations, simulation research, and education (48). Virtual simulation has been defined as “the use of partial immersion through a digital learning environment (e.g., computer, tablet, phone, screen, etc.) to foster a perceived lived experience for an intended outcome (e.g., learning, entertainment, etc.)” (46). The use of virtual simulation and virtual simulation games in HCP training allows for increased decision making opportunities by participants when compared to in-person simulation that generally occur in groups, as well as increased accessibility by learners worldwide (47). In addition, virtual simulation can lessen fear, anxiety, and embarrassment in new learners who may worry about making mistakes in front of fellow students and instructors (47).

Gamification is a process that introduces elements of game design into alternative contexts, such as healthcare and education, to increase the engagement and motivation of participants (49). Game design elements may include points, badges, rewards, narrative elements for immersion, feedback provided for improvement, and more (50). The field of serious games and gamification is rapidly evolving and therefore more research is needed to determine the strengths and limitations. However, gamification introduces a form of entertainment to previously monotonous training (50) and has shown cognitive benefits (51). Educational games can be competitive or uncompetitive, with the latter allowing users an opportunity for greater exploration and self-reflection (50).

#### *1.1.7 Role of Confidence, Self-efficacy, and Self-evaluation in HCP Education*

Competency-based medical education (CBME) curricula are generally organized around certain skills required for professional practice, aim to ensure HCP can practice at a specific level of competency (52), and have become increasingly common in modern HCP education (53). Related to this, both confidence and self-efficacy are similar but distinct factors that influence professional development. Self-confidence is a general concept that describes an overall “strong self-perceived belief or feeling” in oneself that can be both positive or negative (54). Self-efficacy is more specific, in that it describes “an individual’s belief in their capacity to execute behaviours necessary to produce specific outcomes” (55, 56). Self-efficacy involves one’s ability to use tools and resources to deal with specific situations. Confidence and self-efficacy in HCPs are each influenced by several factors including stress, emotions, cognitive load (53), and personal experience in particular. As HCPs gain experience in clinical skills, their self-confidence and self-efficacy generally improve.

The use of self-evaluation as an educational strategy is common in healthcare training, however it can sometimes be challenging to evaluate due to a mismatch in learners perceived

confidence and true abilities (53) known as the Dunning-Kruger effect (DKE). The DKE describes the phenomenon where a person's lack of skills can cause them to overestimate their abilities while those with greater levels of competence can underestimate their skills (57, 58). There are several factors that have been shown to contribute to inaccuracy in self-evaluation, including misunderstandings of what is required, self-deception due to overconfidence, scoring of potential or ideal performance instead of actual performance, scoring of effort rather than achievement, impression management, and as compensation for poor performance (59). However, self-evaluation can be an extremely effective tool for medical education when used with clear expectations and self-evaluation criteria. It has been shown to significantly improve academic performance as it allows learners to critically reflect on their experiences and learnings, increase their motivation and interest, and helps them to set goals for improvement in the future (59, 60). Self-evaluation allows HCP learners to have a better understanding of the competencies required for certain skills and what is required to master them, and as a result may be more likely to follow them (59).

## **1.2 Project Overview and Aims**

Based on the need identified by Pelly et al. (42), and recognizing that HCPs are frequently found to be the most trusted source of vaccine information, our research team set out to develop, validate, and disseminate an educational program for HCP learners to prepare them for future roles in vaccine advocacy, delivery, and promotion.

This project was comprised of 5 aims which are summarized in the following section and subsequent chapters of this thesis: 1) complete a needs assessment, 2) map and align the scopes of practice of nursing, pharmacy, and medicine related to immunization, 3) define and develop the educational intervention, 4) evaluate and validate the intervention through a pre-post pilot study with self-assessments, and 5) disseminate the findings widely if successful. Aims 1 and 2

were completed by other members of the research team (MP, MMF, AL, SKDH, KG, SD, CC) prior to the start of my MSc program. As part of my MSc program, I was actively involved in Aim 3 (by assisting with the development of the educational intervention and related resources) and Aim 4 (by recruiting for and coordinating the pilot study of the intervention [EJD and MP], designing and maintaining the UCalgary Qualtrics surveys [EJD], moderating the focus group discussions [EJD], de-identifying and cleaning the quantitative survey data and qualitative transcripts [EJD], conducting the quantitative [EJD] and qualitative analyses [EJD and MP], manuscript planning [EJD, MP, MMF], drafting [EJD, MP, MMF], and revising [ED], and by completing the University of Calgary Conjoint Health Research Ethics Board (CHREB) application for the study and all subsequent study modifications [EJD]). Aims 3 and 4 will be covered in Chapter Two and Three in this thesis.

### *1.2.1 Aims 1 and 2 - Needs Assessment and Mapping Scopes of Practice*

Initial work from the research team in Fall 2021 included the completion of a needs assessment through a primary literature review and environmental grey literature scan to determine the current state and best practices around vaccine communication and uptake education. Additionally, the scopes of practice regarding vaccine communication competencies of medicine, nursing, and pharmacy professionals were mapped and aligned. The scoping review (61) identified a total of 42 interventions that targeted the HCP population, with 26 from peer-reviewed literature. A further 16 interventions were found via the grey literature scan. The main purpose of the interventions identified aimed to increase vaccine uptake and decrease hesitancy through HCP training. Most interventions focused on knowledge sharing and/or communication training aspects; however, no interventions specifically addressed the recognition or management of HCP emotions, despite findings that the emotional state of the provider significantly impacts their ability to have challenging conversations (62, 63).

Medical learners (including medical students, residents, physicians, and physician assistants) were the most common discipline that interventions were targeted towards (n=15), specifically those in family medicine and pediatrics. Interventions were identified for nursing, pharmacy, and midwifery providers however they were less common (n=9) despite these providers playing an important role in immunization distribution and uptake. Interventions were identified for HCP learners in all stages of training, from undergraduate to postgraduate (n=12), as well as those for practicing HCPs (n=16), while others were not practice-level specific (n=13). Approximately half of the interventions found were not tailored towards a specific disease or vaccine (n=21), while the remainder focused heavily on Human Papillomavirus disease and vaccines (n=10). Interventions targeting SARS-CoV-2 virus and vaccine were more commonly found in the grey literature (n=9) rather than in peer-reviewed literature (n=1) likely due to the rapidly evolving nature of vaccines during the pandemic. The interventions were generally designed for delivery within 4 hours and were evaluated through pre-post study designs using questionnaires (n=14), while a small portion utilized qualitative feedback of interventions and thematic analysis (n=4).

Overall, most of the interventions increased HCPs' self-perceived confidence discussing vaccines with patients (n=12) yet there was little guidance on how to choose the best intervention for a particular discipline or clinical context. HCP confidence and self-efficacy was often measured using participant self-evaluation before and after interventions. Only one study of pediatric residents demonstrated no significant change in confidence or communication skills following the intervention (a one-hour online learning module on the principles of vaccinology followed by a one-hour live training session on the Announce, Inquire, Mirror, Secure [AIMS] method) (64). Further, none of the interventions were found to have contributed to a change in HCP attitudes towards vaccines.

Self-directed and digital interventions were common as they offer flexibility to learners, but may limit user-uptake due to the learning responsibility required (65). Another key finding was the limited accessibility and dissemination of interventions published in peer-reviewed literature, as few interventions could be implemented without obtaining additional information and others required registration and payment (61). Therefore, this needs assessment further confirmed the need identified by Pelly et al. (42) for an intervention that is (1) discipline agnostic (can be utilized by all HCP regardless of discipline or level of training), (2) knowledge agnostic (focuses on the management of HCP emotions and communication skills regardless of their theoretical knowledge of vaccine administration and ingredients), and (3) is easily accessible to all HCP disciplines (through integration into HCP education curriculums across Canada and freely accessible on an online platform).

### *1.2.2 Aim 3 - Development of the Educational Intervention*

In collaboration with CAN-Sim (Canadian Alliance of Nurse Educators Using Simulation) and 19 to Zero, this preliminary work allowed our research team to develop an online learning program for healthcare learners in nursing, medicine, and pharmacy. The intervention consisted of self-paced online learning modules, three virtual simulation games (VSGs), self-evaluation rubrics, reflective questions, and additional resources for learners to prepare for their future roles in healthcare. The online learning program was designed to be discipline and knowledge agnostic, to ensure that all healthcare disciplines can complete the intervention regardless of their specific knowledge about vaccine administration, side effects, and ingredients, and freely available online for improved accessibility.

Each of the three VSGs developed for the intervention went through a rigorous phase of development in collaboration with content experts in nursing, pharmacy, and medicine training and education following the CAN-Sim model (66) with a focus on incorporating presumptive

statements and the PrOTCT Framework (38). The three main topics chosen to be covered in each game were based on existing vaccine hesitancy profiles: conversing with a patient expressing hesitancy around receiving a booster/completing a vaccine series due to fear of side effects (VSG 1), conversing with a patient who is vaccine complacent by minimizing the risk of disease while maximizing the risk of the vaccine (VSG 2), and how to foster personal resilience, maintain a professional sense of self-efficacy, and prevent burnout and moral distress when dealing with vaccine refusal from challenging patients (VSG 3).

### *1.2.3 Aim 4 - Validation and Evaluation of the Educational Intervention*

We hypothesized that due to literature identifying HCPs as the most common and trusted source of information (29-31) for Canadians, the addition of education and skill development in vaccine communication among healthcare learners during their training would increase their individual confidence and self-efficacy around vaccine discussion with their patients. As a result of this increase in overall HCP confidence and self-efficacy discussing vaccination, Canadians' confidence in and uptake of vaccines should increase over time.

## **1.3 Thesis Research Question and Objectives**

### *1.3.1 Research Question*

How effective is a targeted online learning module (consisting of VSGs and self-assessments) for Canadian healthcare learners in nursing, pharmacy, and medicine in increasing their confidence and self-efficacy discussing vaccines with patients?

### *1.3.2 Research Objectives*

- 1) To understand the impact of the online learning module on HCP learners' self-reported confidence and self-efficacy regarding vaccine communication and promotion.
- 2) To explore participants' personal experiences discussing vaccines with patients.

- 3) To identify changes and/or improvements to the VSGs prior to dissemination.
- 4) To identify how and when to best use the VSGs.
- 5) To inform the development of future VSGs on similar topics.

#### **1.4 Summary of Thesis Format**

This thesis contains four chapters, including an introduction, two manuscripts, and an integrated discussion and conclusion. The research objectives in section 1.3.2 will be explored through two separate manuscripts which will both be submitted to *BMC Medical Education*. The first manuscript (Chapter Two) provides an overview of the development process to create three VSGs focused on vaccine hesitancy which were designed to improve HCP confidence and self-efficacy engaging in vaccine discussion. It addresses Objective 1 by presenting the results of a quantitative evaluation of participant self-assessment scores before and after completing the VSGs. The second manuscript (Chapter Three) qualitatively addresses the remaining objectives by exploring learners' personal experiences with vaccine communication and collecting feedback on the VSGs through the use of focus groups and qualitative thematic analysis.

Program outcome evaluation was conducted through self-assessment rubrics (Appendix B) completed immediately before and after each VSG to provide a measurement of any changes to the participants confidence and self-efficacy, as well as a measure of user experience which allows for assessment of the effectiveness of the program. Participant self-efficacy was assessed based on their reported self-perceived abilities in the self-assessment rubrics, including their knowledge and communication skills around vaccinations (67). Participant confidence was assessed based on their reported self-perceived confidence around vaccine education and communication through self-assessment rubrics and self-reflection (68). All surveys and rubrics were hosted using a University of Calgary survey tool (Qualtrics). Process evaluation was

conducted through the collection of descriptive statistics through the pre- and post-intervention surveys (Appendix D) as well as through the focus groups with a subset of participants. This supplemented the outcome evaluation and helped explain other factors that may have contributed to the results of the outcome evaluation (69). Additionally, participant feedback was compiled, and changes were incorporated into the educational interventions before the final content validation of the VSGs by experts in nursing, pharmacy, and medicine and dissemination.

## **1.5 Research Methodology**

### *1.5.1 Study Design*

This masters-based research project is a mixed-method sequential embedded approach pre-post pilot study to evaluate the effectiveness of a targeted online learning module for Canadian healthcare learners in nursing, pharmacy, and medicine in increasing their confidence and self-efficacy in discussing vaccines with patients through surveys, self-evaluations, and focus groups. The sequential embedded design model was selected for this study as there are aspects of the research objectives that can be answered with both quantitative and qualitative methodologies (70). With the chose mixed-methods approach, data was collected *sequentially*, with the quantitative pre-measure and post measure collected first followed by the qualitative measure, and is *embedded*, with one data type playing a secondary, supportive role (70). In this *embedded* design study, the supplementary qualitative data provides additional context to the primary quantitative data. Researchers (ED and MP) recruited HCP learners to complete the VSGs alongside self-assessment rubrics, followed by focus group discussions for validation and evaluation of the overall online learning module.

### *1.5.2 Research Paradigm*

A pragmatic research paradigm was selected to guide this research as it gives priority to the research question over the research methods (71), and gives a more flexible and reflexive

approach to research design (72). *Pragmatism* provides a bridge between two traditional research paradigms; *positivism* (quantitative approaches such as surveys which rely on measurement, objectivity, and reason) and *constructivism* (qualitative approaches such as focus groups which rely on interpretation of social constructs and the subjectivity of reality) (73, 74). It also allows for *abductive* reasoning (seeking the simplest plausible conclusion without definitively verifying it) based on the approach to the research question (72, 75), in contrast to *inductive* (development of new theories from specific observations) and *deductive* (testing of existing theories through data collection and observations) reasoning. To mitigate bias from and increase reflexivity of the researcher who determined what was important in the pragmatic design multiple methods, researchers, and perspectives were incorporated.

A general consensus exists amongst mixed-methods researchers in support of pragmatic approaches to mixed-methods research (72, 76). This approach allows for the incorporation of various research methodologies and multidisciplinary perspectives to address different aspects of the research objectives. Methodologic triangulation helps mitigate biases such as sampling or measurement bias that may occur when using a single method or a single researcher (77). In this thesis, the results are integrated through a *contiguous narrative approach* in sequential chapters (78), with the quantitative findings being reported in Chapter Two and the qualitative findings being reported in Chapter Three. The fit of data integration (78) is discussed in Chapter Four, as the qualitative findings confirmed and expanded upon the quantitative findings.

## CHAPTER TWO: Development and Evaluation of Virtual Simulation Games

### Development and evaluation of Virtual Simulation Games to increase the confidence and self-efficacy of healthcare learners in vaccine communication, advocacy, and promotion.

#### Authors:

Emily J. Doucette<sup>1</sup>, Madison M. Fullerton<sup>2,3</sup>, Margaret Pateman<sup>2,3</sup>, Alyssa Lip<sup>4</sup>, Sherilyn K.D. Houle<sup>5</sup>, James D. Kellner<sup>1,6</sup>, Jenine Leal<sup>7,8,9,10,11,12</sup>, Shannon E. MacDonald<sup>1,13</sup>, Deborah McNeil<sup>2,6,7,9,14</sup>, Sandra Davidson<sup>2</sup>, Cora Constantinescu<sup>7,15</sup>

<sup>1</sup> Department of Pediatrics, Cumming School of Medicine, University of Calgary, Calgary, AB, Canada

<sup>2</sup> Faculty of Nursing, University of Calgary, Calgary, AB, Canada

<sup>3</sup> 19 to Zero Inc., Rocky Mountain House, AB, Canada

<sup>4</sup> Division of Respiriology, Department of Medicine, University of Calgary, Calgary, AB, Canada

<sup>5</sup> School of Pharmacy, University of Waterloo, Waterloo, ON, Canada

<sup>6</sup> Alberta Children's Hospital Research Institute, University of Calgary, Calgary, AB, Canada

<sup>7</sup> Department of Community Health Sciences, Cumming School of Medicine, University of Calgary, Calgary, AB, Canada

<sup>8</sup> Department of Microbiology, Immunology and Infectious Diseases, University of Calgary, Calgary, AB, Canada

<sup>9</sup> O'Brien Institute for Public Health, University of Calgary, Calgary, AB, Canada

<sup>10</sup> Infection Prevention and Control, Alberta Health Services, Calgary, AB, Canada

<sup>11</sup> Antimicrobial Resistance - One Health Consortium, University of Calgary, Calgary, AB, Canada

<sup>12</sup> Real World Evidence Consortium, University of Calgary, Calgary, AB, Canada

<sup>13</sup> Faculty of Nursing, University of Alberta, Edmonton, AB, Canada

<sup>14</sup> Maternal Newborn Child and Youth Strategic Clinical Network, Alberta Health Services, Calgary AB, Canada

<sup>15</sup> Pediatric Infectious Diseases, Department of Pediatrics, Cumming School of Medicine, University of Calgary, Calgary, AB, Canada

## 2.1 Abstract

**Background:** Although healthcare providers (HCPs) are the most trusted source of vaccine information, there is a paucity of easily accessible, multidisciplinary educational tools on vaccine communication for them. Virtual simulation games (VSGs) are innovative, yet accessible and effective tools in healthcare education. The objectives of our study were to develop VSGs to increase HCP confidence and self-efficacy in vaccine communication, advocacy, and promotion, and evaluate the VSGs effectiveness using a pre-post self-assessment pilot study.

**Methods:** A multidisciplinary team of experts in nursing, pharmacy, medicine, and simulation development created three VSGs for HCP learners focused on addressing conversations with vaccine hesitant individuals. We evaluated the VSGs with 24 nursing students, 30 pharmacy students, and 18 medical residents who completed surveys and 6-point Likert scale pre-post self-assessments to measure changes in their confidence and self-efficacy.

**Results:** There were no significant differences in baseline confidence and self-efficacy across the three HCP disciplines, despite varied levels of education. Post-VSG confidence and self-efficacy (median: 5) were significantly higher than pre-VSG (median: 4-5) for all three HCP disciplines ( $P \leq 0.0005$ ), highlighting the effectiveness of the VSGs. Medical residents reported significantly lower post-VSG confidence and self-efficacy than nursing and pharmacy learners despite completing the greatest amount of education.

**Conclusions:** Following the completion of the VSGs, learners in nursing, pharmacy, and medicine showed significant improvement in their self-assessed confidence and self-efficacy holding vaccine conversations. The VSGs as an educational tool, in combination with existing clinical immunization training, can be used to increase HCP confidence and possibly engagement in vaccine discussions with patients, which may ultimately lead to increased vaccine confidence among patients.

**Keywords:** virtual simulation, simulation games, healthcare learner, vaccine hesitancy, communication, evaluation

## 2.2 Introduction

Prior to the COVID-19 pandemic, vaccine hesitancy (the delay in acceptance or refusal of vaccination despite vaccine availability) (14), was named one of the top ten global health concerns by the World Health Organization (13). Following the pandemic, vaccine hesitancy continues to be a significant factor preventing the public, globally, from vaccinating against infectious diseases such as COVID-19 (11, 22). It is well cited that healthcare providers (HCPs) are patients' most trusted source of health and immunization information, suggesting that conversations with HCPs about vaccines may be an effective way to address vaccine hesitancy (29-31).

Although HCPs can address vaccine hesitancy, their willingness to recommend immunization for their patients is dependent on their knowledge of vaccine effectiveness and safety in addition to their personal feelings towards vaccination (31). It is essential that all HCP feel confident in themselves and maintain a professional sense of self-efficacy when engaging in vaccine discussions. While confidence generally describes "a strong self-perceived belief" and can be both positive or negative (54), self-efficacy describes "an individual's belief in their capacity to execute behaviours necessary to produce specific outcomes" (55, 56). A recent scoping review by our team examined whether educational interventions existed for HCPs on how to effectively engage in vaccine conversations with patients (61). The review identified that current interventions are not easily accessible, are targeted towards medical learners (e.g., students, residents, physicians, etc.) and are not inclusive of other professionals that also play a key role in immunization distribution and uptake, such as nurses and pharmacists.

Virtual simulation games (VSGs) are a form of digital learning and have been used in clinical nursing education for many years (46), but their development and use have become increasingly common since the COVID-19 pandemic restricted in-person learning (47). The

Canadian Alliance of Nurse Educators Using Simulation (CAN-Sim) is a leading organization in simulation education and research with extensive experience developing VSGs for HCPs on various health topics (66). VSG benefits include increased decision-making opportunities by participants compared to in-person simulation that often occurs in large group settings, as well as increased accessibility by learners worldwide (47). VSGs have also been shown to lessen fear, anxiety, and embarrassment in new learners who may worry about making mistakes in front of fellow students and instructors (47).

When considering interventions to address vaccine hesitancy, it is important to consider the framing of the conversation in addition to the information being presented to a patient. Patients were more likely to accept vaccine recommendations from a HCP if they used presumptive statements (e.g., “Today you will receive two vaccinations, correct?”) rather than participatory (e.g., “Are we going to vaccinate today?”) (34). The PrOTCT Framework provides HCPs with a structure to discuss vaccinations with patients and build trust by **P**resuming the patient will vaccinate, **O**ffering to share knowledge and personal experiences with vaccines, **T**ailoring recommendations to address patients specific health **C**oncerns, and **T**alking through a specific plan for when and where to get vaccinated (38). Taken together, presumptive statements and the evidence-based PrOTCT Framework could serve as the basis to create evidence-informed educational materials to better support HCPs in discussing vaccines with their patients.

Given the paucity of accessible and multidisciplinary educational tools alongside the benefits of virtual simulation, the objectives of this study were: to 1) develop three VSGs to increase the confidence and self-efficacy of HCP learners in vaccine communication, advocacy, and promotion through the use of presumptive statements and the PrOTCT Framework, and 2) evaluate the VSGs using a pre- and post-intervention self-assessment to measure their perceived effectiveness in increasing HCP vaccine communication confidence and self-efficacy.

## 2.3 Methods

A diverse team of subject matter experts in the areas of nursing, pharmacy, and medicine came together to support and guide the development of three VSGs. The team met virtually in February and March 2022 via the Zoom platform (Zoom Video Communication, San Jose, California, USA) to design the VSGs with leadership from and templates provided by CAN-Sim.

### 2.3.1 *Virtual Simulation Game Development*

The VSGs were developed through a series of virtual workshops led by CAN-Sim using the CAN-Sim framework (66), with a focus on incorporating presumptive statements (34) and the PrOTCT model (38) as the communication framework for the games. The VSGs were designed to be discipline and knowledge agnostic to ensure that any of the three healthcare disciplines could complete the intervention regardless of their practice setting or specific knowledge about vaccine administration, side effects, and ingredients. Based on the scoping review conducted by our team (61) as well as input from subject matter experts in the areas of medicine, nursing, and pharmacy, we chose the following topics related to vaccine hesitancy to be covered in each game: how to have a conversation with a patient expressing hesitancy around receiving a booster/completing a vaccine series (VSG1); how to support a patient who minimizes the risk of disease while maximizing the risk of the vaccine (VSG2); and how to foster personal resilience, maintain a professional sense of self-efficacy, and prevent burnout and moral distress during challenging patient interactions (VSG3).

Once a case summary was drafted for each scenario, the first step of the VSG development process was the creation of learning outcomes and indicators (Appendix A I), followed by the creation of self-assessment rubrics using Likert scales (Appendix B). Next, using the CAN-Sim Decision Point Map template (Appendix A II), decision points were created based on the established learning outcomes to outline the flow of the games. Each decision point

consists of a critical thinking question with one correct response and two responses that were not correct or not the best answer. The evidence-based rationale for each decision point was determined by the content experts from each discipline and was kept consistent through each VSG. The filming scripts were then written in teams consisting of nurses, pharmacists, and physicians as well as learners from these disciplines to determine the dialogue between characters based on the learning outcomes and decision points. The scripts were reviewed by key stakeholders in the community including practicing clinicians and learners in the three disciplines, and two individuals from the public who identified as vaccine hesitant. After completion of the peer review and incorporation of feedback, the VSGs were filmed in person with actors. The games were combined by CAN-Sim using Articulate Storyline 3 Software and made available through an online open-access website (79).

### *2.3.2 Target Audience and Pilot Participant Recruitment*

The target audience for the VSGs were HCP learners in nursing, pharmacy, and medicine. However, in efforts to pilot the games before broader dissemination, we recruited medical residents in the specialties of Internal Medicine (IM), Family Medicine (FM), Obstetrics and Gynecology (OBGYN), Pediatrics (Peds), Emergency Medicine (EM), and undergraduate nursing students in their third and fourth year from the University of Calgary, while undergraduate pharmacy students in their second, third, and fourth year were recruited from the University of Waterloo. Informed consent was obtained prior to study participation (Appendix C) Participants were offered an electronic gift card for their time spent completing the VSGs for the amount of CAD \$25 per VSG completed up to CAD \$75. The target sample size was calculated to be 30 participants from each discipline (nursing, pharmacy, and medicine) to participate in the pilot evaluation of the VSGs. Sample size targets were based on statistical analysis using G\*Power (80). Assuming the intervention would increase the perceived confidence in discussing

vaccine hesitancy with a one-sided t-test, a medium effect size 0.5, power of 0.8, and type I error probability of 0.05, the calculated minimum sample size per group was 28.

### *2.3.3 Virtual Simulation Game Evaluation using Pre- and Post-Intervention Self-Assessments*

Prior to and after completing the three VSGs, participants were asked to self-assess their confidence and self-efficacy using 6-point self-assessment Likert-based scales for each VSG ranging from 1 (least amount of confidence/self-efficacy) to 6 (most amount of confidence/self-efficacy) (Appendix B). The three self-assessment scales were designed using CAN-Sim templates and were validated by a team of experts to ensure content was appropriate.

### *2.3.4 Data Analysis*

Demographic factors including participants' age, gender, year of program, medical specialty (residents only), and questions about whether participants had experience learning about vaccine conversations were collected in the pre-intervention survey (Appendix D). Differences in demographic factors between HCP disciplines were assessed using Fisher's exact test and reported significant if  $P < 0.05$ .

Statistical analysis of pre-post self-assessment responses was conducted on each of the VSGs independently. Individual Likert item scores for questions were stratified into two evaluation categories, confidence and self-efficacy, for each VSG (VSG 1 had 3 confidence questions and 2 self-efficacy questions, VSG 2 had 3 confidence questions and 3 self-efficacy questions, and VSG 3 had 2 confidence questions and 2 self-efficacy questions). Non-parametric testing methods were used as normality assumptions were not met; target sample sizes were not met, and significant skew was identified visually and confirmed statistically using the Shapiro-Wilk test. A one-sided Wilcoxon matched-pairs signed rank test using Pratt's method was used to compare the paired difference between median scores in pre- and post-assessments and a Kruskal-Wallis test with Dunn's multiple comparison test was used to compare self-assessment

scores across HCP disciplines (significance reported based on an alpha value of 0.05). Unpaired responses (missing a pre- or post- survey response) were included for descriptive statistics and excluded during paired analyses. Data was analyzed using R 1.1.463 and figures were created using GraphPad Prism 9.2.0.

## 2.4 Results

A total of 81 participants provided consent to participate in the study; however, 9 were excluded from analyses due to more than one missing or incomplete self-assessment (4 pharmacy and 4 medical learners) or being unable to confirm enrollment in a HCP training program (1 nursing learner). Data from 72 participants, including 24 nursing, 30 pharmacy, and 18 medicine learners, were included in the final analysis.

There were no significant differences in participants' gender across the three disciplines, however medical learners were significantly older than nursing and pharmacy learners (Table 2.1). All pharmacy and medical learners reported having a previous vaccine conversation with patients, compared with only 70.8% of nursing learners (Table 2.1). Whether or not participants learned about how to have vaccine conversations with patients in their program also differed significantly by discipline ( $P < 0.001$ ) (Table 2.1), and the most common setting participants learned to have conversations was in theory and/or coursework.

No significant differences in baseline confidence or self-efficacy were identified across the three disciplines on VSG1 and VSG3 (median score = 4); however, medical and pharmacy learner responses differed significantly in self-confidence before VSG2 ( $P < 0.05$ ) (Figure 2.1A-C; Figure 2.2A-C). Medical learners reported significantly lower confidence and self-efficacy than nursing and pharmacy learners on all three post-intervention self-assessments, with the exception of post-VSG2 self-efficacy which had no differences between disciplines (Figure 2.1D-F; Figure 2.2D-F).

All pre- and post-intervention self-assessment scores were non-normally distributed and skewed to the upper end of the 6-point Likert scales (Figure 2.3, Appendix B). The median response for confidence and self-efficacy pre- self-assessments ranged from 4-5, while the median response for post- self-assessments was 5 (with the exception of the VSG1 self-efficacy score by medical learners) (Table 2.2). The overall post-intervention scores for both confidence and self-efficacy questions were significantly higher than the pre-intervention scores across all three HCP disciplines and for all three VSGs (Table 2.2).

Although most paired participant scores improved after each game (57.5% of all responses for VSG1, 55.2% for VSG2, 53.3% for VSG3), some scores did not change (33.6% of all responses for VSG1, 39.5% for VSG2, 24.6% for VSG3), while a small amount decreased (3.3% of all responses for VSG 1, 3.8% for VSG2, 4.4% for VSG3). 5.6%, 1.4%, and 17.6% of responses for VSG1, VSG2, and VSG3, respectively, were unpaired due to missing or incomplete self-assessments.

## **2.5 Discussion**

In this study, we designed and developed three VSGs to increase the confidence and self-efficacy of HCP learners in vaccine communication, advocacy, and promotion, and evaluated their efficacy with participants in nursing, pharmacy, and medicine. Learners in all three disciplines reported significantly improved self-confidence and self-efficacy scores in the post-VSG self-assessments for all three VSGs. These findings support the introduction of VSGs into the clinical training of all HCPs who may discuss vaccines with patients. Several unique strengths of the VSGs include their multidisciplinary development process which utilized engagement of multiple stakeholders, collaboration with CAN-Sim, and the discipline and

knowledge agnostic content (in comparison to most other online learning modules that often target a specific vaccine or a single discipline).

Despite varied levels of education across the three disciplines, participants reported similar baseline scores on all three pre-VSG self-assessments, suggesting that the variable amounts of immunization-related training in different HCP programs previously identified (42) does not result in any differences in HCP learner confidence or self-efficacy. Ultimately, HCPs are most likely to improve their confidence in communication skills through repeated practice with patients, and simulations are an effective way to emulate real patient scenarios. They offer a low stakes environment where learners can try new skills, receive immediate feedback, and learn from mistakes (47).

The use of pre-post measurements with Likert scale assessments introduces a potential for initial overconfidence bias and post-test overcorrection due to the Dunning-Kruger effect (57, 58), where lack of knowledge can cause someone to overestimate their skills. This was likely observed in the small proportions of participants whose scores did not change or decreased from pre- to post-test. Interestingly, medical learners consistently reported significantly lower levels of self-confidence in the post-VSG self-assessments when compared to participants in nursing and pharmacy despite completing the most years of medical education. This may be a result of the Dunning-Kruger effect, or it may be possible that with greater amounts of training and responsibility medical learners experience increased feelings of patient care ownership (PCO). PCO, or feelings of accountability for patients when in charge of clinical decision-making (81, 82), has been shown to increase as residents' seniority increases (81, 83). Therefore, residents who feel greater levels of PCO and who fear hindering the therapeutic relationship with long term patients could result in overall lower perceived self-confidence.

## **2.6 Limitations**

This study has several limitations. Each survey had missing pre- or post-assessment responses. VSG3 in particular had the largest percentage of missing pre-VSG responses, suggesting problems with the UCalgary Qualtrics survey website may have prevented some responses from being saved. Due to the challenge of recruiting participants from busy HCP training programs, we relied on convenience sampling and recruited a smaller number of participants than initially anticipated. This reduces our statistical power, increases the likelihood that learners with lower initial levels of self-confidence were excluded, and decreases our ability to generalize our findings to the broader population. To lessen the impact of scheduling conflicts resulting in participant dropouts, we offered flexible options to those participating to maximize completion rates. Additionally, the use of ordinal Likert scales for self-assessments and a pre-post test study design limits statistical analysis and introduces potential social desirability bias (84). We attempted to mitigate this by emphasizing the anonymity of the assessments so as to encourage honest self-reflection. Future studies may benefit from using a continuous scale assessment and/or a randomized control trial design to increase generalizability. Face validity of the outcome measure of confidence and self-efficacy was established however further construct validity and reliability testing would be strengthen its use. Lastly, we recruited participants from only one institution per profession, although baseline scores were similar across all professions which decreases the likelihood that inter-institutional differences in how vaccine-related content is taught impacted our results.

## **2.7 Conclusions**

Our VSGs significantly improved HCP learners' confidence in holding challenging vaccine conversations with patients. Based on our findings, we recommend the development and use of VSGs for both HCP education programs and accredited continuing education programs as

they are easily accessible and can be used by any HCP learner or practitioner. Further, these learning modules can easily be expanded to add additional content, further assessments, and practice material on many different vaccine hesitancy situations. In combination with existing didactic immunization training, these virtual simulation modules will complement HCPs existing knowledge and provide useful tools and skills to increase the likelihood they engage in conversations with those who are vaccine hesitant. Such interventions will continue to strengthen the patient-provider relationship, build trust, and provide support to both HCPs and the public in vaccination decisions.

## **2.8 Declarations**

### *2.8.1 Ethics approval and consent to participate*

This study received approval from the University of Calgary Conjoint Health Research Ethics Board (REB22-0012) and a University of Waterloo Research Ethics Board (REB 44487).

### *2.8.2 Consent for publication*

Not applicable.

### *2.8.3 Availability of data and materials*

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

### *2.8.4 Funding*

This study was funded by the Public Health Agency of Canada's Immunization Partnership Fund (IPF).

### *2.8.5 Authors' contributions*

ED and MP were involved in acquisition of data. ED, MMF, MP, AL, SKDH, JT, MLF, SD, and CC were responsible for conception and design of the study. ED performed the analysis and interpretation of data. ED and MMF drafted the manuscript. ED, MMF, MP, AL, SKDH,

JDK, SEM, JL, DM, SD, and CC gave critical revision of the manuscript for important intellectual content. SD and CC obtained funding and accept full responsibility for the work and/or the conduct of the study, had access to the data, and controlled the decision to publish.

#### *2.8.6 Acknowledgements*

We gratefully thank all HCP learners in nursing, pharmacy, and medicine who gave their time to complete the online learning modules and provide feedback. We also appreciate the expertise of the following individuals who provided knowledge and oversight to this project: Dr. Jane Tyerman, Dr. Marian Luctkar-Flude, Dr. Kelly Grindrod, Dr. Zahra Shajani, Deana Sabouda, and Irina Rajakumar.

**Table 2.1.** Participant demographics from pre-intervention survey (P-values calculated with Fisher's exact test).

	Nursing Students (N=24)	Pharmacy Students (N=30)	Medical Residents (N=18)	Total (N=72)	P-value
Age (n, %)					<0.0001
18-25	15 (62.5)	22 (73.3)	2 (11.1)	39 (54.2)	
26+	7 (29.2)	7 (23.3)	15 (83.3)	29 (40.3)	
Unknown	2 (8.3)	1 (3.3)	1 (5.6)	4 (5.6)	
Gender (n, %)					0.3884
Female	19 (79.2)	23 (76.7)	13 (72.2)	55 (76.4)	
Male	4 (16.7)	7 (23.3)	5 (27.8)	16 (22.2)	
Non-binary	1 (4.2)	0 (0.0)	0 (0.0)	1 (1.4)	
Year of HCP training program (n, %)					<0.0001
1st	1 (4.2)	0 (0.0)	6 (33.3)	7 (9.7)	
2nd	0 (0.0)	3 (10.0)	8 (44.4)	11 (15.3)	
3rd	9 (37.5)	21 (70.0)	1 (5.6)	31 (43.1)	
4th	14 (58.3)	5 (16.7)	3 (16.7)	22 (30.6)	
Other (Graduated)	0	1 (3.3)	0 (0.0)	1 (1.4)	
Medical Specialty (n, %) <sup>1</sup>					N/A
FM			8 (44.4)	8 (44.4)	
OBGYN			1 (5.6)	1 (5.6)	
Peds			7 (38.9)	7 (38.9)	
PHPM			2 (11.1)	2 (11.1)	
Have you ever had a vaccine conversation with a patient? (Not necessarily about VH) (n, %)					0.0003
Yes	17 (70.8)	30 (100.0)	18 (100.0)	65 (90.3)	
No	7 (29.2)	0 (0.0)	0 (0.0)	7 (9.7)	
Did you learn about how to have vaccine conversations with patients in your program? (n, %)					<0.0001
Yes	4 (16.7)	26 (86.7)	9 (50.0)	39 (54.2)	
No	13 (54.2)	2 (6.7)	7 (38.9)	22 (30.6)	
Unsure	7 (29.2)	2 (6.7)	2 (11.1)	11 (15.3)	
If yes, where you learned about vaccine conversations (select all that apply) (n)					N/A
Theory/coursework	1	15	4	20	
Lab/simulation setting	1	10	0	11	
Clinical practice	1	4	4	9	
Workshop	0	2	1	3	

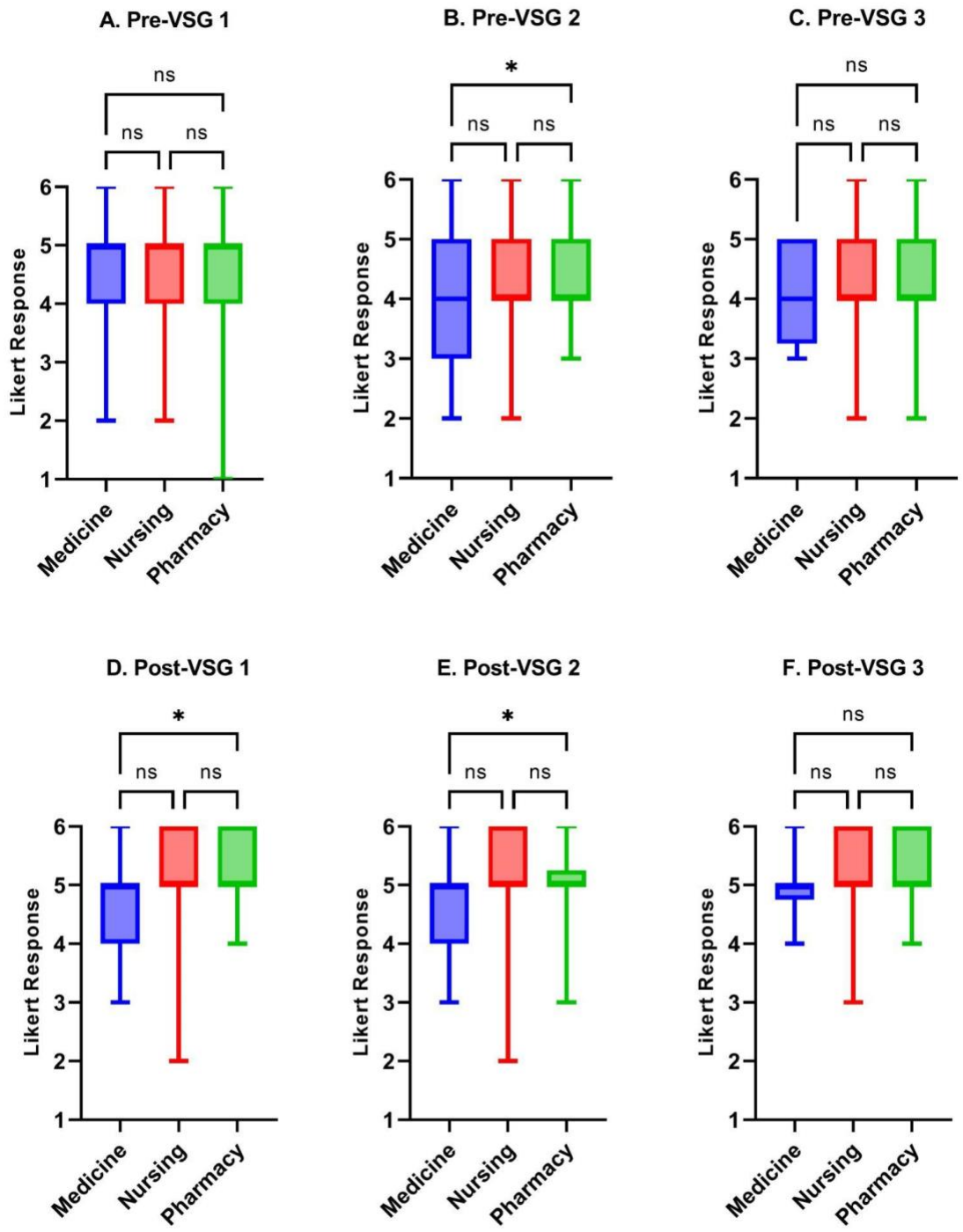
<sup>1</sup>FM=family medicine, OBGYN= obstetrics and gynecology, Peds=pediatrics, PHPM= public health and preventative medicine.

**Table 2.2.** Self-assessment response overview per VSG by HCP discipline. VSG1: 3 confidence questions and 2 self-efficacy questions, VSG2: 3 confidence questions and 3 self-efficacy questions, and VSG3: 2 confidence questions and 2 self-efficacy questions.

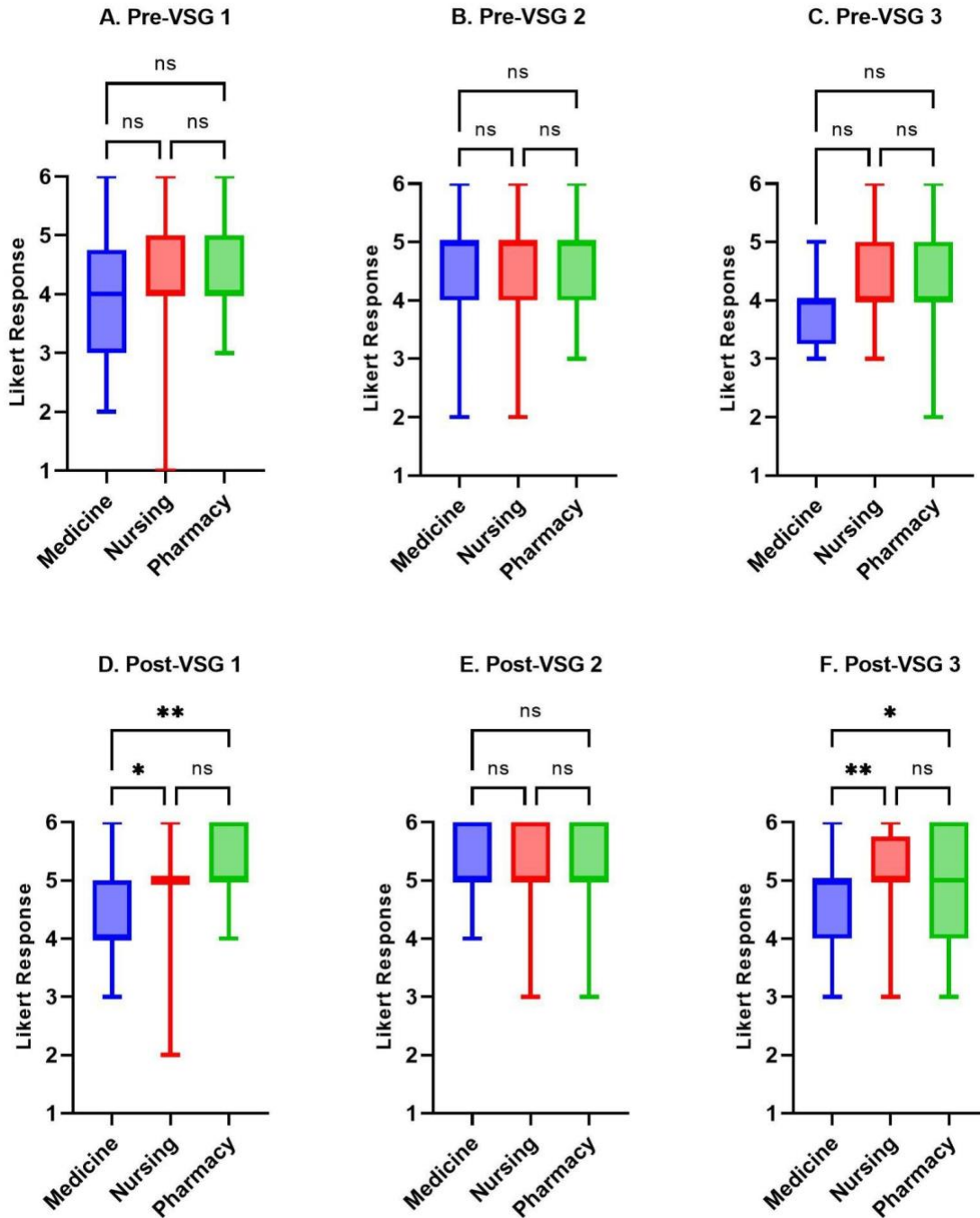
<b>VSG 1</b>					
Discipline	Attribute Assessed	Self-Assessment (pre/post)	Participant responses (n)	Median Response (range)	P value
Medicine	Confidence	Pre	48	5 (2-6)	0.0005
		Post	48	5 (3-6)	
	Self-efficacy	Pre	32	4 (2-6)	<0.0001
		Post	32	4 (3-6)	
Nursing	Confidence	Pre	66	5 (2-6)	<0.0001
		Post	66	5 (2-6)	
	Self-efficacy	Pre	44	4 (1-6)	<0.0001
		Post	44	5 (2-6)	
Pharmacy	Confidence	Pre	90	5 (1-6)	<0.0001
		Post	90	5 (4-6)	
	Self-efficacy	Pre	60	4 (3-6)	<0.0001
		Post	60	5 (4-6)	
<b>VSG 2</b>					
Discipline	Attribute Assessed	Self-Assessment (pre/post)	Participant responses (n)	Median Response (range)	P value
Medicine	Confidence	Pre	51	4 (2-6)	<0.0001
		Post	51	5 (3-6)	
	Self-efficacy	Pre	51	5 (2-6)	<0.0001
		Post	51	5 (4-6)	
Nursing	Confidence	Pre	66	4 (2-6)	<0.0001
		Post	66	5 (2-6)	
	Self-efficacy	Pre	66	5 (2-6)	<0.0001
		Post	66	5 (3-6)	
Pharmacy	Confidence	Pre	90	4 (3-6)	<0.0001
		Post	90	5 (3-6)	
	Self-efficacy	Pre	90	5 (3-6)	<0.0001

		Post	90	5 (3-6)	
<b>VSG 3</b>					
Discipline	Attribute Assessed	Self-Assessment (pre/post)	Participant responses (n)	Median Response (range)	P value
Medicine	Confidence	Pre	28	4 (3-5)	0.0002
		Post	28	5 (4-6)	
	Self-efficacy	Pre	28	4 (3-6)	0.0001
		Post	28	5 (3-6)	
Nursing	Confidence	Pre	38	4 (2-6)	<0.0001
		Post	38	5 (3-6)	
	Self-efficacy	Pre	38	4 (3-6)	<0.0001
		Post	38	5 (3-6)	
Pharmacy	Confidence	Pre	46	4 (2-6)	<0.0001
		Post	46	5 (4-6)	
	Self-efficacy	Pre	46	4 (2-6)	<0.0001
		Post	46	5 (4-6)	

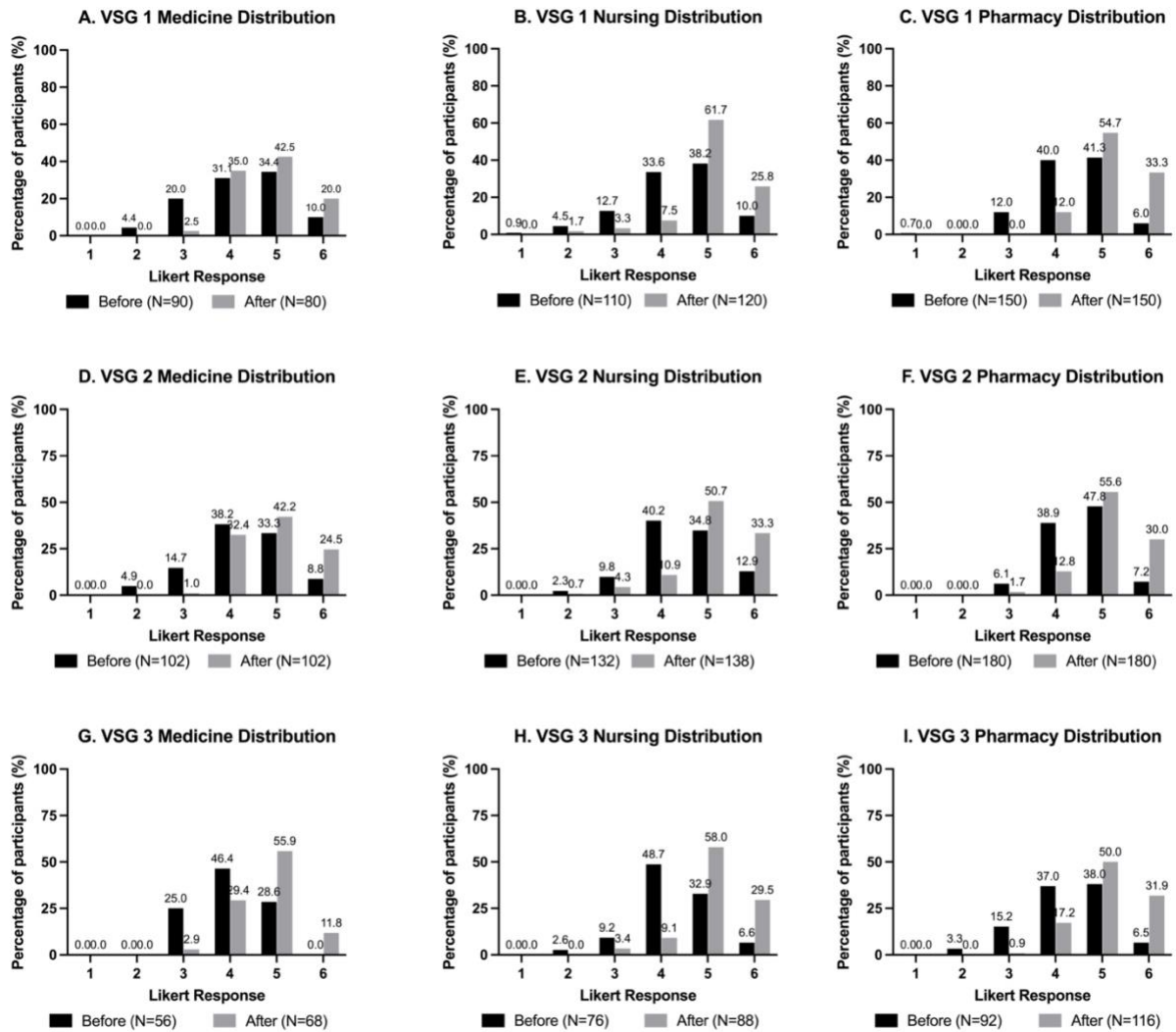
**Figure 2.1.** Confidence score comparisons between disciplines for each pre- and post-VSG self-assessment. (ns =  $P > 0.05$ , \* =  $P \leq 0.05$ , \*\* =  $P \leq 0.01$ , \*\*\* =  $P \leq 0.001$ ).



**Figure 2.2.** Self-efficacy score comparisons between disciplines for each pre- and post-VSG self-assessment. (ns =  $P > 0.05$ , \* =  $P \leq 0.05$ , \*\* =  $P \leq 0.01$ , \*\*\* =  $P \leq 0.001$ ).



**Figure 2.3.** Pre- and post-intervention self-assessment response distributions. Likert scale responses ranged from 1 (least amount of confidence/self-efficacy) to 6 (most amount of confidence/self-efficacy).



## CHAPTER THREE: Qualitative Inquiry of HCP Learner Perspectives

### **“You can push these conversations, but don’t push your patient away”: Learner perspectives on Virtual Simulation Games as an educational approach to address vaccine hesitancy**

#### **Authors:**

Emily J. Doucette<sup>1</sup>, Margaret Pateman<sup>2,3</sup>, Madison M. Fullerton<sup>2,3</sup>, Alyssa Lip<sup>4</sup>, Sherilyn K.D. Houle<sup>5</sup>, James D. Kellner<sup>1,6</sup>, Jenine Leal<sup>7,8,9,10,11,12</sup>, Shannon E. MacDonald<sup>1,13</sup>, Deborah McNeil<sup>2,6,7,9,14</sup>, Sandra Davidson<sup>2</sup>, Cora Constantinescu<sup>7,15</sup>

<sup>1</sup> Department of Pediatrics, Cumming School of Medicine, University of Calgary, Calgary, AB, Canada

<sup>2</sup> Faculty of Nursing, University of Calgary, Calgary, AB, Canada

<sup>3</sup> 19 to Zero Inc., Rocky Mountain House, AB, Canada

<sup>4</sup> Division of Respiriology, Department of Medicine, University of Calgary, Calgary, AB, Canada

<sup>5</sup> School of Pharmacy, University of Waterloo, Waterloo, ON, Canada

<sup>6</sup> Alberta Children’s Hospital Research Institute, University of Calgary, Calgary, AB, Canada

<sup>7</sup> Department of Community Health Sciences, Cumming School of Medicine, University of Calgary, Calgary, AB, Canada

<sup>8</sup> Department of Microbiology, Immunology and Infectious Diseases, University of Calgary, Calgary, AB, Canada

<sup>9</sup> O’Brien Institute for Public Health, University of Calgary, Calgary, AB, Canada

<sup>10</sup> Infection Prevention and Control, Alberta Health Services, Calgary, AB, Canada

<sup>11</sup> Antimicrobial Resistance - One Health Consortium, University of Calgary, Calgary, AB, Canada

<sup>12</sup> Real World Evidence Consortium, University of Calgary, Calgary, AB, Canada

<sup>13</sup> Faculty of Nursing, University of Alberta, Edmonton, AB, Canada

<sup>14</sup> Maternal Newborn Child and Youth Strategic Clinical Network, Alberta Health Services, Calgary AB, Canada

<sup>15</sup> Pediatric Infectious Diseases, Department of Pediatrics, Cumming School of Medicine, University of Calgary, Calgary, AB, Canada

### 3.1 Abstract

**Background:** Vaccine hesitancy is a significant threat to public health. Healthcare providers (HCPs) can address hesitancy during routine conversations with patients, however very few multidisciplinary education tools exist for HCPs to learn how to engage in vaccine discussions. The objectives of this study were to explore HCP learners' experiences with vaccine communication, and qualitatively evaluate an online learning module composed of three virtual simulation games (VSGs) which incorporate presumptive statements and the PrOTCT Framework for HCP vaccine communication.

**Methods:** Three virtual focus groups were conducted from December 2022 to January 2023 with Canadian healthcare learners in nursing (N=6), pharmacy (N=9), and medicine (N=7) who participated in a larger study measuring the effectiveness of the VSGs. Using a pragmatic approach, a qualitative thematic analysis was conducted using NVivo to identify themes and subthemes.

**Results:** A total of 22 HCP learners participated in this study and three key themes were identified. Across all three disciplines, participants expressed that 1) their prior education was didactic and lacked training on how to hold vaccine conversations, resulting in uncomfortable personal experiences with patients; 2) the VSGs increased their confidence in holding these conversations by providing novel tools and skills; and 3) participants also provided feedback to improve the VSGs which was implemented and supported the dissemination to all HCP professions.

**Conclusions:** Although HCPs are a trusted source of vaccine information, participants in this study felt they received little training on how to engage in challenging conversations regarding vaccines. The introduction of the PrOTCT Framework and presumptive statements provided novel strategies for HCP to initiate vaccine conversations, and participants appreciated the

emphasis on coping strategies and resilience. It is essential that HCP are provided both opportunities to practice managing these conversations, and tools and skills to succeed at an early point in their careers to prepare them for future roles in vaccine advocacy, delivery, and promotion.

**Keywords:** virtual simulation, simulation games, healthcare learner, vaccine hesitancy, communication, thematic analysis, focus groups, qualitative research

## 3.2 Introduction

Vaccine hesitancy is defined by the World Health Organization as the delay or refusal to accept vaccines despite availability (14). The emergence of widespread skepticism and mistrust among the vaccine-hesitant population, as well as other barriers to immunization, has led to a dangerous global decrease in vaccination rates across several vaccination programs (20, 21). This has been exacerbated due to the COVID-19 pandemic and vaccine hesitancy remains one of the top ten critical threats to global health and well-being (13). Following the pandemic, healthcare providers (HCPs) have reported feeling uncomfortable initiating vaccine discussions due to the erosion of trust in the healthcare system (85-87). As a result, urgent action is needed to develop effective strategies to combat vaccine hesitancy and encourage the acceptance of vaccines (11, 88).

Vaccine discussion is a complicated interpersonal interaction that requires verbal and non-verbal communication skills to actively listen, recognize hesitancy, and address denialism, as pro-vaccine messaging alone is unlikely to be effective (23, 33, 34, 89). Whereas initially treated as a knowledge deficit phenomenon, more recent work recognizes vaccine hesitancy as a complex by-product of a person's lived and collective experiences with illness, biomedical institutions, injustices, and their relationships with government and the scientific community (25-27). Rather than viewing these individuals as one homogenous category, HCPs need both knowledge and communication tools to respond in a tailored fashion to individual vaccine hesitant archetypes (18) to effectively engage, build trust, and advance vaccination intention.

A recent scoping review conducted by Lip et al. (61) examined whether educational interventions existed for HCPs on how to effectively engage in vaccine discussions. Several gaps were identified, such as limited accessibility of the interventions. Notably, the interventions were more targeted towards medical learners (students, residents, physicians, and physician assistants)

and less so to other disciplines such as nursing and pharmacy, despite these providers playing an important role in immunization distribution and uptake. Similarly, a survey of American HCP students identified a lack of knowledge and overall discomfort engaging in vaccine discussion among nursing, pharmacy, and medical students (90).

In response to this gap, we developed an online learning module consisting of three virtual simulation games (VSGs) to specifically address the need for more accessible interventions targeting HCPs across disciplines of nursing, pharmacy and medicine (79). Each VSG was objective-based and designed to increase HCPs confidence and self-efficacy in vaccine communication through the use of presumptive statements (34) and the PrOTCT Framework (38), which are effective evidence-based tools developed to help HCPs discuss vaccines with patients. VSG1 focused on conversing with patients expressing hesitancy around receiving a booster or completing a vaccine series. VSG2 focused on conversing with patients who minimize the risk of disease while maximizing the risk of the vaccine. VSG3 focused on fostering HCPs' personal resilience, building and maintaining self-efficacy, and provided suggestions to prevent burnout and moral distress when dealing with vaccine refusal.

The objectives of this study were to: 1) explore HCP learners' personal experiences with vaccine education and vaccine discussion, and 2) conduct a qualitative evaluation of the VSGs to identify opportunities for improvement prior to dissemination of the VSGs.

### **3.3 Methods**

#### *3.3.1 Study Design*

This was a qualitative evaluation within a larger pilot study in which we conducted three focus groups between December 2022 and January 2023 with students in nursing from the University of Calgary, students in pharmacy from the University of Waterloo, and medical residents in the internal medicine, family medicine, public health, pediatrics, obstetrics and

gynecology, and emergency medicine specialties from the University of Calgary who provided informed consent. Focus groups were used to foster valuable discussions to identify the opinions of and recommendations for the VSGs.

### *3.3.2 Participant Recruitment*

Participants were recruited for the focus groups from an existing cohort of 72 participants who had completed all 3 VSGs as part of a larger project evaluating the effectiveness of the VSGs at improving learners' confidence and self-efficacy in addressing vaccine hesitancy (manuscript in progress). Eligibility was defined as nursing students in the third or fourth year of their program, pharmacy students in second, third, or fourth year of their program, and medical residents in the eligible specialties previously listed. Participants were offered an electronic gift card for their time spent participating in the focus group for the amount of CAD \$50.

### *3.3.3 Focus Group Guide Development*

The focus group guide (Appendix E) was developed by the project team based on the findings from the scoping review (61) that outlined the gaps in vaccine conversation education. Questions were designed to explore participants' past experiences with vaccine communication, as well as their experiences with the VSGs specifically exploring the user experience and their perceived confidence with vaccine discussions.

### *3.3.4 Focus Group Moderation/Data Collection*

Discipline-specific focus groups were led by two female members of the research team who were approximately the same age as the participants and were experienced in qualitative methodology. The focus groups were conducted online using Zoom (Zoom Video Communications, Inc., San Jose, CA). Focus groups were 1-1.5 hours in length and were led by one researcher, while one facilitator observed, took field notes, and provided technical support.

Following the focus groups, the moderator and facilitator debriefed and shared field notes with each other.

### *3.3.5 Qualitative Analysis*

The focus groups were audio and video recorded, with third-party verbatim transcription to support rigorous data analysis. Two qualitative researchers performed iterative thematic analysis on transcribed data to identify key themes using Braun and Clarke's 6 step framework (familiarize oneself with the data; generate initial codes; search for themes; review themes; define and name themes; produce final report) (91). Analysis was conducted until thematic saturation was reached to support the dependability of our findings. Data organization and analysis were conducted using the qualitative data analysis software, NVivo 12 (92). The coding and thematic analysis was supported by reviewing field notes recorded during each focus group and comparing the emergent findings to ensure no key themes were missed. Regular communication between the researchers ensured that potential biases from their subjective experiences were addressed and changes to the analysis were discussed and agreed upon. In the discussion of themes, quotations from participants are provided along with the participants' discipline and year of program.

## **3.4 Findings**

Of the 72 potential participants from the larger pilot study, 22 participated in one of three discipline-specific focus groups; the distribution included 6 nursing students, 9 pharmacy students, and 7 medical residents. Overall, participants were predominantly female (95.4%). Twenty participants (90.9%) reported having a vaccine conversation in the past, while 13 (59.1%) reported learning about how to have vaccine conversations in their program. Additional participant characteristics are provided in Table 3.1. Three broad themes consistent across all

three disciplines were identified through thematic analysis. Additional quotations and subthemes are included in Table 3.2.

*3.4.1 Theme 1: HCP learners' prior education lacked practical training on how to have difficult conversations with patients, resulting in uncomfortable personal experiences discussing vaccines.*

When asked about their prior education about vaccine conversations, participants in all three disciplines reported that their experiences were often didactic and lacked training on communication skills. The academic training often included information on how to administer vaccines and address common questions regarding vaccine ingredients and side effects, but rarely explored how to navigate challenging conversations.

*“The vaccine class, or the whole vaccine program that we did in school just felt more theoretical. It was mainly based on knowledge of vaccines. I do understand that we had other courses which touched upon patient communication and how to use active listening, like those soft skills, but there’s really no course that combines the two.” (3<sup>rd</sup> year pharmacy student)*

In addition, participants in all three disciplines frequently reported feeling nervous, uncomfortable, and unprepared to engage in challenging vaccine conversations with patients. These emotions often resulted in them responding passively or dismissively when patients brought up concerns, while others hoped to avoid the conversations entirely by not bringing up the topic of vaccines. Residents expressed their hesitancy to address the topic, because they feared that it would hinder the therapeutic relationship with the patient and impact longitudinal care.

*“If I’m being totally honest, I’ve had a lot of negative experiences, so I’m kind of less and less motivated to really push vaccines on patients, which sounds kind of terrible as a new graduate*

*now, ... Like how much do I wanna burn myself out trying to sort of almost convince people?"*

(2<sup>nd</sup> year family medicine resident)

Participants from all disciplines felt motivated to complete the VSGs as they recognized their lack of relevant education and self-confidence. They emphasized their desire to become more confident in their vaccine communication skills, as they felt they would be utilized often in their future roles as HCPs.

*"I think just knowing that this is something that's gonna come up over and over again in residency and in practice, and just wanting those skills, and recognizing that I don't have them or need some help."* (2<sup>nd</sup> year pediatrics resident)

3.4.2 *Theme 2:* HCP learners felt the educational intervention increased their confidence and self-efficacy in having challenging vaccine conversations by providing useful tools and new and transferable skills.

Participants in all three disciplines reported finding the VSGs content to be discipline agnostic, with emphasis on the "soft skills" for communication. They felt the VSGs would be a useful educational tool for all HCPs to complete as they provide skills that are applicable to many different patient scenarios (including other vaccines, medication counselling, and nonpharmacologic lifestyle changes). In addition, they felt that widespread training on vaccine conversations would be beneficial as patients may be more comfortable sharing information with certain providers over others.

*"I think it can be applicable to many other healthcare professionals as well, because at the end of the day, it really depends on who the patients are most comfortable sharing information with. So it might not be their pharmacist. It might not be their nurse. They may be more comfortable with, you know, their doctor or like another social worker... Depends on who*

*they have that really good rapport with, so if that's another healthcare provider that's not in pharmacy or nursing, then they'll still benefit from this module.”* (4th year pharmacy student)

The content in the third VSG specifically focused on HCP resilience, coping strategies, and avoiding moral injury when difficult conversations do not go the way the HCP had planned. Learners in all disciplines appreciated the reminder about the importance of self-compassion and felt the VSG content was a unique and often overlooked strategy for HCPs to utilize when dealing with challenging patient conversations.

*“I'll take away the self-compassion piece and the piece about, you know, you can push these conversations, but don't push your patient away. And knowing when to kind of take that step back to preserve the therapeutic relationship.”* (1st year public health resident)

Although participants had not learned about presumptive statements and the PrOTCT Framework before, they were enthusiastic about practicing the techniques and incorporating them into conversations with future patients. Participants in both nursing and medicine expressed their surprise regarding the effectiveness of presumptive statements, as they had been taught not to make assumptions about patients.

*“So I would say that definitely the presumptive language that the module introduced was something that was also quite surprising to me 'cause it's definitely not an approach that I had thought about before. I think initially when I had seen that in the modules, I actually thought it was quite an abrupt way to ask patients about their vaccines. It was something that I haven't had much practice in the past before. And I'd say in general, the modules were a really good starting point to develop an approach to having these conversations.”* (2<sup>nd</sup> year pediatrics resident)

3.4.3 *Theme 3:* HCP learners enjoyed the learning modules and provided actionable feedback on the content, suggestions for future games, and endorsed accreditation.

All participants found the VSGs to be enjoyable, interactive, and engaging due to the use of real-life patient scenarios and first-person filming perspectives. Participants also appreciated the opportunity to learn from wrong answers as well as correct ones; the VSGs provided learners the opportunity to see how a situation would change when wrong responses were selected, and why it was not the best option at that time.

*“I just think it was really well-formatted in the way that it was very interactive because I think sometimes... When we are taught therapeutic communication, you can read an entire textbook about it, but until you actually have that opportunity to do it, like in a case study type of situation, or even in like real-life experiences... That's when you really start to understand the types of comebacks people might give to you, um, which makes it a lot more challenging.”* (4th year nursing student)

Participants in all three disciplines appreciated the unique knowledge agnostic VSG design that did not centre around factual learning. They felt that the content complemented their existing theoretical knowledge, however all students expressed a desire for additional information regarding how to best integrate vaccine-specific knowledge with communication skills.

*“I think these conversations are really balancing like the art and science of medicine. I think these modules are really good at giving an approach for developing those communication skills for having these difficult conversations with families. But I do think that since a lot of them are coming up with specific facts that they read online, that it is really important to know the facts, and the science, and the evidence behind their specific questions.”* (1st year pediatrics resident)

Finally, participants provided feedback and suggestions to improve the VSGs immediately and for future games (Table 3.3). All participants supported accreditation of the VSGs by a governing body and the integration of the VSGs into healthcare training program curricula to make the intervention more likely to be completed by a larger number of HCPs.

### **3.5 Discussion**

Focus groups with learners in nursing, pharmacy, and medicine were conducted to qualitatively evaluate the VSGs, as well as elicit narrative experiences of HCP learners in holding these conversations. Thematic analysis of focus groups transcripts resulted in the identification of three key themes. Overall, HCP learners in nursing, pharmacy, and medicine reported a lack of training on how to engage in challenging vaccine conversations. However, they felt that the online learning module complemented their prior education on immunizations and increased their confidence holding these conversations by providing novel tools and useful skills. The VSGs were perceived to be a positive and useful learning modality for broader distribution. Our online learning module has the potential to address some of the gaps in HCP knowledge and education.

Participants from all three disciplines felt the education they received was didactic, generalized, and did not provide training on soft communication skills or presumptive statements. This is supported by a previous assessment of Canadian nursing, pharmacy, and medical school immunization curricula which found that curriculum content focused on immunization practices and principles rather than communication skills (42). Further, the time spent on the topic varied significantly by discipline and school, lacking consistency even within disciplines (42). Concerningly, HCP learners felt uncomfortable or unprepared when vaccine conversations arose, possibly related to the lack of training. It has been shown that the overall preparedness of a HCP is an important factor in their willingness to engage in conversations with

patients (31), however even practicing HCP have expressed discomfort when the topic of vaccines is brought up by patients as a result of the pandemic (85-87). Participants recognized their lack of confidence, the importance of these conversations, and the frequency with which they will occur in practice, which was a motivating factor in completing the learning modules.

The VSGs resulted in an increase in willingness to engage in vaccine conversations with patients across all three disciplines. Highlights of the VSGs were that they were engaging, interactive, multidisciplinary, and provided transferable skills, meaning they could be used by any HCP engaging in conversations with patients, both vaccine-related or otherwise. The introduction of the evidence-based PrOTCT Framework (38) for guiding vaccine conversations was a novel technique across all three disciplines. Nursing and medical learners found presumptive statements contradicted their prior education about avoiding making assumptions about patients. This suggests a need for HCP training programs to integrate the use of presumptive statements in their immunization education, as presumptive statements have been shown to be significantly more effective than participatory statements in decreasing the odds of parental resistance to vaccines (34). All three disciplines found the content of the VSGs useful, supporting the use of the learning module as a multidisciplinary educational tool.

A unique aspect of the VSGs identified and celebrated by all three disciplines was the emphasis on HCP resilience, coping strategies, and strategies to preserve the therapeutic relationship. Participants enjoyed the reminder of the importance of self-compassion in healthcare roles, especially during difficult or adversarial patient conversations. To our knowledge, no other vaccine communication interventions specifically address the management of HCP emotions (61), despite findings that the emotional state of HCPs significantly impacts their ability to have challenging conversations (62, 63, 93). Moral distress is the psychological distress experienced by HCP as a result of morally challenging situations (94-96), such as in

instances of vaccine refusal, and has been associated with HCPs leaving their professions. While research exists to measure and address moral distress, including strategies such as specialist consultations, reflective debriefing, and educational interventions, further rigorous research is needed in this area (97). As HCP are at an increased risk of burnout, anxiety, and depression now more than ever, it is essential for institutions to not only provide mental health resources following burnout, but to provide strategies and training to avoid and address moral distress early in HCP education (93, 98).

Participants supported accreditation and inclusion of the modules in HCP training programs to increase awareness and use of the VSGs, which will be facilitated alongside open access to the learning modules. We also explored potential areas for improvement. Participants appreciated that the learning modules did not require any specific knowledge of vaccines, but requested additional information about responding to specific vaccine questions which was not included in the games. This provides an opportunity for future VSGs to be added alongside the presently created ones for further education.

### **3.6 Limitations**

The study has several limitations. First, recruitment of HCP learners in each discipline in the larger pilot study was challenging due to HCP training programs' rigorous academic demands. This resulted in a limited convenience sample of participants. To mitigate the impact, we offered multiple date and time options to participants in an effort to increase attendance. Medicine and pharmacy learners in this sample identified as female at a much higher rate than in the Canadian HCP population (99), although the percentage of female nursing learners in this sample was similar to the percentage of female nurses in Canada (100). Further, selection bias likely occurred due to our recruitment strategy and therefore we may have unknowingly missed learners with very high and low levels of self-confidence, as they may have been less likely to

enroll in a study on improving confidence due to fear of embarrassment or indifference. Lastly, it is important to acknowledge the role of both qualitative researchers and that their personal experiences, assumptions, and beliefs may have influenced the thematic analysis and what they deemed to be key themes.

### **3.7 Conclusions**

This qualitative evaluation adds to the growing literature emphasizing the important role HCPs play as a trusted source of vaccine information (29, 31, 36, 101), and the effectiveness of VSGs as an educational tool for HCP training (66). Our findings indicate that the VSGs effectively address the need for a discipline and knowledge agnostic educational tool to increase the confidence of Canadian HCP learners in nursing, pharmacy, and medicine. This was done by introducing new skills, such as the use of presumptive statements, and a focus on HCP resiliency that can complement existing immunization training. Ultimately, it is essential that HCP gain exposure to challenging vaccine conversations at an early point in their training to prepare them for future roles in vaccine advocacy, delivery, and promotion.

### **3.8 Declarations**

#### *3.8.1 Ethics approval and consent to participate*

This study received approval from the University of Calgary Conjoint Health Research Ethics Board (REB22-0012) and a University of Waterloo Research Ethics Board (REB 44487).

#### *3.8.2 Consent for publication*

Not applicable.

#### *3.8.3 Availability of data and materials*

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

#### 3.8.4 *Funding*

This study was funded by the Public Health Agency of Canada's Immunization Partnership Fund (IPF).

#### 3.8.5 *Authors' contributions*

ED and MP were involved in acquisition of data. ED, MMF, MP, AL, SKDH, SD, and CC were responsible for conception and design of the study. ED and MP performed the analysis and interpretation of data. ED and MP drafted the manuscript. ED, MMF, MP, AL, SKDH, DM, JL, SEM, JDK, SD, and CC gave critical revision of the manuscript for important intellectual content. SD and CC obtained funding and accept full responsibility for the work and/or the conduct of the study, had access to the data, and controlled the decision to publish.

#### 3.8.6 *Acknowledgements*

We gratefully thank all HCP learners in nursing, pharmacy, and medicine who gave their time completing the eLearning modules and providing feedback. We also appreciate the expertise of the following individuals who provided knowledge and oversight to this project: Dr. Kelly Grindrod, Dr. Zahra Shajani, Deana Sabouda, Irina Rajakumar, Dr. Jane Tyerman, and Dr. Marian Luctkar-Flude.

**Table 3.1.** Focus group participant demographics.

	<b>Nursing (N=6)</b>	<b>Pharmacy (N=9)</b>	<b>Medicine (N=7)</b>
<b>Age, n (%)</b>			
18-25	4 (66.7)	9 (100.0)	1 (14.3)
26+	2 (33.3)	0 (0.0)	6 (85.7)
<b>Gender, n (%)</b>			
Female	6 (100.0)	9 (100.0)	6 (85.7)
Male	0 (0.0)	0 (0.0)	1 (14.3)
<b>Year of HCP program, n (%)</b>			
1st	0 (0.0)	0 (0.0)	4 (57.1)
2nd	0 (0.0)	1 (11.1)	3 (42.9)
3rd	1 (16.7)	5 (55.6)	0 (0.0)
4th	5 (83.3)	3 (33.3)	0 (0.0)
<b>Medical resident specialty, n (%)</b>			
Pediatrics			2 (28.6)
Public Health and Preventative Medicine (PHPM)			1 (14.3)
Family Medicine			4 (57.1)

**Table 3.2.** Qualitative focus group themes, subthemes, and representative quotes from each HCP learner discipline.

Theme	
Subtheme	Key Quotes
<b>Theme 1: HCP learners’ prior education lacked practical training on how to have difficult conversations with patients, resulting in uncomfortable personal experiences discussing vaccines.</b>	
Participants prior education was very didactic and lacked training on soft communication skills and presumptive statements.	<p><i>“I honestly don't think we had very much training as far as having those conversations with patients. Like if I think back, way back to my term three, I think maybe there was some, like a little bit of training just as far as like vaccines just like on their own, but not necessarily like the conversations behind them as far as like, this is how you should approach it with a patient and XYZ”</i> (4<sup>th</sup> year nursing student)</p> <p><i>“The vaccine class, or the whole vaccine program that we did in school just felt more theoretical. It was mainly based on knowledge of vaccines. I do understand that we had other courses which touched upon patient communication and how to use active listening, like those soft skills, but there's really no course that combines the two.”</i> (3<sup>rd</sup> year pharmacy student)</p> <p><i>“We did have just one lecture, I think, that addressed the vaccine hesitancy. And they did kinda give us some of the main reasons that people provide for being hesitant to vaccines and kinda some of the evidence to rebuttal that...”</i> (1<sup>st</sup> year family medicine resident)</p>
Participants felt uncomfortable and unprepared to have challenging vaccine conversations with patients, fearing it would hinder the therapeutic relationship.	<p><i>“I think when faced with a more difficult individual that's like very passionate about their opposing beliefs or that's just very strong-willed it makes me, I feel like I might get a little nervous 'cause some individuals might get aggressive. I don't know if that's an extreme, but I just know that some people are very passionate about their opinions in specific situations, and I tend to be a more non-confrontational individual in general. So just because of that I tend to be a little bit more hesitant if it was to take that negative, um, turning point.”</i> (4<sup>th</sup> year nursing student)</p> <p><i>“I was being pretty passive in [a] conversation, um, just because I didn't really know how to respond and I was trying to provide reasons to that patient, just general reasons, like that everyone should get it, um, you never know. You can't really protect against it. But I felt as though I could have been more active, but I didn't know how I could direct the conversation and better convince them instead of just giving, you know, general things that they probably heard elsewhere.”</i> (3<sup>rd</sup> year pharmacy student)</p> <p><i>“If you open up the record and see like, they have had no vaccines. Then all of a sudden, I'm like kind of a bit nervous (laughs) and thinking like, “Oh, gosh. How do I even have this conversation?”</i> (2<sup>nd</sup> year family medicine resident)</p>

<p>Participants were motivated to complete the VSGs due to the importance of vaccine communication skills in their daily practice.</p>	<p><i>“I think knowing that this information could be helpful for so many difficult clinical situations we might encounter, just knowing our profession is like what really kind of motivated me to want to do the games you could say ... so just establishing that connection and understanding how common it is to see hesitancy, see or just face difficult situations or conversations with patients”</i> (4<sup>th</sup> year nursing student)</p> <p><i>“For me, working in a community pharmacy, I came across many vaccine hesitant patients and I didn't know exactly how to deal with them, so I wanted to better my own skills and be more confident in that area, so that's what motivated me a lot.”</i> (4<sup>th</sup> year pharmacy student)</p> <p><i>“I think just knowing that this is something that's gonna come up over and over again in residency and in practice, and just wanting those skills, and recognizing that I don't have them or need some help”</i> (2<sup>nd</sup> year pediatrics resident)</p>
<p><b>Theme 2: HCP learners felt the educational intervention increased their confidence and self-efficacy in having challenging vaccine conversations by providing useful tools and new and transferable skills.</b></p>	
<p>The emphasis on HCP resilience and coping strategies present in VSG 3 brought a unique and often overlooked approach for HCPs dealing with challenging conversations.</p>	<p><i>“But I also like the part of the games where they're like, “Oh, like when you have difficult conversations with patients, you also have to have compassion for yourself.” I really like that part because I feel like we skip over that a lot. But like, going through the games kind of helped me recircle back to that point that you have to be kind with yourself even while having these conversations with patients.”</i> (4<sup>th</sup> year nursing student)</p> <p><i>“...for that last module, there was no real resolution, it didn't have a happy ending of the patient ending up with a vaccine, and I think if that happened in real life, I would blame myself. I would say, “If it were someone else who were better at this than me, the patient would've ended up with the vaccine.” And I think that made me realize like this is a professional handling it, and it didn't go the way that I wanted it to go, or the professional wanted it to go, so maybe it's not my fault that this is happening, maybe the patient just was not ready for it today.”</i> (4<sup>th</sup> year pharmacy student)</p> <p><i>“I'll take away the self-compassion piece and the piece about, you know, you can push these conversations, but don't push your patient away. And knowing when to kind of take that step back to preserve the therapeutic relationship.”</i> (1<sup>st</sup> year PHPM resident)</p>
<p>Use of novel PrOTCT framework and presumptive statements</p>	<p><i>“So I would say that definitely the presumptive language that the module introduced was something that was also quite surprising to me 'cause it's definitely not an approach that I had thought about before. I think initially when I had seen that in the modules, I actually thought it was quite an abrupt way to ask patients about their vaccines. It was something that I haven't had much practice in the past before. And I'd say in general, the modules were a really good starting point to develop an approach to having these conversations.”</i> (2<sup>nd</sup> years pediatrics resident)</p> <p><i>“I had also never heard of it before and I had never used it before. And I didn't really consider it until I saw it being used, like implemented in the videos. And I was, at first I was taken aback 'cause I thought that you weren't supposed to kind of assume, um, but to see how it's laid out and how it's used, um, I think it makes sense more now to me. And I kind of like... I appreciated having the modules because of that, because if I had never done it, then I would've never known and I would've continued on with my mindset of like, “Don't assume” and “don't, you know, don't go in that specific way.” So I really, really, appreciated that.”</i> (4<sup>th</sup> year nursing student)</p>

<p>The VSGs content was discipline agnostic, making it multidisciplinary and applicable to many different patient scenarios (other vaccines, medications).</p>	<p><i>“I think [the VSGs are] applicable to general vaccines and administration, and also medication hesitancy because both of those things are concepts that happen a lot... with people not knowing what it does or like having bad experiences in the past.”</i> (4th year nursing student)</p> <p><i>“Two examples I can think of, outside of vaccines, that I can see myself using the skills that I learned from these modules include like for diabetes, patient starting insulin, and even recommending not pharmacologic changes to patient for lifestyle modifications, like smoking cessation. Um, just being personable, kind of like building that rapport with them was something that I took away from the module that we can really apply to any patient scenario, just to, you know, get the ball rolling.”</i> (3<sup>rd</sup> year pharmacy student)</p> <p><i>“I would definitely recommend them to ... most, or any other health profession who's seeing the public in a preventative health kind of way. I think that would apply to a lot of different disciplines, even if they're not set up to specifically provide vaccines or discuss them all the time. I think just having that background and being able to navigate some of those conversations that are inevitably going to come up, regardless of the healthcare setting, I think it would be... I think the skills are very transferable amongst health professions.”</i> (1<sup>st</sup> year family medicine resident).</p>
--	--

**Theme 3: HCP learners enjoyed the learning modules and provided actionable feedback on the content, suggestions for future games, and endorsed accreditation.**

<p>The VSGs were enjoyable, interactive, patient-oriented, and engaging through real-life scenarios and first-person perspectives.</p>	<p><i>“I really like them. I found them very user friendly and there were aspects where I found myself a bit challenged. Overall it was pretty easy to navigate just through common sense. But, there were definitely areas where I would click the wrong response and then through the, explanation, I really appreciated the explanations that were provided for those wrong responses as they allowed me to kinda reflect on my way of thinking.”</i> (4<sup>th</sup> year nursing student)</p> <p><i>“I really liked how in that last simulation game, the questions were embedded within, so you really felt like you were the healthcare provider providing the information to that patient... And I liked how you could see, okay, if I chose this option, let's see what happens and this why it's like not the right option, and then it ... with the correct answer, it walks you through it, and then you see how it plays out.”</i> (4th year pharmacy student)</p> <p><i>“I enjoyed them actually. I thought the approaches discussed were... Like they were new to me. 'Cause like I had mentioned earlier, I had just not had really any significant formal teaching around it. And I think what was helpful was the videos and then the questions afterwards ... I might select X, Y, Z answer, and it turned out to be wrong, um, for a lot of them. But, then watching the videos around it was quite helpful. So honestly, I think it was a pretty good curriculum. I wish it was introduced into medical school earlier for us.”</i> (2<sup>nd</sup> year family medicine resident)</p>
--	---

<p>Knowledge agnostic content complemented existing theoretical knowledge, but learners want additional information to integrate both</p>	<p><i>“I kind of have mixed feelings about it. Um, positive and negative. Like positive in the fact that like, it was strengthening the knowledge that we already had about having those conversations. But like, um, I feel like it was really wonderful to get to know more of that stuff. But like, I also thought, like I would've also appreciated a little bit of a knowledge base. I don't know if that was the point of the games. But like, um, I would've also have appreciated maybe just a little bit of like how to integrate, like talking about the theory part of it with the patient as well” (4th year nursing student)</i></p> <p><i>“I don't think these videos need to cater towards the theoretical knowledge, they do a great way of working on soft skills in an online platform, and I think that's something that's, we don't really get much in school outside of the clinical labs. So these videos are a really great way of learning how to practice on those soft skills without having to do it in person.” (3<sup>rd</sup> year pharmacy student)</i></p> <p><i>“I think these conversations are really balancing like the art and science of medicine. I think these modules are really good at giving an approach for developing those communication skills for having these difficult conversations with families. But I do think that since a lot of them are coming up with specific facts that they read online, that it is really important to know the facts, and the science, and the evidence behind their specific questions. And I think as a healthcare provider, I think it also can diminish their trust in us, and if we don't like to have the specific details and the evidence behind like their particular question that they're asking us. And so, I think that it's important for us to be able to know, like some of the evidence and the research behind, like some of their questions that they have, uh, with regards to vaccines.” (1st year pediatrics resident)</i></p>
<p>Accreditation of the VSGs by a governing body/integration into coursework will make the intervention more likely to be completed by more HCPs.</p>	<p><i>“If this was like added on into [coursework] in some way ... like the school making us do it. I think like if you ask some students to do it themselves, they might not, but if you throw it into a course and it's enforced ... like they won't see how the benefits play out until they actually do it.” (4th year pharmacy student)</i></p> <p><i>“I think [accreditation] would be nice too, because I'm in the process of interviewing for jobs right now. Um, and something that I've noticed that a lot of people ask is what, like external education, are you doing on top of school. Um, and so I've been bringing this one up.” (4th year nursing student)</i></p>

**Table 3.3.** Suggested improvements for VSGs design and topics of interest for future games.

Suggested improvements for VSGs	<ol style="list-style-type: none"> <li>1. Table of contents/back button to allow for movement within VSGs</li> <li>1. Open text responses to provide opportunity to come up with potential answers</li> <li>2. Video responses to provide participants an opportunity to practice saying their responses out loud</li> <li>3. More information on the PrOTCT Framework</li> </ol>
Suggested topics for future games	<ol style="list-style-type: none"> <li>1. “Selective hesitancy”, patients who prefer a certain vaccine brand over another (e.g. Pfizer vs Moderna)</li> <li>2. Vaccine hesitancy in diverse patient populations (e.g. pediatrics, pregnancy, seniors)</li> <li>3. How to answer questions about vaccine ingredients (pharmacy specific)</li> <li>4. Vaccine-specific games e.g. (HPV, flu, shingles) (resident specific)</li> </ol>

## CHAPTER FOUR: Conclusions

### 4.1 Summary of Findings

As outlined in Chapter One, vaccine hesitancy has been an established danger to public health long before it was declared one of the top ten global health threats by the WHO in 2019 (13), and has been further amplified as a result of the COVID-19 pandemic. Vaccine hesitancy exists on a broad spectrum from minor hesitation to extremism, and there are a multitude of factors that contribute to its development (25). It is well established that HCPs are the most trusted source of information about vaccines (29-31), and a HCPs overall preparedness is a contributing factor in the likelihood that they engage in potentially challenging conversations about vaccines (31). Unfortunately, vaccine communication education in Canada varies significantly by discipline and by program (42). This presented a key opportunity to develop and implement an educational tool for HCPs to learn how to have successful vaccine conversations early in their training, in order to practice and develop effective communication skills.

The primary objective of this thesis was to understand the effectiveness of the VSGs in improving HCP learners' self-reported confidence and self-efficacy regarding vaccine communication and promotion. Confidence and self-efficacy are similar concepts that may be interpreted together by some (102). However, the concepts differ in that confidence is a general description of perceived capability, while self-efficacy is a belief in being able to succeed in a specific task and/or situation (55, 56). As presented in Chapter Two, based on the gap identified by a needs assessment and a scoping review (61), we successfully designed and developed three different discipline and knowledge agnostic VSGs for Canadian HCP learners. The VSGs covered topics including vaccine communication, advocacy, and promotion following the CAN-Sim model (66), and the VSGs were combined into one open access online learning module (79). Following a pre-post pilot study of 72 learners in nursing, pharmacy, and medicine, it was found

that all three VSGs significantly improved participants' self-confidence and self-efficacy when addressing vaccine hesitant patients. Although nursing, pharmacy, and medical learners presented with varying levels of education, there were no significant differences between the baseline self-assessment scores from each of the disciplines. Medical learners reported significantly lower levels of confidence and self-efficacy in the post-assessments when compared with nursing and pharmacy learners, which may be due to increased feelings of patient care ownership (81, 83) or a result of the Dunning-Kruger effect causing decreased self-confidence due to their advanced level of education (57, 58).

The secondary objectives of this study were to explore participants' personal experiences discussing vaccines with patients, identify changes and/or improvements to the VSGs prior to dissemination, identify how and when to best use the VSGs, and inform the development of future VSGs on similar topics. As presented in Chapter Three, a pragmatic thematic analysis of learner perspectives identified three key themes through focus groups with each HCP discipline. HCP learners' prior education lacked practical training on how to have difficult conversations with patients, resulting in uncomfortable personal experiences discussing vaccines (Theme 1); they felt the educational intervention increased their confidence and self-efficacy in having challenging vaccine conversations by providing useful tools and new and transferable skills (Theme 2); and they enjoyed the learning modules, provided actionable feedback on the content, suggestions for future VSGs, and endorsed accreditation (Theme 3). Highlights of the qualitative findings included the emphasis on HCP resilience and coping strategies, and the introduction to the PrOTCT Framework (38) as a novel tool for initiating vaccine conversations.

In this mixed-methods study, the pre- and post-intervention self-evaluation data acted as the main data set to measure the impact of the online learning module and helped quantify the change in HCP confidence and self-efficacy regarding vaccine communication. The use of a

sequential embedded mixed-methods study design utilizing focus groups and pragmatic thematic analysis improved this research through data triangulation in several ways. First, it increased the validity and credibility of the quantitative findings that the learning module improved HCP confidence and self-efficacy and confirmed the lack of prior training on vaccine communication. Second, it allowed for a deeper understanding of participants' unique personal experiences with vaccine communication that would not have been identified otherwise (103). Third, it identified specific areas for improvement in the VSGs and provided information about what could be changed or improved prior to dissemination, how to best use the intervention to improve communication in each discipline and will inform the planning and design of future VSGs on similar topics. Finally, this approach highlighted the importance of providing all HCPs with easily accessible training and skills to promote resilience to mitigate the development of burnout. As a discipline agnostic tool, the VSGs are not limited to a specific healthcare discipline and can be used by any HCP who interacts with patients. The knowledge agnostic content emphasized the management of HCP emotions and strategies to preserve the therapeutic relationship in difficult or adversarial conversations, which no current educational programs currently contain.

Taken together, these findings support the integration of the VSGs into HCP education programs and promotion more broadly to all HCP. The VSG content complements the current didactic immunization education curricula and provide tools and skills to improve HCPs willingness to engage in vaccine discussions.

#### **4.2 Study Limitations**

This study was not without challenges and limitations. Study-specific limitations were reported in Chapter Two and Chapter Three, including challenges with recruiting busy HCP learners during a pandemic, the use of Likert scales and self-evaluation, the pre-post study design, and the use of convenience sampling. Broader limitations are reported below.

#### *4.2.1 Impact of COVID-19 Pandemic on Development*

As a result of the COVID-19 pandemic, the entirety of the project from VSG design and development, to participant recruitment, follow-up, and focus groups was conducted virtually. Although this may have unintentionally excluded certain participants due to internet requirements, it also provided a unique opportunity to collaborate with researchers and academics nationwide to ensure the VSGs content was applicable to most HCP learners.

#### *4.2.2 Potential Sources of Bias*

Sampling bias, social desirability bias, and overconfidence bias are potential sources of bias that can be considered additional limitations to this thesis. Sampling bias can occur when a research sample either underrepresents or overrepresents the general population it came from (104). In this research, sampling bias may have occurred due to our convenience recruitment strategy, that may have unintentionally resulted in a sample whose overall confidence and self-efficacy holding vaccine conversations does not truly represent the levels in the general population. However, as no significant differences between the baseline self-evaluation scores across all three disciplines and institutions in two different provinces were found, the likelihood of sampling bias is less likely to have influenced to our findings. Further, as self-evaluation responses ranged from 1 (least amount of confidence/self-efficacy) to 6 (greatest amount of confidence/self-efficacy) on all assessments, this suggests the recruited sample captured learners from all levels of confidence.

Social desirability bias is another potential limitation to this study. Social desirability bias occurs when survey participants answer questions in a way they feel will be viewed favourably rather than answering honestly (84). Participants in the study may have felt obligated to give themselves higher scores on self-evaluations to avoid being perceived as incompetent or unskilled in their HCP role. In an attempt to mitigate this, each participant was assigned a unique

participant ID and the anonymous nature of the surveys and self-evaluations was emphasized. Participants were also reminded that their involvement in the study would not impact their standing with their academic institution.

Overconfidence bias, often caused by the Dunning-Kruger effect (57), is another factor that likely impacted these findings. The use of self-evaluations can be challenging as early learners often overestimate their abilities, while those who have more experience can underestimate their skills (105). This was observed as participant responses were generally skewed towards the upper end of the Likert scales, and through participant feedback in the form of comments about initial overestimations of confidence. While the use of self-evaluation in this study did not allow for the direct measurement of HCP competence in vaccine communication, it did encourage participants to critically reflect on their own skills and shortcomings and provided tools and information to allow for the improvement of HCPs vaccine communication skills over time.

#### *4.2.3 Sample Size*

The target sample size of 28 participants per HCP discipline calculated based on the assumption that the intervention would increase the perceived confidence in discussing vaccine hesitancy with a one-sided t-test, a medium effect size 0.5, power of 0.8, and type I error probability of 0.05, were not met for nursing and medicine groups due to recruitment challenges. Therefore, the precision and power of the statistical analysis completed in Chapter Two are reduced, decreasing the ability to generalize the findings to broader HCP learner populations. However, incorporating the qualitative data into the analysis allows for triangulation of the data as findings were consistent across both approaches.

#### 4.2.4 *Language Limitations*

The pilot study was conducted fully in English with participants from the University of Calgary and the University of Waterloo, which resulted in the exclusion of learners who may not speak English. Although non-English speakers were not included in the pilot study, the VSGs and all relevant materials were translated to French and are available online and open access to French-speaking learners as well to increase the availability to more Canadian HCP learners (79).

#### 4.2.5 *Equity, Diversity, and Inclusion Considerations*

Efforts were made to ensure the diversity of actors during the scriptwriting, casting, and filming of the VSGs to avoid harmful racial and ethnic stereotypes. Unfortunately, due to limitations in the amount of content able to be included in each VSG, and the vaccine hesitancy topics selected for inclusion, we were unable to address additional sources of vaccine hesitancy at this time. For example, vaccine hesitancy in Black, Indigenous, and People of Colour (BIPOC) communities can often stem from systemic racism, marginalization, and other valid trauma-based experiences with governments, healthcare systems, and HCP (106, 107). Although the VSGs were not designed to address these issues specifically, the communication skills covered in the VSGs can be utilized to begin to rebuild trust and relationships between BIPOC communities and HCP. Future VSGs development would benefit from the incorporation of a culturally-informed lens of equity, diversity, and inclusivity into the design to further address these limitations.

### **4.3 Future Directions**

Following the completed evaluation of the online learning module in English, as the VSGs were found to be effective in increasing participants' confidence and self-efficacy, participant feedback from Chapter Three was incorporated into the games based on the users'

experiences and French versions were finalized for publication. In order to ensure prolonged relevancy to all HCP disciplines, the preliminary work of this project and needs assessment focused on identifying competencies which were common to all disciplines. Through the expertise of educators and collaborators involved with this project, the virtual nature of this learning module will be an effective tool for future pandemic-related educational restraints, or for any other changes to in-person education. It can be customized and adapted based on differing program timelines and multidisciplinary curricula.

#### *4.3.1 Dissemination of VSGs*

A long-term goal of this project was to incorporate this educational program into nursing, pharmacy, and medical education nationally. In order to accomplish this goal, an open access, project-specific website has been created (79) and will be maintained on the CAN-Sim website where all of the educational and interventional materials will be available to not only learners, but practicing HCPs and healthcare organizations to be used for professional development and continuing competency activities. A national dissemination strategy will be implemented to direct learners to the website using social media and presentations at national and international conferences. The website can later be updated to include additional educational resources and webinars to teach others how to use the educational tool.

To facilitate dissemination and knowledge translation to physicians, medical residents, and medical students, the research team has begun to leverage existing connections to integrate the modules into medical school curricula first in Alberta, with plans to expand to other provinces. Additionally, we are seeking accreditation for the VSGs in order to expand their availability to all practicing physicians and residents as well as medical students.

Regarding pharmacy learners, a peer-leader approach to implementation in pharmacy curricula across Canada will be used. This approach will involve identifying a pharmacy faculty

member champion at each school to identify how the program can be either incorporated into the existing curriculum or used as an extra-curricular interprofessional activity. They can then organize learner engagement and program uptake. Pharmacy schools across the country had previous success with the multi-program implementation of several online learning modules (including those for informatics and Indigenous training) and multi-disciplinary modules on professionalism, and therefore implementation of this educational module is likely to be successful as well.

To disseminate the learning module to nursing learners, the research team will collaborate with the Canadian Association of Schools of Nursing (CASN). In addition to their role as an important connection to nursing schools across the country, CASN also supports a Simulation Nurse Educator Interest Group, with members who act as champions and leaders in all types of simulation learning, including virtual simulation. This relationship will be leveraged to facilitate the adoption and adaptation of the program into nursing education programs across the country.

#### **4.4 Implications of Research**

Overall, the findings from the studies in this thesis present potential implications for improvements to future HCP training and vaccine education. This work confirmed the inaccessibility of available resources on vaccine communication for HCPs, and the paucity of vaccine communication content in current HCP training programs. Only 54.2% of participants reported learning about how to engage in vaccine discussions in their program. While only two institutions were evaluated in this study (University of Calgary and University of Waterloo), no significant differences in baseline confidence or self-efficacy were identified between institutions or disciplines. This suggests that the gap in training is not an institutional or discipline-specific issue.

This research also validates findings that both healthcare learners and practicing HCP often feel unprepared and nervous to engage in vaccine conversations for fear of increasing workload, impacting the therapeutic relationship with patients, and accelerating HCP burnout. The VSGs provide a unique opportunity for HCP to gain useful skills at an early point in their career by providing low-stakes opportunities for practice. With this additional practice, HCP learners in this study felt more confident and resilient engaging in vaccine conversations, ending conversations that went poorly, and practicing self-compassion techniques.

#### **4.5 Significance of Research**

Participants in this pilot study were part of a group of HCP learners involved in implementing a first of its kind, discipline and knowledge agnostic educational tool for individuals training to become HCPs. While the VSGs are highly applicable for the COVID-19 pandemic and related vaccines, the skills and knowledge that study participants gained are transferable to general vaccine hesitancy interactions and other challenging patient interactions for health issues across all ages. The incorporation of a review of the VSG content by vaccine hesitant members of the public in the VSG development stage further supports the accuracy of the content. In the future, additional VSGs for HCP can be created based on suggestions from participants for VSGs about specific vaccines or in specific populations (Table 3.3) and would benefit from community involvement in their design. Further, VSGs tailored to the general public to provide knowledge and suggestions for how to discuss vaccines with hesitant friends and families could be another useful approach to decrease hesitancy and increase vaccine uptake. A community-based participatory research design with integrated knowledge translation would be an effective approach to ensure engagement and accuracy.

If we are able to increase the confidence of a greater number of HCPs in discussing vaccines, this may eventually lead to a reduction in overall vaccine hesitancy which would be of

great benefit to individual and public health. As trusted sources of vaccine information, by increasing HCPs' overall confidence and self-efficacy discussing vaccination, Canadians' confidence in and uptake of vaccines should also increase over time. The educational intervention fills a significant gap identified in Chapter One and the scoping review (61), with the creation of a virtual and open access educational program for HCP learners.

#### **4.6 Conclusions**

This thesis aimed to describe the evaluation of VSGs that were created for HCP learners to improve their vaccine communication skills and prepare them for future roles in vaccine advocacy, delivery, and promotion. The findings highlight the important role HCPs can play in addressing vaccine hesitancy as well as gaps in current literature, educational curricula, and online training modules. Post-pandemic, it is essential that both new and practicing HCP are empowered, confident, and maintain professional self-efficacy in order to engage with those who are vaccine hesitant and avoid burnout. The findings from this thesis serve as a foundation for future HCP education tools, including additional VSGs, to ultimately allow HCP to address vaccine hesitancy more effectively.

## REFERENCES

1. Statistics Canada. COVID-19 in Canada: A Two-year Update on Social and Economic Impacts. <https://www150.statcan.gc.ca/n1/pub/11-631-x/11-631-x2022001-eng.htm> 2022.
2. Fisman DN, Tuite AR. Evaluation of the relative virulence of novel SARS-CoV-2 variants: a retrospective cohort study in Ontario, Canada. *CMAJ*. 2021;193(42):E1619-E25.
3. IPBES, Daszak, P, Amuasi, J, das Neves, CG, Hayman, D, Kuiken, T, Roche, B, Zambrana-Torrel, C, Buss, P, Dunderova, H, Feferholtz, Y, Földvári, G, Igbino, E, Junglen, S, Liu, Q, Suzan, G, Uhart, M, Wannous, C, Woolaston, K, Mosig Reidl, P, O'Brien, K, Pascual, U, Stoett, P, Li, H, Ngo, HT, IPBES secretariat. Workshop Report on Biodiversity and Pandemics of the Intergovernmental Platform on Biodiversity and Ecosystem Services. IPBES; 2022; Bonn, Germany.
4. Independent Panel for Pandemic Preparedness and Response. A Global Deal for our Pandemic Age: Report of the G20 High Level Independent Panel on Financing the Global Commons for Pandemic Preparedness and Response, 2021. 2021.
5. The Lancet Planetary Health. A Pandemic Era. *Lancet Planet Health*. 2021;5(1):e1. Available from <https://www.ncbi.nlm.nih.gov/pubmed/33421401>. doi: 10.1016/S2542-5196(20)30305-3
6. Nguyen-Van-Tam JS, Hampson AW. The epidemiology and clinical impact of pandemic influenza. *Vaccine*. 2003;21(16):1762-8.
7. Corona A. Disease eradication: What does it take to wipe out a disease? *American Society for Microbiology*; 2020. Available from <https://asm.org/Articles/2020/March/Disease-Eradication-What-Does-It-Take-to-Wipe-out>
8. Artaud C, Kara L, Launay O. Vaccine Development: From Preclinical Studies to Phase 1/2 Clinical Trials. *Methods Mol Biol*. 2019;2013:165-76.

9. Ball P. The lightning-fast quest for COVID vaccines - and what it means for other diseases. *Nature*. 2021;589(7840):16-8.
10. Boucher JC, Cornelson K, Benham JL, Fullerton MM, Tang T, Constantinescu C, et al. Analyzing Social Media to Explore the Attitudes and Behaviors Following the Announcement of Successful COVID-19 Vaccine Trials: Infodemiology Study. *JMIR Infodemiology*. 2021;1(1):e28800.
11. Dror AA, Eisenbach N, Taiber S, Morozov NG, Mizrachi M, Zigran A, et al. Vaccine hesitancy: the next challenge in the fight against COVID-19. *Eur J Epidemiol*. 2020;35(8):775-9.
12. Dube E, Laberge C, Guay M, Bramadat P, Roy R, Bettinger J. Vaccine hesitancy: an overview. *Hum Vaccin Immunother*. 2013;9(8):1763-73.
13. World Health Organization. Ten threats to global health in 2019 2019 [Available from: [who.int/news-room/spotlight/ten-threats-to-global-health-in-2019](http://who.int/news-room/spotlight/ten-threats-to-global-health-in-2019)].
14. MacDonald NE, Hesitancy SWGoV. Vaccine hesitancy: Definition, scope and determinants. *Vaccine*. 2015;33(34):4161-4.
15. Keane MT, Walter MV, Patel BI, Moorthy S, Stevens RB, Bradley KM, et al. Confidence in vaccination: a parent model. *Vaccine*. 2005;23(19):2486-93.
16. Gust D, Brown C, Sheedy K, Hibbs B, Weaver D, Nowak G. Immunization attitudes and beliefs among parents: beyond a dichotomous perspective. *Am J Health Behav*. 2005;29(1):81-92.
17. Benin AL, Wisler-Scher DJ, Colson E, Shapiro ED, Holmboe ES. Qualitative analysis of mothers' decision-making about vaccines for infants: the importance of trust. *Pediatrics*. 2006;117(5):1532-41.

18. Yeo J, Gudmundsen C, Fazel S, Corrigan A, Fullerton M, Gagneur A, et al. 80 Archetypes of vaccine hesitant caregivers towards COVID-19 immunization during a global pandemic: A qualitative study. *Paediatrics & Child Health*. 2021;26(Supplement\_1):e58-e9.
19. Government of Canada. COVID-19 vaccination in Canada. 2022. <https://health-infobase.canada.ca/covid-19/vaccination-coverage/>
20. MacDonald SE, Paudel YR, Kiely M, Rafferty E, Sadarangani M, Robinson JL, et al. Impact of the COVID-19 pandemic on vaccine coverage for early childhood vaccines in Alberta, Canada: a population-based retrospective cohort study. *BMJ Open*. 2022;12(1):e055968.
21. COVID-19 pandemic fuels largest continued backslide in vaccinations in three decades [press release]. Geneva/New York, 15 JUL 2022 2022.
22. United Nations Children's Fund, The State of the World's Children 2023: For every child, vaccination, UNICEF Innocenti – Global Office of Research and Foresight. Florence, April 2023.
23. Nyhan B, Reifler J, Richey S, Freed GL. Effective messages in vaccine promotion: a randomized trial. *Pediatrics*. 2014;133(4):e835-42.
24. Nyhan B, Reifler J. Does correcting myths about the flu vaccine work? An experimental evaluation of the effects of corrective information. *Vaccine*. 2015;33(3):459-64.
25. Butler R, MacDonald NE, Hesitancy SWGoV. Diagnosing the determinants of vaccine hesitancy in specific subgroups: The Guide to Tailoring Immunization Programmes (TIP). *Vaccine*. 2015;33(34):4176-9.
26. Bednarczyk RA. Examining the "why" of vaccine hesitancy. *Health Psychol*. 2018;37(4):316-7.
27. Hornsey MJ, Harris EA, Fielding KS. The psychological roots of anti-vaccination attitudes: A 24-nation investigation. *Health Psychol*. 2018;37(4):307-15.

28. Yeo J, Furr Gudmundsen C, Fazel S, Corrigan A, Fullerton MM, Hu J, et al. A behavior change model to address caregiver hesitancy around COVID-19 vaccination in pediatrics. *Vaccine*. 2022;40(39):5664-9.
29. Benham JL, Atabati O, Oxoby RJ, Murali M, Shaffer B, Sheikh H, et al. COVID-19 Vaccine-Related Attitudes and Beliefs in Canada: National Cross-sectional Survey and Cluster Analysis. *JMIR Public Health Surveill*. 2021;7(12):e30424.
30. MacDougall DM, Halperin BA, MacKinnon-Cameron D, Li L, McNeil SA, Langley JM, et al. The challenge of vaccinating adults: attitudes and beliefs of the Canadian public and healthcare providers. *BMJ Open*. 2015;5(9):e009062.
31. Paterson P, Meurice F, Stanberry LR, Glismann S, Rosenthal SL, Larson HJ. Vaccine hesitancy and healthcare providers. *Vaccine*. 2016;34(52):6700-6.
32. Taddio A, McMurtry CM, Shah V, Riddell RP, Chambers CT, Noel M, et al. Reducing pain during vaccine injections: clinical practice guideline. *CMAJ*. 2015;187(13):975-82.
33. Diethelm P, McKee M. Denialism: what is it and how should scientists respond? *Eur J Public Health*. 2009;19(1):2-4.
34. Opel DJ, Heritage J, Taylor JA, Mangione-Smith R, Salas HS, Devere V, et al. The architecture of provider-parent vaccine discussions at health supervision visits. *Pediatrics*. 2013;132(6):1037-46.
35. Zolezzi M, Paravattil B, El-Gaili T. Using motivational interviewing techniques to inform decision-making for COVID-19 vaccination. *Int J Clin Pharm-Net*. 2021;43(6):1728-34.
36. Gagneur A. Motivational interviewing: A powerful tool to address vaccine hesitancy. *Can Commun Dis Rep*. 2020;46(4):93-7.
37. Rollnick S, Miller WR, Butler CC. Motivational interviewing in health care. Helping patients change behavior. New York: The Guildford Press; 2008.

38. Centre for Effective Practice. (December 2020). Constantinescu, C., Ivers. N., Grindrod. K. PrOTCT Framework. Ontario. Toronto: Centre for Effective Practice.
39. Shen SC, Dubey V. Addressing vaccine hesitancy: Clinical guidance for primary care physicians working with parents. *Can Fam Physician*. 2019;65(3):175-81.
40. Connors JT, Slotwinski KL, Hodges EA. Provider-parent Communication When Discussing Vaccines: A Systematic Review. *J Pediatr Nurs*. 2017;33:10-5.
41. Kennedy A, Glasser J, Covello V, Gust D. Development of vaccine risk communication messages using risk comparisons and mathematical modeling. *J Health Commun*. 2008;13(8):793-807.
42. Pelly LP, Pierrynowski Macdougall DM, Halperin BA, Strang RA, Bowles SK, Baxendale DM, et al. THE VAXED PROJECT: an assessment of immunization education in Canadian health professional programs. *BMC Med Educ*. 2010;10:86.
43. Ildarabadi E, Karimi Moonaghi H, Heydari A, Taghipour A, Abdollahimohammad A. Vaccination learning experiences of nursing students: a grounded theory study. *J Educ Eval Health Prof*. 2015;12:29.
44. Gerges S, Peter E, Bowles SK, Diamond S, Bucci LM, Resnick A, et al. Pharmacists as vaccinators: An analysis of their experiences and perceptions of their new role. *Hum Vaccin Immunother*. 2018;14(2):471-7.
45. Shipton EE, Bate F, Garrick R, Steketee C, Shipton EA, Visser EJ. Systematic Review of Pain Medicine Content, Teaching, and Assessment in Medical School Curricula Internationally. *Pain Ther*. 2018;7(2):139-61.
46. Foronda CL, Fernandez-Burgos M, Nadeau C, Kelley CN, Henry MN. Virtual Simulation in Nursing Education: A Systematic Review Spanning 1996 to 2018. *Simul Healthc*. 2020;15(1):46-54.

47. Luctkar-Flude M, Tyerman J. The Rise of Virtual Simulation: Pandemic Response or Enduring Pedagogy? *Clin. Simul. Nurs.* 2021;57:1-2.
48. CAN-Sim. Canadian Alliance of Nurse Educators Using Simulation. 2023. Available from: <https://can-sim.ca>.
49. Wood LC, Reiners T. Gamification. In: Khosrow-Pour DBAM, editor. *Encyclopedia of Information Science and Technology*, Third Edition. Hershey, PA, USA: IGI Global; 2015. p. 3039-47.
50. Damaševičius R, Maskeliūnas R, Blažauskas T. Serious Games and Gamification in Healthcare: A Meta-Review. *Information (Basel)*. 2023;14(2):105.
51. Deterding S, Dixon D, Khaled R, Nacke L. From game design elements to gamefulness: defining "gamification". *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments*; Tampere, Finland: Association for Computing Machinery; 2011. p. 9–15.
52. McGaghie WC, Miller GE. Competency-based curriculum development in medical education: an introduction. 1978.
53. Gottlieb M, Chan TM, Zaver F, Ellaway R. Confidence-competence alignment and the role of self-confidence in medical education: A conceptual review. *Med Educ.* 2022;56(1):37-47.
54. Stewart J, O'Halloran C, Barton JR, Singleton SJ, Harrigan P, Spencer J. Clarifying the concepts of confidence and competence to produce appropriate self-evaluation measurement scales. *Med Educ.* 2000;34(11):903-9.
55. Bandura A. *Self-efficacy: The Exercise of Control*. New York: W.H. Freeman and Company; 1997.
56. Klassen RM, Klassen JRL. Self-efficacy beliefs of medical students: a critical review. *Perspect Med Educ.* 2018;7(2):76-82.

57. Kruger J, Dunning D. Unskilled and unaware of it: how difficulties in recognizing one's own incompetence lead to inflated self-assessments. *J Pers Soc Psychol.* 1999;77(6):1121-34.
58. Rahmani M. Medical Trainees and the Dunning-Kruger Effect: When They Don't Know What They Don't Know. *J Grad Med Educ.* 2020;12(5):532-4.
59. Evans AW, McKenna C, Oliver M. Self-assessment in medical practice. *J R Soc Med.* 2002;95(10):511-3.
60. Sharma R, Jain A, Gupta N, Garg S, Batta M, Dhir SK. Impact of self-assessment by students on their learning. *Int J Appl Basic Med Res.* 2016;6(3):226-9.
61. Lip A, Pateman M, Fullerton MM, Chen HM, Bailey L, Houle S, et al. Vaccine hesitancy educational tools for healthcare providers and trainees: A scoping review. *Vaccine.* 2022.
62. Cheng A, LaDonna K, Cristancho S, Ng S. Navigating difficult conversations: the role of self-monitoring and reflection-in-action. *Med Educ.* 2017;51(12):1220-31.
63. Martin EB, Jr., Mazzola NM, Brandano J, Luff D, Zurakowski D, Meyer EC. Clinicians' recognition and management of emotions during difficult healthcare conversations. *Patient Educ Couns.* 2015;98(10):1248-54.
64. Barton SM, Calhoun AW, Bohnert CA, Multerer SM, Statler VA, Bryant KA, et al. Standardized Vaccine-Hesitant Patients in the Assessment of the Effectiveness of Vaccine Communication Training. *J Pediatr.* 2022;241:203-11 e1.
65. Curran V, Gustafson DL, Simmons K, Lannon H, Wang C, Garmsiri M, et al. Adult learners' perceptions of self-directed learning and digital technology usage in continuing professional education: An update for the digital age. *J. Adult Contin. Educ.* 2019;25(1):74-93.
66. Tyerman J, Luctkar-Flude M, Chumbley L, Lalonde M, Peachey L, McParland T, et al. Developing virtual simulation games for presimulation preparation: A user-friendly approach for nurse educators. *J Nurs Educ Pract.* 2021;11.

67. Makoul G. Essential elements of communication in medical encounters: the Kalamazoo consensus statement. *Acad Med.* 2001;76(4):390-3.
68. Tobler K, Grant E, Marczinski C. Evaluation of the impact of a simulation-enhanced breaking bad news workshop in pediatrics. *Simul Healthc.* 2014;9(4):213-9.
69. James Bell Associates. 2007. Evaluation Brief: What's the Difference? Understanding Process and Outcome Evaluation. Arlington, VA. October 2007.
70. Creswell JW, Plano Clark VL. Designing and conducting mixed methods research.: SAGE; 2018.
71. Bryman A. Paradigm Peace and the Implications for Quality. *Int. J. Soc. Res. Methodol.* 2006;9(2):111-26.
72. Kaushik V, Walsh CA. Pragmatism as a Research Paradigm and Its Implications for Social Work Research. *Soc. Sci.* 2019;8(9):255.
73. Green J, Thorogood N. Qualitative Methods for Health Research. Los Angeles: SAGE Publications Ltd; 2018.
74. Goldkuhl G. Pragmatism vs interpretivism in qualitative information systems research. *Eur. J. Inf. Syst.* 2012;21(2):135-46.
75. Morgan DL. Paradigms Lost and Pragmatism Regained: Methodological Implications of Combining Qualitative and Quantitative Methods. *J. Mix. Methods Res.* 2007;1(1):48-76.
76. Teddlie C, Tashakkori A. Foundations of Mixed Methods Research: Integrating Quantitative and Qualitative Approaches in the Social and Behavioral Sciences: SAGE Publications; 2008.
77. Roberta H, Dorothy F. Understanding triangulation in research. *Evid Based Nurs.* 2013;16(4):98.

78. Fetters MD, Curry LA, Creswell JW. Achieving integration in mixed methods designs- principles and practices. *Health Serv Res.* 2013;48(6 Pt 2):2134-56.
79. CAN-Sim. Vaccine Conversations. 2023. Available from: <https://can-sim.ca/vaccine-hesitancy/>.
80. Faul F, Erdfelder E, Buchner A, Lang A-G. Statistical power analyses using G\*Power 3.1: Tests for correlation and regression analyses. *Behav Res Methods.* 2009;41(4):1149-60.
81. Cowley DS, Markman JD, Best JA, Greenberg EL, Grodesky MJ, Murray SB, et al. Understanding ownership of patient care: A dual-site qualitative study of faculty and residents from medicine and psychiatry. *Perspect Med Educ.* 2017;6(6):405-12.
82. Conti CR. Some thoughts about patient ownership. *Clin Cardiol.* 2015;38(1):1.
83. Fujikawa H, Son D, Aoki T, Eto M. Association between patient care ownership and personal or environmental factors among medical trainees: a multicenter cross-sectional study. *BMC Med Educ.* 2022;22(1):666.
84. Krumpal I. Determinants of social desirability bias in sensitive surveys: a literature review. *Qual Quant.* 2013;47(4):2025-47.
85. Dube E, Labbe F, Malo B, Manca T, Aylsworth L, Driedger SM, et al. "I don't think there's a point for me to discuss it with my patients": exploring health care providers' views and behaviours regarding COVID-19 vaccination. *Hum Vaccin Immunother.* 2022;18(5):2088970.
86. Deslatte A. The Erosion of Trust During a Global Pandemic and How Public Administrators Should Counter It. *Am. Rev. Public Adm.* 2020;50(6-7):489-96.
87. Nahum A, Drekonja DM, Alpern JD. The Erosion of Public Trust and SARS-CoV-2 Vaccines- More Action Is Needed. *Open Forum Infect Dis.* 2021;8(2):ofaa657.

88. Cascini F, Pantovic A, Al-Ajlouni Y, Failla G, Ricciardi W. Attitudes, acceptance and hesitancy among the general population worldwide to receive the COVID-19 vaccines and their contributing factors: A systematic review. *EClinicalMedicine*. 2021;40:101113.
89. World Health Organization. Regional Office for Europe. How to respond to vocal vaccine deniers in public: best practice guidance. Copenhagen: World Health Organization. Regional Office for Europe; 2017 2017.
90. Dybsand LL, Hall KJ, Carson PJ. Immunization attitudes, opinions, and knowledge of healthcare professional students at two Midwestern universities in the United States. *BMC Med Educ*. 2019;19(1):242.
91. Braun V, Clarke V. Using thematic analysis in psychology. *Qual. Res. Psychol*. 2006;3(2):77-101.
92. QSR International Pty Ltd.: NVivo (Version 12). 2018. p.  
<https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home>.
93. Sexton JB, Adair KC, Proulx J, Profit J, Cui X, Bae J, et al. Emotional Exhaustion Among US Health Care Workers Before and During the COVID-19 Pandemic, 2019-2021. *JAMA Netw, Open*. 2022;5(9):e2232748-e.
94. Epstein EG, Whitehead PB, Prompahakul C, Thacker LR, Hamric AB. Enhancing Understanding of Moral Distress: The Measure of Moral Distress for Health Care Professionals. *AJOB Empir Bioeth*. 2019;10(2):113-24.
95. Whitehead PB, Herbertson RK, Hamric AB, Epstein EG, Fisher JM. Moral distress among healthcare professionals: report of an institution-wide survey. *J Nurs Scholarsh*. 2015;47(2):117-25.
96. Morley G, Bradbury-Jones C, Ives J. What is 'moral distress' in nursing? A feminist empirical bioethics study. *Nurs Ethics*. 2020;27(5):1297-314.

97. Morley G, Field R, Horsburgh CC, Burchill C. Interventions to mitigate moral distress: A systematic review of the literature. *Int J Nurs Stud.* 2021;121:103984.
98. Morgantini LA, Naha U, Wang H, Francavilla S, Acar Ö, Flores JM, et al. Factors contributing to healthcare professional burnout during the COVID-19 pandemic: A rapid turnaround global survey. *PLoS One.* 2020;15(9):e0238217.
99. Canadian Institute for Health Information. Health Workforce in Canada, 2021 — Quick Stats [Internet]. 2021. Available from: <https://www.cihi.ca/en/topics/health-workforce>.
100. Canadian Nursing Association. Nursing Statistics. 2021. [Internet]. Available from: <https://www.cna-aiic.ca/en/nursing/regulated-nursing-in-canada/nursing-statistics#:~:text=In%202021%2C%20about%2091%25%20of,be%20a%20female%2Ddominate d%20profession.>
101. Wiley KE, Massey PD, Cooper SC, Wood N, Quinn HE, Leask J. Pregnant women's intention to take up a post-partum pertussis vaccine, and their willingness to take up the vaccine while pregnant: a cross sectional survey. *Vaccine.* 2013;31(37):3972-8.
102. Pajares F, Urdan TC. Self-efficacy Beliefs of Adolescents: IAP - Information Age Pub., Incorporated; 2006.
103. Teddlie C, Tashakkori A. Foundations of mixed methods research: Integrating quantitative and qualitative approaches in the social and Behavioral Sciences.: SAGE; 2009.
104. Felson DT. Bias in meta-analytic research. *J. Clin. Epidemiol.* 1992;45(8):885-92.
105. Hodges B, Regehr G, Martin D. Difficulties in Recognizing One's Own Incompetence: Novice Physicians Who Are Unskilled and Unaware of It. *Acad. Med.* 2001;76(10).
106. Quinn SC, Andrasik MP. Addressing Vaccine Hesitancy in BIPOC Communities — Toward Trustworthiness, Partnership, and Reciprocity. *NEJM.* 2021;385(2):97-100.

107. Quinn SC, Jamison A, Freimuth VS, An J, Hancock GR, Musa D. Exploring racial influences on flu vaccine attitudes and behavior: Results of a national survey of White and African American adults. *Vaccine*. 2017;35(8):1167-74.

## APPENDIX A

### I. Learning Outcomes and Indicators Example (VSG 1)

<b>VSG 1</b>			
	<b>DO WHAT</b>	<b>WHERE/WHEN</b>	<b>WHY</b>
1 confidence	Self-regulation  Regulates own emotions	before, during and after a clinical encounter	to promote a therapeutic relationship with patients
2 confidence	Presumptive statement  Make presumptive statements around vaccination	during a clinical encounter with a patient who has not completed a vaccine series	to reinforce positive behaviours
3 Self-efficacy/ ability	Pattern recognition  Recognize vaccine hesitancy profile	during a routine clinical encounter	to determine approaches to understanding reasons for not continuing with vaccine series
4 Self-efficacy/ ability	Communication  Support decision-making	for patient who has not completed a vaccine series	to develop a personalized and achievable plan for vaccination

## *II. Decision Point Map and Rationale Example (VSG 1)*

Game Title: Team 1- Booster

### Learning Objectives

1. Regulates own emotions before, during and after a clinical encounter to promote a therapeutic relationship with patients
2. Develop a rapport in a healthcare setting to build ongoing relationship with the patient
3. Make presumptive statements around vaccination during a clinical encounter with a patient who has not completed a vaccine series to reinforce positive behaviours
4. Recognize vaccine hesitancy profile during a routine clinical encounter to determine approaches to understanding reasons for not continuing with vaccine series
5. Support decision-making for patient who has not completed a vaccine series to develop a personalized and achievable plan for vaccination

Decision Point	Scene	Question	Response 1 (Correct)	Response 2 (Incorrect)	Response 3 (Incorrect)
1	HCP accompanied by a student is reviewing electronic chart on computer/ laptop outside door of clinic room. HCP points to laptop screen (vaccine series box is highlighted) and HCP points out and says to the student that booster is overdue.	As the HCP how would you prepare to address a conversation about the vaccine booster?	<p>Review personal biases regarding vaccines</p> <p>Rationale: Important not to let personal biases influence informing the patient. The goal is to provide a safe environment for this conversation to improve patient outcomes.</p>	<p>Assume patient is vaccine hesitant</p> <p>Rationale: Important not to make assumptions as this interferes with the therapeutic relationship. The goal is to provide a safe environment for this conversation to improve patient outcomes.</p>	<p>Avoid engaging in conversation about vaccines</p> <p>Rationale: Avoiding and important health outcome (appropriate vaccination) is not providing the best patient care. The goal is to provide a safe environment for this conversation to improve patient outcomes.</p>
2	<p>HCP speaking to student: I'd like the patient to get their booster (third dose of vaccine). It is recommended for persons with an underlying condition such as diabetes to have all their vaccines up to date. Let's address this today.</p> <p>Knock and enter clinic room. Introduce themselves.</p>	What would the HCP say to initiate the conversation about the vaccine?	<p>"How are you doing today? Did you do anything fun over the weekend?"</p> <p>Rationale: It is important to remain nonjudgmental and establish a rapport with the patient prior to initiating a sensitive conversation. The goal is to provide a therapeutic environment to promote a longitudinal, trusting relationship</p>	<p>"Can I ask why you haven't received your third dose/booster of the COVID vaccine yet?"</p> <p>Rationale: This is a judgmental statement. It is important to remain nonjudgmental and establish a rapport with the patient prior to initiating a sensitive conversation. The goal is to provide a therapeutic environment to promote trust.</p>	<p>"I notice you're not up to date on some of your vaccines. I worry that people with diabetes are at a higher risk for ending up in ICU if they're not vaccinated"</p> <p>This statement assumes a lack of knowledge and provides knowledge in an overwhelming manner. It is important to remain nonjudgmental and establish a rapport with the patient prior to initiating a sensitive conversation. The goal is to provide a therapeutic environment to promote trust</p>
3	Talk about fun.	How would the HCP initiate the conversation about the vaccine?	<p>"When are you booked to have your COVID booster?"</p> <p>Rationale: The first step of the PrOTCT model is to make a presumptive statement.</p>	<p>"Are you interested in receiving a 3rd dose of the COVID vaccine?"</p> <p>Rationale: This is a participatory statement.</p>	<p>"You need to get your COVID booster. The student can give it to you today"</p> <p>Rationale: Presumptive statements must be carefully worded not to be judgemental. This strongly worded and judgemental statement impairs further conversation and damages the patient-provider relationship.</p>

4	<p>When are you booked...</p> <p>Patient: I've been putting it off because I was fatigued and felt sick for two days after the second dose.</p>	How would the HCP respond?	<p>Offer to provide information about vaccine side effects and how to manage them</p> <p>Rationale: This response aligns with the second step of the PrOTCT model and addresses the patient's concerns and provides them with potential solutions to promote best health outcomes</p>	<p>Provide information about diabetes and its relationship to COVID.</p> <p>Rationale: This response does not address the underlying cause of the vaccine hesitancy.</p>	<p>Share personal experience with the COVID vaccine</p> <p>Rationale: This response minimizes the patient's experience with the vaccine</p>
5	<p>Can I provide some information about the vaccine for you..."</p> <p>Patient: agrees</p> <p>HCP provides information</p>	What would the HCP do next?	<p>Ask about concerns</p> <p>Rationale: This response aligns with the PrOTCT model to allow the discussion to be tailored to the patient and specific to their concerns.</p>	<p>Book a Friday appointment</p> <p>Rationale: This response is presumptive and does not address the patient's specific concerns</p>	<p>Suggest patient book an appointment</p> <p>Rationale: This response is passive and least likely to result in action by the patient</p>
6	<p>HCP asks do you have any specific concerns. Pt acknowledges the information provided. But is it worth these side effects? I don't think I need another dose.</p>	How would the HCP respond?	<p>"The reason I think you should get a third dose is because we now know that two doses doesn't provide the best protection, especially since you have diabetes."</p> <p>Only address the importance of receiving a third dose of the vaccine.</p> <p>Rationale: the counselling is tailored to the patient and the patient's specific</p>	<p>"Let me tell you more about COVID."</p> <p>Provide information about COVID, vaccine importance, vaccine side effects</p> <p>Rationale: this response is overwhelming and not specific to the patient's concerns.</p>	<p>"Public health recommends that everyone gets a third dose."</p> <p>Reinforce the need for receiving the third dose</p> <p>Rationale: this response is not tailored to the patient or the patient's specific concerns. It does not provide rationale to come to a shared understanding.</p>

			concerns which aligns with the PrOTCT model.		
7	<p>Patient: “I didn’t realize there was such a big difference between two doses and three doses...and maybe I should be more concerned now that I have diabetes.</p>	How would the HCP respond?	<p>“I’m happy I was able to provide some helpful information. It sounds like you’re motivated. I can help you book your vaccine appointment now.</p> <p>Rationale: this response provides positive reinforcement and makes an actionable plan which aligns with the final step of the PrOTCT model.</p>	<p>“I’m glad to hear we’re on the same page. Hopefully when we see you again in three months you will have had your third dose.”</p> <p>Rationale: this response provides positive reinforcement but does not include an actionable plan.</p>	<p>“Now that I’ve provided you with information. You can check with your family doctor at your follow-up appointment to help you decide.”</p> <p>Rationale: All HCPs have an equal responsibility to advocate for vaccines.</p>
8	<p>I’m happy to ...book your appointment. Let’s book you for Friday and you’ll have the weekend to recover if you have any side effects.</p> <p>Patient: Thank you.</p> <p>Fade to black</p> <p>HCP and student in the room to debrief. Role model debriefing...how I felt during, how I took a pause and reoriented, debriefing is important...</p>				

## APPENDIX B

### Self-Assessment Rubrics

#### I. VSG 1 - Vaccine Hesitancy - Booster Assessment Rubric

Learning Outcome	Confidence/Self-efficacy Indicators				
<b>Which statement best describes how <u>confident</u> you are regulating your emotions before, during and after a clinical encounter to promote a therapeutic relationship with patients?</b>	<ul style="list-style-type: none"> <li>I focus on problem-solving</li> <li>I can approach situations with an open mindset</li> <li>I can identify and recognize specific triggers</li> <li>I am aware of what I am feeling</li> <li>I can identify the causes of my emotions</li> <li>I can identify a 'safe space' when emotions are heightened</li> </ul>	<b>I am fully confident that I can</b> prioritize personal emotional regulation before, during and after a clinical encounter.	<b>I am somewhat confident that I can</b> prioritize personal emotional regulation before, during and after a clinical encounter.	<b>I am not confident that I can</b> prioritize personal emotional regulation before, during and after a clinical encounter.	
Comments:	Likert Scale	6	5	4	3
<b>Which statement best describes how <u>confident</u> you are in developing rapport in a healthcare setting to build an ongoing relationship with a patient?</b>	<ul style="list-style-type: none"> <li>I can create a safe space using verbal and non-verbal communication skills</li> <li>I can engage in an honest conversation with patients</li> <li>I know how to use active listening skills</li> <li>I can establish a common ground with patients</li> </ul>	<b>I am fully confident</b> in my ability and skills to develop a rapport with a patient to establish/build upon a therapeutic relationship.	<b>I am somewhat confident</b> in my ability and skills to develop a rapport with a patient to establish/build upon a therapeutic relationship.	<b>I am not confident</b> in my ability and skills to develop a rapport with a patient to establish/build upon a therapeutic relationship.	
Comments:	Likert Scale	6	5	4	3
<b>Which statement best describes how <u>confident</u> you are making presumptive statements around vaccination during a clinical encounter with a patient who has not completed a vaccine series to reinforce positive behaviours?</b>	<ul style="list-style-type: none"> <li>I assume a person wants to optimize their personal health outcomes</li> <li>I assume a person will choose to get immunized</li> <li>I can give strong recommendations</li> <li>I can make the presumptive statement in a relevant and appropriate manner</li> <li>I am respectful, calm, and non-judgmental</li> </ul>	<b>I am fully confident</b> using these techniques when making presumptive statements.	<b>I am somewhat confident</b> using these techniques when making presumptive statements.	<b>I am not confident</b> using these techniques when making presumptive statements.	
Comments:	Likert Scale	6	5	4	3
<b>Which statement best describes your <u>ability</u> to recognize vaccine hesitancy profiles during a routine clinical encounter to determine approaches to understanding</b>	<ul style="list-style-type: none"> <li>I am able to review client vaccine needs</li> <li>I am able to explore patients' reasons for vaccine hesitancy</li> <li>I am able to identify specific patient concerns</li> </ul>	<b>I am consistently</b> able to recognize vaccine hesitancy profiles to identify a patient's priority concerns.	<b>I am sometimes</b> able to recognize vaccine hesitancy profiles to identify a patient's priority concerns.	<b>I am rarely able to</b> recognize a vaccine hesitancy profile to identify the patient's priority concerns.	

reasons for not continuing with vaccine series?							
Comments:	Likert Scale	6	5	4	3	2	1
<b>Which statement best describes your <u>ability</u> to support decision-making for patients who have not completed a vaccine series to develop a personalized and achievable plan for vaccination?</b>	<ul style="list-style-type: none"> <li>I support patients to recognize and acknowledge risks and benefits of each option</li> <li>I am able to support clients' values and preferences</li> <li>I am able to address patient needs</li> <li>I am able to provide additional resources if requested</li> </ul>	<b>I am consistently able to support decision-making regarding vaccines with a patient who has not completed a vaccine series.</b>	<b>I am sometimes able to support decision-making regarding vaccines with a patient who has not completed a vaccine series.</b>	<b>I am rarely able to support decision-making regarding vaccines with a patient who has not completed a vaccine series.</b>			
Comments	Likert Scale	6	5	4	3	2	1

II. VSG 2 - Responding to Vaccine Hesitancy Assessment Rubric

Learning Outcome	Confidence/Self-efficacy Indicators						
<b>Which statement best describes your <u>ability</u> to recognize your own emotions before, during and after the clinical encounter to provide a therapeutic relationship with the patient?</b>	<ul style="list-style-type: none"> <li>I focus on problem-solving</li> <li>I am able to approach situations with an open mindset</li> <li>I am able to identify and recognize triggers</li> <li>I am aware of what you I am feeling</li> <li>I am able to identify the causes of my emotions</li> <li>I am able to identify a 'safe space' when emotions are heightened</li> </ul>	<b>I am consistently able to recognize my own emotions before, during and after a clinical encounter</b>	<b>I am sometimes able to recognize my own emotions before, during and after a clinical encounter</b>	<b>I am rarely able to recognize my own emotions before, during and after a clinical encounter</b>			
Comments	Likert Scale	6	5	4	3	2	1
<b>Which statement best describes your <u>ability</u> to develop rapport in a healthcare setting to build an ongoing relationship with the patient?</b>	<ul style="list-style-type: none"> <li>I am able to create a safe space using verbal and non-verbal communication skills</li> <li>I am able to engage in an honest conversation</li> <li>I use active listening skills</li> <li>I am able to establish a common ground</li> </ul>	<b>I am consistently able to develop a rapport in a healthcare setting</b>	<b>I am sometimes able to develop a rapport in a healthcare setting</b>	<b>I am rarely able to develop a rapport in a healthcare setting</b>			
Comments	Likert Scale	6	5	4	3	2	1
<b>Which statement best describes your <u>ability</u> to use presumptive statement(s) around vaccination during a clinical encounter?</b>	<ul style="list-style-type: none"> <li>I assume a person wants to optimize their personal health outcomes</li> <li>I assume a person will choose to get immunized</li> <li>I am able to give strong recommendations</li> <li>I am able to make the presumptive statement in a relevant and appropriate manner</li> </ul>	<b>I am consistently able to use appropriate presumptive statement techniques</b>	<b>I am sometimes able to use presumptive statement techniques</b>	<b>I am rarely able to use presumptive statement techniques</b>			

	● I am respectful, calm, and non-judgmental						
Comments	Likert Scale	6	5	4	3	2	1
<b>Which statement best describes how <u>confident</u> you are using interviewing techniques during a clinical encounter to help identify a patient's point of view and reasons for vaccine hesitancy?</b>	<ul style="list-style-type: none"> <li>● I can affirm a patient's point of view</li> <li>● I can express and show empathy towards patients</li> <li>● I can support and identify discrepancies (between patient's wants and actions)</li> <li>● I can effectively manage resistance</li> <li>● I can support patient's self-efficacy</li> </ul>	<b>I am fully confident that I can</b> use motivational interview strategies to identify reasons for vaccine hesitancy.	<b>I am somewhat confident that I can</b> use motivational interview strategies to identify reasons for vaccine hesitancy.	<b>I am not confident that I can</b> use motivational interview strategies to identify reasons for vaccine hesitancy.			
Comments	Likert Scale	6	5	4	3	2	1
<b>Which statement best describes how <u>confident</u> you are identifying the root cause or pattern behind vaccine hesitancy during a clinical encounter to ensure a personalized approach to the conversation?</b>	<ul style="list-style-type: none"> <li>● I can identify patient priorities vs healthcare provider priorities</li> <li>● I can communicate in a sensitive manner</li> <li>● I can involve patients and/or families in conversations</li> </ul>	<b>I am fully confident that I can</b> identify the root cause of vaccine hesitancy during patient conversations.	<b>I am somewhat confident that I can</b> identify the root cause of vaccine hesitancy during patient conversations.	<b>I am not confident that I can</b> identify the root cause of vaccine hesitancy during patient conversations.			
Comments	Likert Scale	6	5	4	3	2	1
<b>Which statement best describes how <u>confident</u> you are supporting patient decision making at the conclusion of the conversation to develop a personalized and achievable plan for vaccination?</b>	<ul style="list-style-type: none"> <li>● I can support patients to recognize and acknowledge risks and benefits of each option</li> <li>● I can support clients' values and preferences</li> <li>● I can address patient needs</li> <li>● I can provide additional resources if requested</li> </ul>	<b>I am fully confident that I can</b> incorporate strategies that meet the patient's priorities and needs to establish a personalized and achievable plan for vaccination.	<b>I am somewhat confident that I can</b> incorporate strategies that meet the patient's priorities and needs to establish a personalized and achievable plan for vaccination.	<b>I am not confident that I can</b> incorporate strategies that meet the patient's priorities and needs to establish a personalized and achievable plan for vaccination.			
Comments	Likert Scale	6	5	4	3	2	1

### III. VSG 3 - Self-regulation Assessment Rubric

Learning Outcome	Confidence/Self-efficacy Indicators			
<b>Which statement best describes how <u>confident</u> you are engaging in therapeutic communication while building trust and collaborating effectively with a patient or caregiver?</b>	<ul style="list-style-type: none"> <li>● I can model respectful conversations</li> <li>● I can identify and apply appropriate communication techniques</li> <li>● I can explore reasons behind a caregiver's perspective (e.g. fixed beliefs, misinformation)</li> <li>● I can utilize and model a strength-based approach</li> </ul>	<b>I am fully confident that I can</b> engage in therapeutic communication while building trust and collaborating effectively	<b>I am somewhat confident that I can</b> engage in therapeutic communication while trying to build trust and collaborate effectively	<b>I am not confident that I can</b> engage in therapeutic communication or attempt to build trust and collaborate

Comments:	Likert Scale	6	5	4	3	2	1
<b>Which statement best describes how <u>confident</u> you are guiding a difficult conversation with a patient or caregiver in order to preserve the therapeutic relationship, and maintain focus on the patient's health needs?</b>	<ul style="list-style-type: none"> <li>• I can ask open ended questions and foster a sense of trust and curiosity</li> <li>• I can avoid having a judgmental attitude towards patients</li> <li>• I can be flexible</li> <li>• I can constructively establish mutually acceptable goals</li> <li>• I can shift the conversation in constructive ways while validating patient perspectives</li> </ul>	<b>I am fully confident that I can</b> guide a difficult conversation with a caregiver		<b>I am somewhat confident that I can</b> guide a difficult conversation with a caregiver		<b>I am not confident that I can</b> guide a difficult conversation with a caregiver	
<b>Which statement best describes your <u>ability</u> to foster personal resilience in the face of moral distress during and after a difficult conversation?</b>	<ul style="list-style-type: none"> <li>• I am able to identify factors that contribute to a difficult conversation (opposing views, high emotion)</li> <li>• I am able to maintain an open attitude</li> <li>• I am able to acknowledge the presence of strong emotions in myself</li> <li>• I am able to self-regulate my personal responses</li> <li>• I am able to maintain respectful conversations</li> <li>• I am able to recognize the presence of moral distress</li> <li>• I am able to identify when core values are being opposed during conversation</li> </ul>	<b>I am consistently able to</b> foster personal resilience in the face of moral distress during and after a difficult conversation		<b>I am sometimes able to</b> foster personal resilience in the face of moral distress during and after a difficult conversation		<b>I am rarely able to</b> foster personal resilience in the face of moral distress during and after a difficult conversation	
<b>Which statement best describes your <u>ability</u> to maintain a professional sense of self-efficacy after a challenging interaction?</b>	<ul style="list-style-type: none"> <li>• I am able to acknowledge and normalize interactions that cause personal stress</li> <li>• I am able to engage in self-kindness instead of self-judgment</li> <li>• I am able to engage in mindfulness and self-compassion</li> </ul>	<b>I am consistently able to</b> maintain a professional sense of self-efficacy after a challenging interaction		<b>I am sometimes able to</b> maintain a professional sense of self-efficacy after a challenging interaction		<b>I am rarely able to</b> maintain a professional sense of self-efficacy after a challenging interaction	
Comments	Likert Scale	6	5	4	3	2	1

## APPENDIX C

### UNIVERSITY OF CALGARY Electronic Consent to Participate in Research

**TITLE:** Training Program for Optimized Vaccine Communication: Empowering our Future Health Care Workers with Vaccination Confidence and Competence

**SPONSOR:** University of Calgary

**FUNDER:** Public Health Agency of Canada

**INVESTIGATORS:** [REDACTED]

**CONTACT INFORMATION:** [REDACTED]

#### INTRODUCTION:

Dr. Sandra Davidson and Dr. Cora Constantinescu are conducting a research study with associates from the Faculty of Nursing and Cumming School of Medicine at the University of Calgary, the School of Pharmacy at the University of Waterloo, the School of Nursing at Queen's University, and the School of Nursing at the University of Ottawa.

This consent form is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, please ask. Take the time to read this carefully and to understand any accompanying information. You will receive a copy of this form for your records.

You were identified as a possible participant in this study because you are a healthcare trainee (undergraduate nursing student at the University of Calgary, pharmacy student at the University of Waterloo, or Canadian medical resident). Your participation in this research study is voluntary.

#### WHY IS THIS STUDY BEING DONE?

The purpose of this research study is to evaluate a new educational program for individuals training to become healthcare providers (HCP) to prepare them for their future roles in vaccine advocacy, delivery, and promotion. Specifically targeted to trainees in medicine, nursing and pharmacy, this educational program will be validated and evaluated within the context of COVID-19 vaccine, but the training will be applicable to vaccination discussions in general.

#### HOW MANY PEOPLE WILL TAKE PART IN THIS STUDY?

**Ethics ID:** REB22-0012

**Study Title:** Training Program for Optimized Vaccine Communication

**PI:** [REDACTED]

Version number: 4.1 & Version date: 29NOV2022

About 120 people will take part in this study Canada wide, comprising of 30-40 undergraduate nursing students (University of Calgary), 30-40 pharmacy students (University of Waterloo), and 30-40 Canadian medical residents.

### **WHAT WILL HAPPEN IF I TAKE PART IN THIS STUDY?**

If you volunteer to participate in this study, the researcher will ask you to complete several assessments before and after participating in an eLearning module (which includes three virtual simulation games (VSGs)) to examine whether it will increase the competence and confidence of health care trainees/students in vaccine communication, advocacy, delivery, and promotion.

You will also be asked to complete self-assessment rubrics and reflective questions before and after the VSGs about your knowledge and skills. You may also be asked to participate in a 60-90 minute virtual focus group to collect more detailed information about your experience with the VSG. Internet and a device (e.g. Smart Phone, iPad, or computer) to participate in the VSG and virtual Zoom focus group will be required.

### **HOW LONG WILL I BE IN THIS STUDY?**

Participation will take a maximum of about 3 hours for participants who complete all three Virtual Simulation Games, the assessments, and the focus group. Completing one Virtual Simulation Game will take approximately 20 minutes (a total of 60 minutes for all three), and the pre- and post-intervention assessment will take approximately 30 minutes. Participating in the focus group will take an additional 60-90 minutes.

### **ARE THERE ANY POTENTIAL RISKS OR DISCOMFORTS THAT I CAN EXPECT FROM THIS STUDY?**

You will be asked questions about yourself, your experience communicating with patients about vaccines, and about your experience completing the eLearning module. There is a risk that you may not be comfortable with some of the topics we will talk about or questions asked. However, you only have to respond when you want to, and you may choose to end your participation at any time.

### **ARE THERE ANY POTENTIAL BENEFITS IF I PARTICIPATE?**

Benefits to participating in this study include increasing your knowledge, education, and skills in vaccine communication as a healthcare provider (HCP) at an early stage in your education/training, which may increase your confidence and competence around vaccine discussion with patients.

You will be part of a group of Canadians involved in implementing an educational program for individuals training to become healthcare providers to prepare them for their future roles in vaccine advocacy, delivery, and promotion. Society will also benefit if we can increase future healthcare providers' confidence discussing vaccines and may lead to a reduction in vaccine

hesitancy. This will also be of significant scientific and scholarly work as we will disseminate our findings to help inform healthcare worker education programs nationally and internationally.

### **WHAT OTHER CHOICES DO I HAVE IF I CHOOSE NOT TO PARTICIPATE?**

You are free to choose not to participate in the study. If you decide not to take part in this study, there will be no penalty to you. Your decision will not affect your academic standing or future employment opportunities.

### **CAN I STOP BEING IN THE STUDY?**

Yes. You can decide to stop at any time. Tell the researchers if you are thinking about stopping or decide to stop.

### **WITHDRAWAL OF STUDY DATA**

You may request that your pre- and post-intervention self-assessment data be withdrawn for up to 2 weeks after completion of the assessments. After that point, it will be anonymized for analysis and can no longer be withdrawn.

Due to the nature of focus group discussions, data from a participant that leaves the study cannot be removed. Therefore, if you choose to leave the study at any point, all of the responses given up to that point will be included in the study but no further responses will be collected from you.

### **WILL I BE PAID FOR PARTICIPATING, OR DO I HAVE TO PAY FOR ANYTHING?**

You will receive a \$25 gift card for participating in each VSG for a total of up to \$75 for completing all three, and a \$50 gift card if you participate in the focus group. Your contact information will be shared with the investigators for the distribution of the gift card(s). Your contact information will be kept separate from the focus group responses so that your responses cannot be linked to you in any way.

### **WILL INFORMATION ABOUT ME AND MY PARTICIPATION BE KEPT CONFIDENTIAL?**

Your self-assessment/self-reflection responses will be kept private. Your name and contact information will be sent to the investigator in order for them to send the gift cards, but these cannot be connected back to any of your responses. Focus group discussions will be confidential; all answers will be anonymized and summarized into themes so as not to identify anyone.

We will conduct the focus group using Zoom, accessed through a password-protected university account. Zoom has high level security precautions built in so your confidentiality is protected. The researchers will ask you and the other people in the group to use only first names during the group session. They will also ask you not to tell anyone outside the group what any particular person said in the group. However, the researchers cannot guarantee that everyone will keep the discussions private.

**Ethics ID:** REB22-0012

**Study Title:** Training Program for Optimized Vaccine Communication

**PI:** [REDACTED]

Version number: 4.1 & Version date: 29NOV2022

We will record the interview using the Zoom feature and will upload and store this recording on a password protected computer without any personal identifiers.

The focus group will be video recorded and members of our research team will have access to the videos for transcription and analysis purposes. All research data and records will be stored electronically on a secure network with password protection.

### **HOW LONG WILL INFORMATION FROM THE STUDY BE KEPT?**

Data from this study will be kept for 5 years. Data collected for this study may be shared with other researchers for future studies that are unknown at this time. Any data shared with other researchers will not include your name or other personal identifying information. Any future use of this research data is required to undergo review by a Research Ethics Board.

### **WHOM MAY I CONTACT IF I HAVE QUESTIONS ABOUT THIS STUDY?**

The Research Team:

You may contact [REDACTED] with any questions or concerns about the research or your participation in this study.

Conjoint Health Research Ethics Board (CHREB):

If you have any questions concerning your rights as a possible participant in this research, please contact the Chair, Conjoint Health Research Ethics Board, University of Calgary at 403-220-7990.

### **WHAT ARE MY RIGHTS IF I TAKE PART IN THIS STUDY?**

Taking part in this study is your choice. You can choose whether or not you want to participate. Whatever decision you make, there will be no penalty to you. You have a right to have all of your questions answered before deciding whether to take part. Your decision will not affect your academic standing or any future employment opportunities. If you decide to take part, you may leave the study at any time.

### **HOW DO I INDICATE MY AGREEMENT TO PARTICIPATE?**

Your signature on this form indicates that you have understood to your satisfaction the information regarding your participation in the research project and agree to take part in the study. In no way does this waive your legal rights nor release the investigators or involved institutions from their legal and professional responsibilities.

### **SIGNATURE OF STUDY PARTICIPANT**

\_\_\_\_\_  
Name of Participant

**Ethics ID:** REB22-0012

**Study Title:** Training Program for Optimized Vaccine Communication

**PI:** [REDACTED]

Version number: 4.1 & Version date: 29NOV2022

\_\_\_\_\_  
Signature of Participant

\_\_\_\_\_  
Date

**SIGNATURE OF PERSON OBTAINING CONSENT**

\_\_\_\_\_  
Name of Person Obtaining Consent

\_\_\_\_\_  
Contact Number

\_\_\_\_\_  
Signature of Person Obtaining Consent

\_\_\_\_\_  
Date

**SIGNATURE OF THE WITNESS**

\_\_\_\_\_  
Name of Witness

\_\_\_\_\_  
Signature of Witness

\_\_\_\_\_  
Date

A signed copy of this consent form has been given to you to keep for your records and reference.

## APPENDIX D

### I. *Pre-Intervention Survey*

1. Please enter your age: \_\_\_\_\_
2. Which of the following best describes you?
  - Woman
  - Man
  - Non-binary
  - Two-spirit
  - Other (describe):
3. What program are you enrolled in?
  - Pharmacy
  - Nursing
  - Medicine
  - Other
4. What year of your program are you currently enrolled in?
  - 1st
  - 2nd
  - 3rd
  - 4th
  - Other
5. If you are a medical resident, what is your specialty?
  - a. Internal medicine (IM)
  - b. Family medicine (FM)
  - c. Obstetrics and Gynecology (OBGYN)
  - d. Pediatrics (Peds)
  - e. Emergency Medicine (EM)
  - f. Other (please specify)
6. Have you ever had a vaccine conversation with a patient? (Not necessarily about vaccine hesitancy)
  - Yes
  - No
7. Did you learn about how to have **vaccine conversations with patients** in your program?
  - Yes
  - No

8. If yes, please select how/when you learned about vaccine conversations from the list below:
  - a. Theory / coursework
  - b. Lab/simulation setting
  - c. Clinical practice
  - d. Workshop
  - e. Other

## *II. Post Intervention Survey*

1. While some of the VSGs are targeted to COVID-19 vaccines, do you think they would still be relevant to discussing other routine immunizations with patients? How could this be applicable to other vaccine conversations?
2. Please provide any general feedback about the online learning module below. Were there things you liked or disliked? Please describe any changes or things you would've liked to have been done differently.
3. Are you interested in participating in a Focus Group after the intervention? If yes, please ensure you completed both the pre and post intervention survey and self-assessments, and all 3 VSGs.

## APPENDIX E

### Focus Group Script and Questions

#### **Initial dialogue:**

*Thanks everyone for taking the time to participate in this focus group today. My name is \_\_\_\_\_ and I'm going to lead our discussion today by asking you questions and then encouraging and moderating our discussion.*

*This will be a 60-90 minute focus group during which I will ask you to share your experience completing the Virtual Simulation Game about vaccine communication. The goal is to evaluate whether this online learning module could help increase the competence and confidence of health care trainees in vaccine communication, advocacy, delivery, and promotion. This is a confidential discussion; we ask that you respect the privacy of everyone involved by not talking about what was shared, beyond this focus group. This discussion will be used to evaluate the effectiveness of the Virtual Simulation Game and inform any necessary changes. All answers will be summarized into themes to ensure that no individual will be identified. This discussion will be recorded in order to allow us to go back and identify themes and analyze answers, but only those involved with the analysis will have access to these recordings.*

*There are no right or wrong answers. We will ensure everyone has some time to respond to each question, before encouraging some general discussion. You are encouraged to be honest and share your true thoughts and feelings, even if you disagree with others in the group; however, please be respectful and listen without interrupting when others are speaking. If at any time you feel uncomfortable or want to leave the study, you are free to do so.*

*Before we get started, does anyone have any questions?*

#### **Icebreaker: Choose one**

Please introduce yourself using your first name, initials, or an alias; then answer this question.

- What is a new hobby or activity that you've tried during the pandemic?
- What TV series have you most enjoyed during the pandemic?
- What current Canadian public figure would you most like to have dinner with?

#### **Focus Group Questions**

- Does anyone have an experience they'd like to share about a time they needed to discuss vaccines with a patient during their healthcare training?
  - How did the experience make you feel? What type of emotions were involved?
  - Please share any concerns you have about discussing vaccines with patients.
- Please briefly describe what training you have received on having conversations with patients about vaccines before these modules?

- Discuss how this intervention might have differed from previous educational experiences about vaccination communication or vaccine hesitancy you might have had?
- How did the VSGs and modules supplement what you have already learned?
- Drawing from the self-reflections you completed before and after the modules, can you comment on your personal level of confidence discussing vaccines with patients?
  - What are some specific skills or strategies that you use when addressing vaccine hesitancy?
  - What did you think about the presumptive statements? Have you learned about them before?
- What did you think of the eLearning module?
  - How easy or difficult was the eLearning module to navigate?
  - How engaging did you find the eLearning module?
  - What did you find helpful about the module?
    - Were there parts that felt redundant or that you felt you already knew how to do?
  - How is this different from any previous vaccination discussion training you might have had?
  - Please discuss how the VSGs might have affected your confidence in holding vaccine conversations with patients?
- How did the eLearning modules (especially the third game with self-regulation techniques such as tapping, yoga, etc.) make you think/feel about your own emotions and self-regulation?
  - How could what you learned through the VSGs be applied to other emotional interactions with patients?
  - What about interactions with colleagues?
- Is there anything you felt was missing from the modules, or that you would like to learn more about?
  - Do you think there are related topics we should have covered, but didn't?
- How did you find an intervention that did not have specific factual learning associated with it (as in, how do you find the experience of trying to hold a vaccine conversation without having been taught specifics about the vaccine science?)

- Although this intervention was designed to address concerns with COVID-19 vaccines, how might content in this module be useful when discussing other vaccines or alternative scenarios with patients?

Protect model / presumptive statements?

- What motivated you to complete the VSGs? Is there anything that would make you more motivated to complete them?
- Would you be more motivated to participate/complete these games if they were accredited?
  - MainPro certification?
- Would you recommend this VSG to other healthcare trainees (not in your discipline)? Why or why not?
- Of all the things we discussed today, what was most important to you?
  - Key takeaway from games/discussion today

**Closing Comments:**

*Thank you for taking part in this focus group, your discussion has been very helpful and appreciated. We are grateful to you for taking the time and sharing your beliefs and practices with this group. If after we are done, there is something you still wish to share, or did not have the opportunity to discuss today, please email us at [REDACTED]*