INFLUENZA VACCINATION RATES IN PRIMARY CARE

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The Supervisory Committee certifies that this ***disquisition*** complies with North Dakota State University's regulations and meets the accepted standards for the degree of

DOCTOR OF NURSING PRACTICE

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ABSTRACT

Influenza is a common and highly contagious upper respiratory illness that affects an average of 8% of Americans each season. The flu was associated with 18 million medical visits, 400,000 hospitalizations, and 22,000 deaths during the 2019-2020 flu season in the United States (US). The best protection from the flu is to receive an annual vaccination. However, only 56.5% of North Dakotans received a flu vaccine for the 2019-2020 season, well below the Healthy People 2030 goal of 70%. Suboptimal vaccination rates, along with increasing vaccine hesitancy and misinformation associated with the COVID-19 pandemic, make efforts in improving vaccine uptake extremely important to prevent future pandemics.

The purpose of this practice improvement project was to increase patient access and provider knowledge of the flu vaccine. The project took place in a primary care clinic in Ellendale, North Dakota. Project implementation occurred from October 1, 2021 through November 30, 2021. Implementation began with education to one provider and two nurses on making recommendations using a presumptive approach, flu vaccine facts and recommendations, and considerations during the COVID-19 pandemic. Informational posters and flu vaccine reminders were displayed in clinic exam rooms and patient areas. Evaluation included an online survey utilizing 5-point Likert scales and manual chart review. Chart review of 75 random patient encounters between October 1 and November 30 of the years 2019, 2020, and 2021 was conducted for a total of 225 charts.

Participants felt they were knowledgeable about the flu vaccine, recommendations for vaccine administration, and contraindications to vaccination after project implementation. Participants were also confident making recommendations for flu vaccination using a presumptive approach and recommended the vaccine most of the time during patient encounters.

Education, visual reminders, and using a presumptive approach to recommend vaccination correlated with an overall improvement in missed opportunities for influenza vaccination. Despite a decline in flu vaccination rates seen in the state of North Dakota since the 2019-2020 flu season, vaccination rates in the primary care clinic in Ellendale improved by eight percentage points from 2020 (34.67%) to 2021 (42.67%) and doubled since 2019 (21.33%) with the implementation of simple interventions.

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LIST OF ABBREVIATIONS

US	United States
CDC	Centers for Disease Control and Prevention
COVID-19	Coronavirus Disease
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus 2
NPI	Nonpharmacological Interventions
ACIP	Advisory Committee on Immunization Practices
CINAHL	Cumulative Index to Nursing and Allied Health Literature
VPD	Vaccine-preventable Disease
RCT	Randomized Control Trial
ILI	Influenza-like-illness
MO	Missed Opportunity
PP	Percentage Points
ONC	Office of the National Coordinator for Health Information Technology
CPSTF	Community Preventive Services Task Force
EMR	Electronic Medical Record
BPA	Best Practice Alert
NDSU	North Dakota State University
NDIIS	North Dakota Immunization Information System
NDDoH	North Dakota Department of Health
VIS	Vaccine Information Sheet
DOT	Department of Transportation

CHAPTER 1: INTRODUCTION

Background and Significance

Influenza, also known as the flu, is a common and highly contagious upper respiratory illness (Centers for Disease Control and Prevention [CDC], 2019a). An average of 8% of people in the United States get sick with influenza each season. The typical flu season in the United States occurs in the fall and winter with peak flu activity between December and February (CDC, 2018). Transmission of the virus from person to person occurs predominantly through respiratory droplets. Evidence also suggests that influenza is transmitted through inhaled virus-containing aerosols (Wang et al., 2021). Symptoms range in severity and include fever, cough, sore throat, runny nose, myalgia, fatigue, and headache (CDC, 2019a). Most people that contract the influenza virus develop mild to moderate illness without serious complications. However, it can result in severe illness, hospitalization, and death. The CDC (2020a) estimates that influenza was associated with illness in 38 million people, 18 million medical visits, 400,000 hospitalizations, and 22,000 deaths during the 2019-2020 flu season in the United States. There has been an average of 37,463 deaths annually since 2010 in the United States (Hall, 2021). Pneumonia and influenza was the 5th leading cause of death in the United States in 2018 for those aged 1-4 years, the 8th leading cause for those aged 5-14 years, 15-24 years, and 65 years and older, and the 9th and 10th leading cause of death for 25-44 years and 45-64 years, respectively (National Center for Health Statistics, 2019). The flu typically creates more severe illness in those younger than 2 years and adults 65 years and older (CDC, 2020a). Pregnant women, individuals with a history of asthma, heart disease, diabetes, HIV/AIDS, cancer, or chronic kidney disease are also at higher risk for complications from the flu (CDC, 2020b).

Seasonal influenza in humans is caused by influenza A and influenza B viruses (Krammer et al., 2018). Influenza C has also been detected in humans but is rarely reported, likely because cases are often subclinical (Hall, 2021). Influenza A characteristically produces moderate to severe illness in all ages, whereas the influenza B virus typically produces milder illness and more commonly affects children. Current classifications of influenza B include Yamagata and Victoria. Influenza A is named and classified by two surface antigens-hemagglutinin (HA) and neuroaminidase (NA). Each antigen has multiple subtypes. There are eight HA subtypes (H1, H2, H3, H5, H6, H7, H9, and H10) and six NA subtypes (N1, N2, N6, N7, N8, and N9) that have been found to affect humans. These surface antigens continually change and can take the form of an antigenic drift or an antigenic shift. Antigenic drifts occur when small mutations in the genes of the virus accumulate over time. These changes can result in novel strains that the human immune system may not recognize. Antigenic drift, along with waning immunity from past exposure or vaccination, may result in annual influenza epidemics. Antigenic shift is a major change in one or both surface antigens on the influenza virus that occurs abruptly. Although rare, antigenic shifts may result in worldwide pandemics if the virus is efficiently transmitted from person to person. Five antigenic shifts have led to pandemics since the late 19th century with the most recent one occurring in 2009-2010 from the influenza A (H1N1) virus. The CDC (2019b) estimated that 12,469 people died in the US and between 151,700 and 575,400 people died worldwide in the first year of the pandemic related to infection with the H1N1pdm09 virus, which continues to circulate and cause significant illness.

H1N1pdm09 was the predominant strain during the 2019-2020 season and resulted in more hospitalizations in children 0-4 years and adults 18-49 years than the 2009 pandemic (CDC, 2019b). The CDC characterized the 2019-2020 flu season as having moderate severity.

The effects on some age groups were more severe than others. The very young and very old typically have higher flu-related hospitalization rates, which was also the case during the 2019-2020 season. However, young adults (age 18-49 years) had the highest hospitalization rate since the 2017-2018 flu season, which was characterized as high severity, and the highest number of influenza cases since the 2010-2011 flu season, which is when the CDC began reporting influenza burden estimates. Adults aged 18-64 years, who typically have low vaccination rates, accounted for 36% of influenza-associated deaths during the 2019-2020 season. These statistics highlight the fact that influenza can have a significant impact on individuals of any age and prevention is important in all age groups.

Flu activity in the United States peaked in January and February of 2020 with very little to no activity after March, which has not been typical in previous seasons (CDC, 2020c). Influenza cases continued to be low throughout the US during the 2020-2021 season. As of Week 26, which ended on July 3, 2021, the total positive influenza tests in the United States were 2,070 cases (CDC, 2021a), compared with 249,624 positive tests after Week 26 in 2020 (CDC, 2020c). It has been thought that the global response to coronavirus disease (COVID-19) contributed to low levels of influenza worldwide through 2020 (Karlsson et al., 2021). Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) emerged at the end of 2019. COVID-19 was declared a public health emergency by the World Health Organization on January 30, 2020 and characterized as a pandemic on March 11, 2020. Decreased influenza activity could be a result of multiple nonpharmacological interventions (NPIs) related to COVID-19, including reduced travel and population mixing, mask-wearing, and viral interference. The COVID-19 pandemic led many countries to quickly implement NPIs to reduce the spread of disease, including social distancing, school and workplace closures, and restrictions on travel. These

measures correlate with a steep drop in flu cases in 2020. Personal hygiene measures including mask-wearing, frequent hand washing, and properly covering coughs and sneezes were heavily encouraged, which could have been effective in reducing influenza transmission. Finally, viral interference between SARS-CoV-2 and influenza virus in the same host is hypothesized to possibly have contributed to decreased flu transmission (Karlsson et al., 2021; Zhou et al., 2020). Multiple respiratory viruses in circulation can result in competitive interactions and innate immune responses. Low levels of circulating influenza in 2020 and less people being exposed means population immunity decreases. This makes communities more susceptible to influenza outbreaks and future pandemics. Therefore, prevention in future flu seasons is particularly important.

The best way to prevent illness, complications, and death due to influenza is to receive an influenza vaccination (CDC, 2020d). The Advisory Committee on Immunization Practices (ACIP) recommends an annual influenza vaccine for all persons 6 months or older who do not have contraindications (Grohskopf et al., 2020). Annual vaccinations are necessary due to the continual changes to the virus and waning immunity over time. The influenza vaccine is formulated each year to attempt to match the circulating strains of the virus. The effectiveness of the vaccine depends on the degree of similarity between the viruses in circulation and those included in the vaccine formulation. The influenza vaccine for the 2019-2020 season was estimated to have been 45% effective (Dawood et al., 2020) and to have prevented 7.52 million illnesses, 3.69 million medical visits, 105,000 hospitalizations, and 6,300 deaths associated with influenza (CDC, 2020d).

Healthy People 2030 objectives set a target goal for 70% of those 6 months and older to be vaccinated annually against influenza (Office of Disease Prevention and Health Promotion,

n.d.). Fifty-one point eight percent of Americans 6 months and older received an influenza vaccine for the 2019-2020 flu season (CDC, 2020d). North Dakota was slightly above the national rate at 56.5%. White, non-Hispanic, individuals have the highest flu vaccination coverage rates in the United States compared with other races and ethnicities (CDC, 2019c). American Indian/Alaska Native, Hispanic adults, and Black, non-Hispanic children have the lowest rates of vaccination coverage. The age groups with the highest rates are typically aged 6 months to 4 years and 65 years or older, while those aged 18-49 years commonly have low rates of vaccination against influenza.

Problem Statement

The development of vaccines is considered one of the greatest achievements in public health. However, influenza vaccination rates remain suboptimal, and the burden on the United States economy and healthcare system is high. Healthcare providers and staff need to improve their efforts to ensure patients are vaccinated annually. Influenza vaccination coverage in the United States has improved by an average of less than one percentage point each season since 2010 (CDC, 2020e). At the current rate, it would take 20 years to reach the goal of 70% of Americans to be vaccinated.

Millions of people become ill with influenza and thousands die each year in the United States. The flu vaccine reduces the risk of illness by 40-60% during seasons when circulating viruses are well-matched with those in the vaccine (CDC, 2020f). However, influenza vaccination rates remain low and there has been little improvement over the past decade.

Purpose

The purpose of this project was to increase patient access and provider knowledge of flu vaccines in a primary care clinic in North Dakota, which may improve influenza vaccination

rates over time. The implementation of this project also gave providers and nurses tools to improve vaccination rates of other vaccine-preventable diseases.

Objectives

1. Providers and nurses will identify patients who are eligible to receive the influenza vaccine and do not have any contraindications.
2. Providers and nurses will give recommendations using a presumptive approach for eligible primary care patients to receive the influenza vaccine.
3. Influenza vaccination will be offered to eligible patients at every office visit during the two-month implementation period.

CHAPTER 2: LITERATURE REVIEW AND THEORETICAL FRAMEWORK

The second chapter includes a review of the literature on individual barriers to receiving an influenza vaccine, as well as methods for healthcare teams to improve vaccination rates. A description of the theoretical frameworks that will be used to guide this project are also included in Chapter 2.

Literature Review

A search of the literature was conducted to review current evidence regarding influenza. Cumulative Index to Nursing and Allied Health Literature (CINAHL) and PubMed were searched, between the years 2016 and 2020, using the search string "(influenza OR flu) AND vaccin* AND (family practice OR family medicine OR primary care)." Search criteria included peer-reviewed articles, reviews, randomized control trials, and systematic reviews in the English language. Articles focusing on chronic disease and illness were excluded. Cochrane Database of Systematic Reviews was also searched, between the years 2016 and 2020, using the terms "influenza vaccine." Additional articles were identified through review of relevant grey literature, hand searching, and a secondary search of reference lists.

Epidemiology

The influenza virus is shed in respiratory secretions and transmitted from person to person through respiratory droplets that are typically generated through a cough or sneeze (CDC, 2015). Transmission can occur through direct contact with the droplets or indirect by touching an infected surface and transferring the virus by touching the eyes, mouth, or nose. The virus is infectious one day prior to, and up to five to seven days after, the development of symptoms. Symptoms include an abrupt onset of fever, body aches, headache, sore throat, and a nonproductive cough. Most individuals that become ill with influenza will fully recover but some

may have asthenia, or lack of strength and energy, for several weeks. The flu can also cause hospitalization or death in some individuals. Death occurs in less than one per 1,000 cases but varies substantially each year. Ninety percent of influenza-associated deaths occur in those 65 years and older. Complications from influenza occur mainly in those 65 years and older, young children, and those with certain chronic health conditions, including asthma, pulmonary disease, heart disease, and diabetes (CDC, 2020g). Other complications from the flu include secondary bacterial pneumonia, myocarditis, chronic pulmonary disease, or bronchitis exacerbation (CDC, 2015).

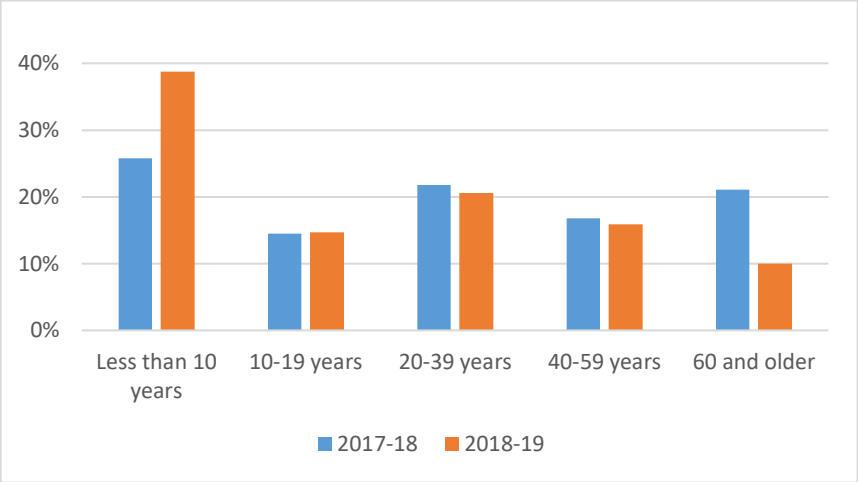
Burden of influenza. The severity of influenza varies each season. According to the CDC (2019d), the 2017-2018 flu season was one of the most severe seasons on record and the most severe since the H1N1 pandemic in 2009 when 60 million Americans became ill with influenza. Forty-five million people were ill, 21 million saw a healthcare provider, 810,000 were hospitalized, and 61,000 died from influenza in 2017-2018 in the United States. Each hospitalized case of influenza in the United States is estimated to cost $5,770 and $258 for each outpatient clinic visit (Ozawa et al., 2016). Prior to the COVID-19 pandemic, influenza accounted for 65% ($5.8 billion) of the total economic burden from vaccine-preventable diseases (VPDs) in the United States. Individuals aged 19-49 years that become ill with influenza represent 85% of the annual total of economic burden from VPDs, attributable to lost wages and productivity from missed days of work. Van Wormer et al. (2017) found that full-time employees that became symptomatic after infection with influenza could expect to lose 3.5-5 days of work.

The 2017-18 flu season also proved to be severe for all ages. Twenty-eight million influenza cases and 9,600 deaths occurred in those aged 18-64 years who generally see low

influenza activity (CDC, 2019d). Cases of influenza in ND for the 2017-2018 flu season were also relatively evenly distributed amongst age groups (Baber, 2018).

Figure 1

Laboratory-Confirmed Influenza Cases in ND



Note. Data source Baber, 2018 & Schlosser, 2019

Residents less than 10 years old made up 25.8% of the laboratory-confirmed influenza cases during the 2017-18 flu season; 14.5% were age 10-19 years, 21.8% age 20-39, 16.75% age 40-59, 21.07% age 60 and older (Baber, 2018). For the 2018-19 flu season, residents less than 10 years old made up 38.7% of the lab-confirmed influenza cases in ND, 14.7% were age 10-19 years, 20.6% age 20-39, 15.9% age 40-59, 10% age 60 and older (Schlosser, 2019).

Influenza Vaccine

Recommendations. ACIP and the CDC recommend individuals be vaccinated by the end of October as the onset of influenza activity in the United States is unpredictable (Grohskopf et al., 2020). However, vaccinations should continue throughout the entire flu season. Research has shown variabilities in the length of immune response to the influenza vaccine. High-dose flu vaccine has a higher number of antigens than the standard-dose and is recommended in those 65 years and older. Young et al. (2017) suggests that immune response to the standard-dose

influenza vaccine in adults 65 years and older wanes over time and is not likely to provide protection from the flu for a full year. In a systematic review conducted by Lee et al. (2018), the high-dose flu vaccine was found to be associated with significantly lower rates of flu-related hospitalizations in those 65 years and older compared with those of the same age group that received a standard-dose flu vaccine. Pregnant women are more likely to have severe illness related to the flu and should receive a flu shot during any trimester (CDC, 2021b). Women who receive the flu vaccine at least 2 weeks prior to delivery also protect their baby up to 4 months, while they are too young to receive the vaccine themselves (Tapia et al., 2016).

Efficacy. Vaccine effectiveness varies each season depending on how closely the virus strains in the vaccine match up with the strains that were circulating. On years that it matches closely, influenza vaccine effectiveness ranges from 40-60% (CDC, 2020f). However, it can be as low as 19%, as it was for the 2014-15 flu season in the United States (CDC, 2020h). Although patients are still susceptible to contracting the influenza virus after they receive a flu vaccine, they are less likely to become severely ill. Vaccination is associated with reduced risk of hospitalization (Havers et al., 2016; Rondy et al., 2017), ICU admission (Thompson et al., 2018), and death associated with influenza (Arriola et al., 2017). Jefferson et al. (2018) conducted a systematic review and determined that the probability of children greater than 2 years old to have confirmed influenza was reduced from 18% to 4% after getting live attenuated flu vaccines and from 30% to 11% after getting an inactivated vaccine, compared with placebo or no vaccine. One percent of healthy individuals aged 16 to 65 years vaccinated against influenza experienced influenza compared with 2% of those that were not vaccinated or received a placebo (Demicheli et al., 2018). A review of randomized control trials (RCT) found that adults aged 65 years or

older who received an influenza vaccine experienced less influenza, 2.4% compared with 6% in those that did not receive a vaccine (Demicheli et al., 2020).

Coverage rates. Influenza vaccination rates have remained well below the Healthy People 2030 goal of 70% (see Table 1) (Schlosser, 2019). Nineteen to 49-year-olds consistently have the lowest vaccination rates. It is also the age group that had the fewest office-based physician visits in the United States in 2016, with those younger than one year old and 65 years and older with the highest rates of office visits (Ashman et al., 2019).

Table 1

Percent of ND Residents Who Received at Least One Dose of Influenza Vaccine During the Flu Season

	6 months-4 years	5-12 years	13-18 years	19-49 years	50-64 years	65 years and older
2016-2017	52.1%	33.2%	24.1%	18.5%	37.2%	48.4%
2017-2018	52.8%	35.1%	28.5%	19.2%	37.4%	51.1%
2018-2019	52.6%	38.2%	28.6%	20.0%	37.9%	53.0%

Note. Data source Schlosser, 2019

Barriers to Vaccination

Low concern of illness. There continues to be misconceptions regarding influenza and the clinical symptoms the flu produces. Kizman et al. (2020) conducted a survey on patients' thoughts about influenza vaccines. Thirty percent of the respondents said their reason for not being vaccinated was that they did not believe the vaccine to be beneficial. Other common reasons patients decline an influenza vaccine is they believe they are not susceptible to illness or the belief that influenza is not a severe illness (Cataldi et al., 2019). Although healthy children between the ages of 5 and 18 have a low risk of hospitalization or complications associated with influenza, they typically have the highest rates of illness during community outbreaks and serve as a major source for transmission (CDC, 2015).

Perceived side effects and misconceptions. In a survey of 620 providers, the most common reasons that patients declined influenza vaccination were the belief that the vaccine will make them sick or that the vaccine will give them the flu (Cataldi et al., 2019). In a small study of elderly primary care patients, the most frequently cited concern and reason for not receiving an influenza vaccine was the belief that the vaccine causes the flu (Rikin et al., 2018). None of the forms of the influenza vaccine can cause flu illness (CDC, 2020g). Flu vaccine injections are either inactivated, or killed, viruses, or made from only one protein of the virus. The nasal spray flu vaccine contains attenuated, or weakened, viruses so they will not cause illness in those that receive them. Common side effects of the flu vaccine include injection site pain and redness, headache, fever, nausea, muscles aches, and fatigue (CDC, 2021c). These symptoms are the result of the body's immune response to the vaccine, also referred to as reactogenicity (Hervé et al., 2019). Symptoms are usually mild and go away on their own in a few days (CDC, 2021c). Over 200 viruses produce symptoms similar to influenza, known as influenza-like-illness (ILI), which includes fever, headache, body aches and pains, cough, and runny nose (Demicheli et al., 2018). Without laboratory testing, ILI cannot be distinguished from influenza. Some people may interpret ILI as the flu although they have been vaccinated. Furthermore, it takes approximately two weeks for the body to develop protection after immunization (CDC, 2020g). If an individual contracts the influenza virus prior to their body developing immune protection, the vaccine they received may have little to no effect on protecting them from developing symptoms.

Missed opportunities. Research consistently shows high percentages of missed opportunities (MO) to vaccinate adults (Bratic et al., 2019; Hurley et al., 2018; Loskutova et al., 2020). There are many different definitions and ways to measure it. A common measurement of an MO is when a patient has had at least one encounter with a provider and is not vaccinated

during the encounter (Loskutova et al., 2017). MOs occur at significant rates in multiple settings, including family practice, emergency rooms, and hospitals. There are many factors that contribute to this, including time constraints and a lack of provider-patient discussion.

Lack of provider support. Provider recommendation to receive a vaccine has shown an increase in vaccination uptake (Kizman et al., 2020). However, provider-patient discussion about vaccination is often lacking. In a survey of healthcare providers, common reported barriers to recommending influenza vaccinations included: other health concerns taking precedence, the amount of time, feeling they will not change patients' minds, and not knowing how to communicate to vaccine-resistant patients (Cataldi et al., 2019). Baspinar et al. (2020) found that patients were 5.35 times more likely to receive an influenza vaccine when their provider recommended it. Provider's comfort and ability to effectively communicate vaccine recommendations, safety, and efficacy is associated with improved vaccination rates. Changolkar et al. (2020) found that patients who saw a provider with less than five years of experience were 8.1 percentage points (PP) less likely to receive an influenza vaccine compared with patients who saw a provider with 5-10 years of experience and 11.3 PP less likely than those who saw a provider with greater than 10 years of experience. Greater experience often yields greater knowledge and confidence. Therefore, these findings may suggest that increased knowledge and comfort with giving recommendations improves vaccination rates.

Interventions to Improve Vaccination Rates

Education. Health care providers are seen as one of the most trusted sources for vaccine information (Chung et al., 2017). When providers have knowledge and understanding of the vaccines they are recommending, they are better equipped to answer patient's questions and concerns. Education to providers and healthcare staff on communication strategies and influenza

vaccine recommendations has been shown to have a positive impact on vaccination status. Medical residents who received an educational curriculum on communicating with vaccine-hesitant caregivers of pediatric patients resulted in less vaccine refusals compared to residents that did not receive the education (Real et al., 2017).

Communication. The way that healthcare providers approach the topic of vaccines and make their recommendations has a great impact on patient acceptance or refusal. Using a presumptive approach to vaccines has been shown to improve vaccination uptake (Hofstetter et al., 2017; Opel et al., 2015). A presumptive approach assumes that parents and patients will want to be vaccinated. The opposite of this is known as the participatory approach. In this format, the provider asks the parent or patient what they would like to do about vaccines. Patients are less likely to accept vaccination when they are asked about it rather than approaching vaccination as a standard, routine part of their care to protect their health (CDC, 2019e). Two separate studies found significantly higher rates of parental vaccine acceptance when providers used the presumptive approach (90% in Opel et al., 2015; 94% in Hofstetter et al., 2017) versus the participatory approach (16.7% in Opel et al., 2015; 28% in Hofstetter et al., 2017) when initiating vaccine recommendations. Hofstetter et al. (2017) also found that parental consent to vaccination was higher if providers were consistent in their recommendation after parents initially voiced resistance to vaccination. Providers should give a strong recommendation by remaining consistent and using a presumptive approach as a strategy to improve vaccination rates.

Patient reminders and recalls. Multiple studies have demonstrated patient reminders and recalls increase vaccination rates (Hurley et al., 2018; Jacobson Vann et al., 2018; Pich, 2019; Sanftenberg et al., 2019). Patient reminders occur when an immunization will be due soon

and recalls occur when immunizations are overdue. However, the extent of effectiveness may depend on patient population, resources available, and the modality being used. Hurley and colleagues (2018) found improvement in influenza immunization rates among high-risk patients and those ≥ 65 years old that were sent reminders but no significant change in healthy patients aged 19-64 years. Kempe and colleagues (2020) found minimal improvements in influenza vaccination rates of pediatric patients using autodial reminders in a RCT in 166 primary care clinics. Telephone calls with an actual person have consistently shown the best outcomes for improving immunization rates when compared with other methods of sending patient reminders and recalls (Pich, 2019). However, the costs of needed personnel and time associated with performing phone calls often limits the practical use of this intervention.

The advantage of digital options for sending reminders and recalls verses phone calls, letters, and postcards is the limited cost associated if the needed infrastructure is already in place. Sixty-eight percent of office-based physicians provide secure messaging capabilities to their patients (Office of the National Coordinator for Health Information Technology [ONC], 2019). Szilagyi et al. (2020) conducted a RCT to determine the effect of direct messages through a patient portal. Generic messages were sent to patients to remind them to schedule an appointment for influenza vaccination. Rates for influenza immunization improved by 1.4 PP in patients that received one reminder, 2.2 PP with two reminders, and 2.9 PP with three reminders. A study focusing on the content of email reminders found that including a map of the closest place to receive an influenza vaccine was more effective than standard email reminders (Baskin, 2018). This finding may suggest that convenient access is an important determanent of vaccination status.

Standing orders. The Community Preventive Services Task Force (CPSTF) (2016) recommends the use of standing orders to increase vaccination rates. Standing orders allow nurses, pharmacists, and others that are authorized, to assess a patient's vaccination status and administer vaccines under a protocol that is approved by an authorized provider. Standing orders can be used in multiple settings without the need of a provider order and examination. The CPSTF conducted a review of the evidence and found that standing orders significantly improve vaccination rates with a median improvement of 24 PP.

Provider reminders. Eighty-six percent of office-based providers in the United States use an electronic medical record (EMR) (ONC, 2019). Many EMR providers offer clinical decision support tools including best practice alerts (BPAs) (Bratic et al., 2019). BPAs are pop-up reminders designed to help providers address gaps in individual patient's care. Bratic et al. implemented influenza vaccine BPAs in pediatric clinics in Texas over three flu seasons. The researchers found a decrease in MOs by 14% in well-child visits during the first year of use and a 3.9% decrease after the third year. It was hypothesized that the decrease in effectiveness over time was a result of clinic workflow. Once staff realized that the BPA could be passed, they were more likely to ignore the reminder, resulting in limited effectiveness. The researchers did not report if there was an overall improvement in influenza vaccination rates after BPA employment. Abdullahi et al. (2020) found that automated reminders to providers when they open their EMR on adolescent patients made little or no impact on vaccination rates. Simple reminder systems for providers have been found to be effective. Sanftenberg et al. (2019) found that standardized checklists for providers to use, when applied to all eligible patients, have a positive effect on immunization rates.

Multicomponent approach. Interventions to improve vaccination rates have been documented, as discussed above. Many of these strategies produce modest improvements. One way to produce even greater improvements in vaccination rates is to implement multiple interventions aimed at improving access to care, education, and/or documentation (Loskutova et al., 2020). Pich (2019) concluded that there was a greater improvement in vaccination rates when reminders or recalls were used in combination with a provider reminder intervention compared with reminders or recalls alone. A practice improvement project conducted by Loskutova et al. (2020) used a multimodal approach including provider reminders, standing orders for vaccination, provider feedback, documentation training, provider education, and enhanced patient outreach through education and visual aids improved influenza vaccination rates by 6.9% compared with 6.2% in the comparator arm that included only provider reminders. MOs were also reduced in both groups but the intervention group with multiple interventions was 48.6% compared to 59.6% in the comparator group.

The 4 Pillars™ Transformation Program is a guide that was developed by a research group at the University of Pittsburgh Department of Family Medicine (University of Pittsburgh School of Medicine, n.d.). The goal of the program is to help outpatient practice settings increase immunization rates. Key domains include convenient services, communication on the importance and availability of vaccine, enhanced system processes, and an immunization champion. Lin, et al. (2016) utilized the 4 Pillars ™ Transformation Program to develop practice improvement changes in primary care clinics in Houston and Pittsburgh. Influenza immunization rates improved by 2.7-6.5 PP. Overall improvement in influenza vaccination rate by 2.3 PP was observed in adolescent patients age 11-17 years when the 4 Pillars ™ Transformation Program was applied to 11 clinics (Zimmerman et al., 2017). Changes in vaccination rates ranged from

being worse compared to pre-intervention data and up to an 18.2% improvement. It was not reported if the clinics that had declines in vaccinations had certain substantiating circumstances, such as lack of vaccine stock, to explain the poor results. Nowalk et al. (2016) developed a multicomponent intervention utilizing the 4 Pillars™ Immunization Toolkit and included provider education, feedback on vaccination rates, and early delivery of vaccines. Influenza vaccination rates improved by 12.4 PP during the intervention period. Rates were 2% higher the year after the intervention was complete as well, indicating that the sites were able to maintain the interventions to some degree. The CPSTF (2015) recommends using a combination of interventions to increase vaccination rates. Interventions that they recommend include client reminder and recall systems, client incentives, expanded access, provider assessment and feedback, provider education, and provider reminder systems. The CPSTF conducted a review and found that the median increase in vaccination rates improved by 14 PP when more than one intervention was used.

Summary

Annual immunization against influenza is recommended for individuals 6 months and older in the United States. Vaccination rates are low among all age groups nationally and in North Dakota. Common reasons for vaccine refusal include the perception that illness can be caused by the vaccine and that influenza is not a severe illness. Most people do have mild illness from influenza, but millions seek care, and thousands die each year from the flu. There is a lot of research that has been done on ways to improve influenza vaccination rates. Evidence shows that multiple interventions have a small impact on improving vaccination rates, including patient reminders and recalls, simple provider reminders, utilizing standing orders, and education to patients, caregivers, and providers. The combination of more than one intervention has the

greatest effect on vaccination rates. Therefore, the proposed project will include multiple interventions aimed at improving provider and patient knowledge of the flu and increasing patient access to receiving the influenza vaccine.

Theoretical Framework

The Iowa Model

The Iowa Model of Evidence-Based Practice to Promote Quality Care is used to guide multidisciplinary healthcare teams to make decisions to improve patient outcomes (Melnyck & Fineout-Overholt, 2018). Permission to utilize the Iowa Model to guide this practice improvement project was obtained from the University of Iowa Hospitals and Clinics (see Appendix A). The model involves multiphase changes with feedback loops that are based on the steps in the scientific process (see Appendix B).

I. **Problem and knowledge focused triggers.** Influenza results in many clinic visits, hospitalizations, and deaths each year that could be prevented by receiving an annual vaccine. Healthy People 2030 set a goal for 70% of those 6 months and older to receive an annual influenza vaccination. However, that goal has not been met and rates remain suboptimal. Evidence suggests that implementing a combination of interventions improves vaccination rates (Loskutova et al., 2020; Pich, 2019; Zimmerman et al., 2017).

II. **Organizational priorities**. Primary care clinics are one of the main points of access for people in the community to receive an influenza vaccine. Healthcare providers strive to improve patient care and help their patients stay free from illness. The clinic this project took place is part of the Avera health system. Avera's mission is "to make a positive impact in the lives and health of persons

and communities" (Avera, n.d.). The best way to prevent illness and complications from influenza is for patients to receive an annual flu vaccine. The primary care clinic recommends an annual flu vaccine for patients that are 6 months and older.

III. **Forming a team.** The team consisted of the co-investigator, nurse practitioner, and nurses at the primary care clinic. My role as a co-investigator was to facilitate implementation of interventions, assess effectiveness, and evaluate the results after the implementation period. The supervisory committee included Dr. Mykell Barnacle as the committee chair, Dr. Dean Gross, and Dr. Allison Peltier from the North Dakota State University (NDSU) School of Nursing, and Dr. Danielle Condry from the NDSU Microbiology Department.

IV. **Assemble and analyze relevant research.** A review of the literature was conducted, and synthesis of the evidence revealed adequate information that implementing new interventions could improve vaccination rates.

V. **Pilot the change in practice.** Interventions to meet the project objectives included an educational session, informational posters, and reminders to assess for influenza vaccination status in exam rooms and patient areas.

VI. **Integrate and sustain the practice change and disseminate results**. Chart review in the EMR was used to evaluate MOs to vaccinate against influenza during project implementation and compared with previous flu seasons. Online surveys were given to project participants to determine effects of the project on knowledge and sustainability of interventions in future practice. Results were disseminated via email to project stakeholders.

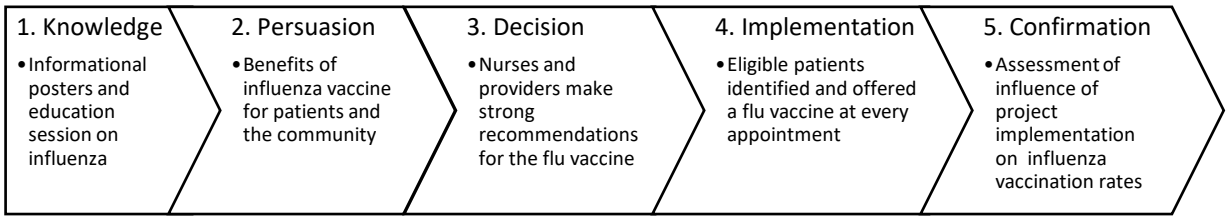
Diffusion of Innovations

The Diffusion of Innovations theoretical model was used to guide this practice improvement project. Everett M. Rogers has been credited as the original developer of the model in 1962, and it is considered one of the oldest social science theories (LaMorte, 2019). *Diffusion* is defined as a process through which new information is spread over time. *Innovation* is defined as an idea, subject, or practice that is perceived to be new. It does not matter if the idea is not new; the perception of newness will direct the reaction to it (Singer, n.d.).

Five step adoption process. Diffusion of Innovations includes five steps to describe how individuals ultimately adopt or reject an innovation: 1) knowledge, 2) persuasion, 3) decision, 4) implementation, and 5) confirmation (see Figure 2) (Singer, n.d.). Before the process could begin, a prior condition was identified as low rates of influenza vaccination and a need for interventions to improve vaccination processes.

Figure 2

Diffusion of Innovations Adoption Process



The first step in the process, knowledge, was to educate the provider and nurses on influenza vaccine recommendations and to display information posters in the clinic waiting and exam rooms. The second step, persuasion, was the development of a positive or negative attitude towards project implementation. The third step, decision, occurred when nurses and the provider decided to either adopt or reject the project. If they adopted the innovation, they made strong recommendations for eligible patients to receive the influenza vaccine using a presumptive

approach. During implementation, nurses and the provider began offering vaccination to all eligible patients at every clinic visit throughout the implementation period. In the final step of confirmation, collection of data was used to either reinforce the continued use of the interventions or cause a change in their decision and they will reject further use. The goal of this step was to show improvements in vaccination rates that solidify the use of the interventions and reinforce the continued use and adoption of the innovation.

CHAPTER 3: METHODS

Project Design

This quality improvement project used a quantitative design through electronic surveys and chart review following implementation of an influenza vaccination program in a primary care clinic in North Dakota. This method was used to determine the impact of the project on influenza vaccination rates during clinic visits, the knowledge gained, and the likelihood of continued use of interventions in future practice.

Project Implementation

Setting

The project took place at a primary care clinic in Ellendale, ND. Ellendale is a rural community near the South Dakota border with a population of 1,211 residents (U.S. Census Bureau, 2019). The median age is 41.1 years, and 26% of the population is 65 years and older. Unemployment is low and 64.1% of the population 16 years and older are in the labor force, 5.2% of them are self-employed. The median household income is approximately $44,688. An estimated 3% of families are considered below the poverty level. Most of the population (96.7%) has health insurance coverage. Residents 25 years or older have a high rate of high school graduation (88.1%). Most of the residents are of white race (93.4%); American Indian or Alaskan Native is the second most prevalent (2.7%). Medical services in town include two primary care clinics, a skilled nursing facility, assisted living, a pharmacy, chiropractor, optometrist, and dental clinic (City of Ellendale, n.d.). The town is situated 28 miles from the nearest hospital.

The primary care clinic sees patients of all ages and includes a full-time nurse practitioner and two nurses. They also have a visiting family practice physician, physical therapist, and

orthopedic doctor. A letter of support for the proposed project was obtained from the clinic manager (see Appendix C). The clinic schedules nurse visits for flu vaccinations when vaccines are available, typically between October and December. During these visits, the nurse enters the order for the vaccine in the EMR that the provider must sign. They do not use standing orders for immunizations. The nurse has access to the North Dakota Immunization Information System (NDIIS), an online system to gather vaccination data on North Dakotans of all ages (North Dakota Department of Health [NDDoH], n.d.). Healthcare providers are mandated by the North Dakota Century Code to report all childhood immunizations (age 18 and younger) to the NDIIS. However, adult immunizations are not required to be reported, and adults have the option to opt out of their vaccinations being reported. Therefore, adult immunization information in the NDIIS may be inaccurate. Nurses review immunizations during the rooming process with patients scheduled for an annual physical or wellness visit. They do not routinely review immunizations for other types of encounters.

Sample

The project included a convenience sample of one nurse practitioner and two nurses working at the primary care clinic. Inclusion criteria for participation was healthcare providers and nurses with direct patient care. Employees who were excluded were those who work less than three days per week at the clinic. Recruitment took place by the co-investigator asking potential subjects directly if they would participate. Participation was voluntary, and consent was obtained through a cover letter requesting participation (see Appendix D).

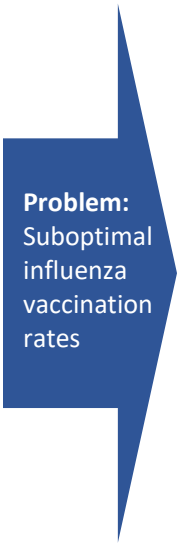
Project Interventions

The project began with an educational presentation (see Appendix E) disseminated via email to participants on October 1, 2021 regarding flu vaccine recommendations and strategies

for communicating with patients. Due to the COVID-19 pandemic and social distancing protocols, an in-person group presentation was not able to be done. Education also included considerations for timing with the COVID-19 vaccine and concurrent COVID-19 illness. Visual aids and reminders were used to improve patient access and ensure patients were offered vaccines at every appointment. Posters from the CDC (2021d) were printed and displayed in the clinic waiting room, exam rooms, and other patient areas to advertise flu vaccine availability (see Appendix F for posters). A document binder with a brightly colored reminder on the front was placed on the desk, easily visible to the patient, provider, and nurses, in every patient room during the implementation period of October 1 through November 30 of 2021. The binders included copies of the vaccine information sheet (VIS) for the influenza vaccine, the vaccination checklist that each patient or caregiver filled out prior to vaccination, and educational handouts on influenza and the vaccine. The nurse assessed flu vaccination status during the rooming process of patients 6 months and older. If the patient had not received a flu vaccine for the current flu season and consented to receiving one, the clinic's current protocols were followed for vaccine administration. If the patient refused vaccination, the nurse and provider educated the patient and gave a recommendation for vaccination. When vaccination status was assessed, the nurse and/or provider documented vaccine receipt or refusal in the EMR. A logic model (see Figure 3) was used to show the relationship between resources, interventions, and outcomes for the project.

Figure 3

Logic Model



Inputs	Outputs		Outcomes	
	Activities	Participation	Short	Long
Providers and nurses Paper for posters Document binders Flu vaccine Vaccine guidelines Time for vaccine administration and documentation EMR	Education to provider and nurses Posters in waiting room and exam rooms Reminder binders with documents in exam rooms Clinic workflow development and implementation Chart review and EMR reports to evaluate MOs during the previous flu seasons and implementation period Post-implementation survey	Providers and nurses with direct patient care Patients with clinic visits who receive a recommendation to be vaccinated against influenza	Improved provider and nurse knowledge of the flu vaccine recommendations Improved provider and nurse confidence in making recommendations using a presumptive approach to receive the flu vaccine Improved clinic workflow for vaccinations Improved patient access to obtaining flu vaccination	Improved influenza vaccination rates Decreased illness and burden associated with influenza

Data Collection and Evaluation

To evaluate the first two objectives, the provider and nurses will (1) identify patients who are eligible to receive the influenza vaccine and do not have any contraindications, and (2) give recommendations using a presumptive approach for eligible primary care patients to receive the influenza vaccine, an online post-implementation survey was distributed to participants via Qualtrics. The survey was disseminated after the education session and two-month

implementation period. The survey utilized a 5-point Likert scale to assess feelings and attitudes towards listed statements (see Appendix G for survey questions). The survey responses assessed participants' opinion of their level of knowledge of influenza vaccine recommendations, comfort when discussing vaccines with patients, and the amount of time they were giving recommendations using a presumptive approach for vaccination.

To evaluate the third objective, influenza vaccination will be offered to eligible patients at every office visit during the two-month implementation period, MOs during the intervention time frame were compared with MOs during the previous two flu seasons. MOs were defined as a clinic visit of any kind for a patient 6 months or older during the period of October 1 through November 30 in which the patient did not have a documented influenza vaccination for that flu season and did not receive immunization at that visit. It was still considered a MO if a patient refused vaccination after it was recommended to them as this was not consistently documented in the EMR. The clinic uses Meditech for their EMR software. The clinic's Quality Management Director was contacted for an EMR report on patient visits and influenza vaccination status. However, a similar report did not exist, and they were unable to establish one. Therefore, individual chart review was needed to collect the appropriate data. Chart review of patients seen in the clinic between October 1 and November 30 of the years 2019, 2020, and 2021 were conducted in Meditech. Seventy-five patients were reviewed at random for each year during the specified time periods for a total of 225. Randomization was done manually with approximately the same time spacing between each encounter. Patients 6 months or older with a clinic visit were included for chart review. Telehealth, nurse-only, lab, and x-ray visits were excluded.

Individual patient charts were reviewed to determine influenza vaccination status at the time of their clinic visit. A Microsoft Excel spreadsheet on the co-investigator's password-

protected computer was used to manage the data. Data elements recorded included: age, month of visit, year of visit, type of visit (episodic, follow-up, Department of Defense [DOT] physical, pre-op or sports physical, wellness exam, or medication rechecks), flu vaccination status for the current season, and flu vaccine administration during the clinic visit. A number that was not affiliated with their personal identifying information or medical record number was assigned to each patient entered in the spreadsheet to avoid duplicate records. Microsoft Excel was also used for data analysis and interpretation. The data set will be destroyed after dissemination of project results has been completed.

Protection of Human Subjects

This project was submitted to the NDSU Institutional Review Board and was granted an exempt status (see Appendix H). Providers and nurses were included in project interventions. There were no foreseeable risks to participants. Potential benefits of participating included increased knowledge and being able to identify patients with contraindications to receiving the influenza vaccine. Patients that received recommendations from the project participants to get a flu vaccine were at no more than minimal risk. The vaccine was only given to those that are recommended by ACIP to receive flu immunization. When patients did consent to receiving a vaccination, they were at risk of vaccine side effects, which most commonly include injection site pain and redness. ACIP and the CDC have determined that the risk of vaccination is less than the benefits and protection that the flu vaccine offers. To protect patient information, no personal identifying information was included on any reports or datasets. Ages were grouped, and race and other demographic information were not reported to minimize the risk of re-identification of patients.

CHAPTER 4: RESULTS

This chapter includes a summary of the results of the data analysis, including survey results and findings from chart review. Evaluation of each objective is described with the key findings highlighted.

Response Rate and Sample Size

A post-implementation survey was distributed to participants online via Qualtrics. The survey was sent to participants' emails on December 9, 2021 with a reminder email sent on December 17, 2021. The survey was open until December 31, 2021. A total of three people responded to the survey for a response rate of 100%. Each of the surveys were completed and included in the final analysis with a sample size of three. Demographic information was not collected from the respondents to maintain confidentiality.

Findings

Objective One

The first objective was for providers and nurses to identify patients who were eligible to receive the influenza vaccine and did not have any contraindications. A 5-point Likert scale was used to evaluate attitudes and beliefs to statements with a range from 1 = strongly disagree to 5 = strongly agree with a neutral option in the middle. Objective one was fully met. All the respondents (100%, $n = 3$) strongly agreed that they were knowledgeable about the influenza vaccine and recommendations regarding who should receive the vaccine, the timing of administration, and contraindications to vaccination.

Objective Two

The second objective was for providers and nurses to give recommendations using a presumptive approach for eligible primary care patients to receive the influenza vaccine. The

Likert scale described above and a second 5-point Likert scale ranging from 1 = never to 5 = all of the time were used to evaluate objective two, which was met.

All respondents (100%, *n* = 3) strongly agreed that they were confident in making a strong recommendation using the presumptive approach for patients to receive an annual flu vaccine. One of the three respondents (33.3%) felt they used the presumptive approach all of the time while the other two (66.7%) felt they used the presumptive approach most of the time when recommending the flu vaccine.

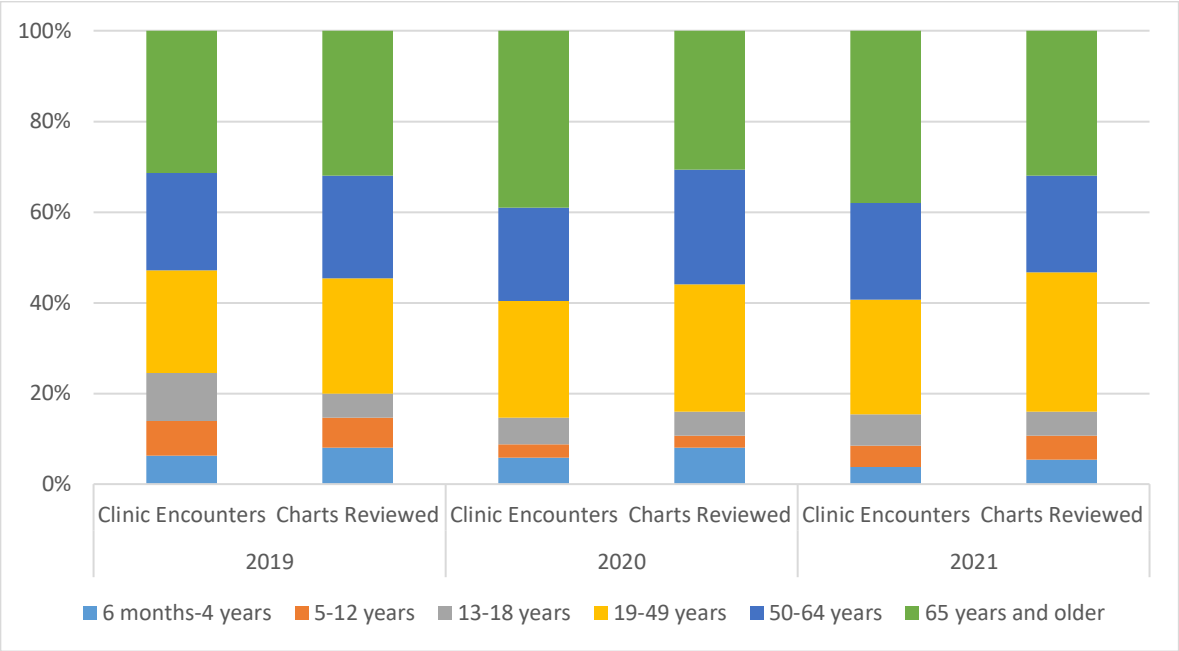
Objective Three

The final objective, that the influenza vaccine would be offered to eligible patients at every office visit during the two-month implementation period, was partially met. Evaluation was done using the two Likert scales described above and a chart review to measure MOs for vaccination. All three participants (100%) strongly agreed that the flu posters helped to remind them to assess flu vaccine status and offer the vaccine to eligible patients at every appointment. Two (66.7%) survey respondents stated they recommended the flu vaccine during clinic visits all of the time, and one (33.3%) felt they recommended the flu vaccine most of the time.

Chart review of 75 random encounters during each of the time periods of October 1, 2019 through November 30, 2019; October 1, 2020 through November 30, 2020; and October 1, 2021 through November 30, 2021 was conducted. The total number of patients 6 months and older seen by a provider in the clinic from October 1 through November 30 was 411 in 2019, 272 in 2020, and 339 in 2021. Age distribution of patient charts that were reviewed was roughly proportionate to that of all patients 6 months and older seen by a provider in the clinic over the same time periods. Gender, race, and other demographic information was not collected.

Figure 4

Age Distribution of All Clinic Patients and Charts Reviewed

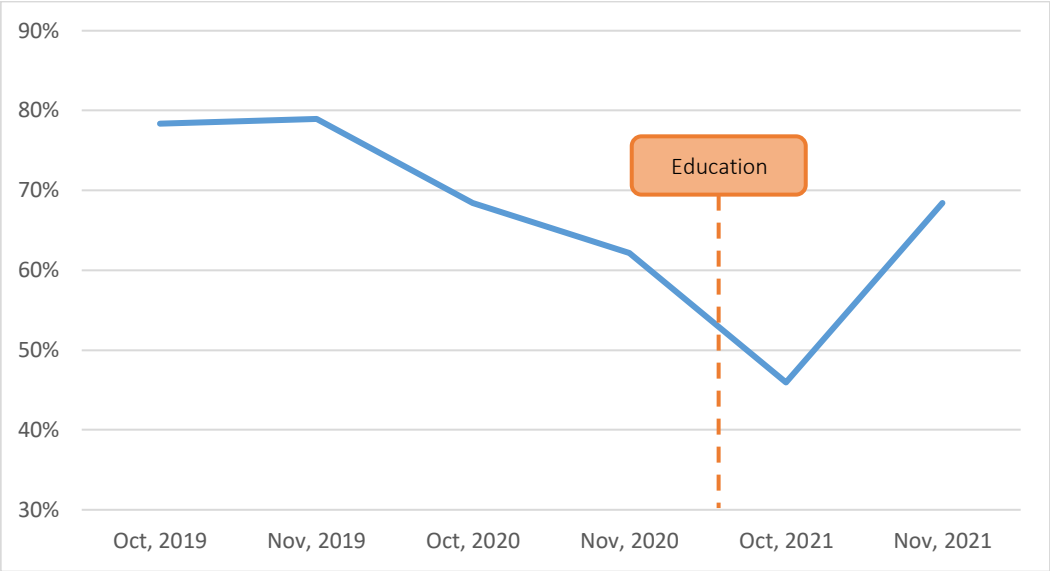


Note. From October 1 through November 30 of each year indicated.

Any provider encounter with a patient 6 months or older who did not have a documented flu vaccine for that season and did not receive an immunization in the clinic was considered a MO. The goal was to see a drop in the rate of MOs. The rate of MOs for influenza vaccination of patients 6 months and older from October 1 through November 30 declined from 78.67% in 2019, 65.33% in 2020, to 57.33% in 2021, after project implementation. MOs were further broken down by the month of visit, age range, and type of visit for further evaluation.

Figure 5

Rate of Missed Opportunities by Month



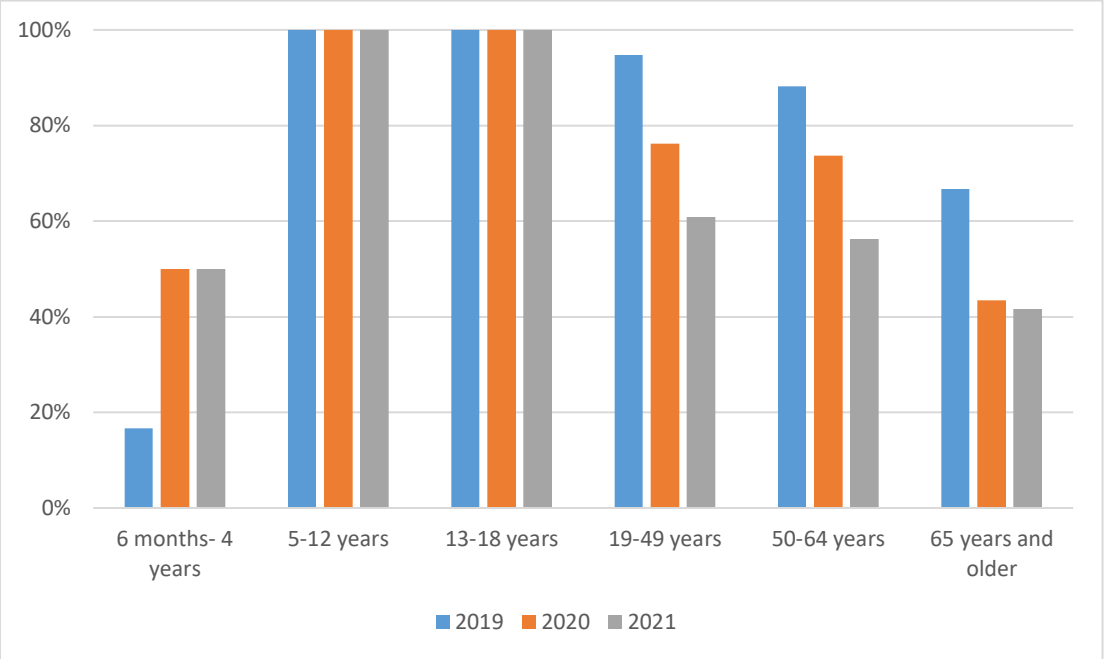
The rate of MOs from October to November remained relatively consistent in 2019 and 2020. Although the overall MO rate decreased in 2021, there was an increase in rates between October and November. MOs went from 78.38% in October of 2019 to 78.95% in November of 2019, and 68.42% in October of 2020 to 62.16% in November of 2020. In 2021, the rate of MOs initially declined to 45.95% in October, after the education session took place, then increased to 68.42% in November.

MOs stayed the same or improved in all age ranges other than the age range 6 months- 4 years (see Figure 6). MOs increased in the 6 month- 4 years age group from 2019 to 2020 then remained the same after project implementation in 2021. One hundred percent of clinic encounters throughout each evaluated time frame for any visit type with patients in the age ranges of 5-12 years (n = 5, 2, and 4 in 2019, 2020, 2021, respectively) and 13-18 years (n = 4 in 2019, 2020, and 2021) were missed opportunities for flu vaccination. In other words, none of

those patients were vaccinated against influenza during their clinic visits and had not been previously vaccinated for that flu season.

Figure 6

Missed Opportunities by Age Range



All charts reviewed of patients of any age seen for a DOT physical (n = 2, 1, and 5 in 2019, 2020, 2021, respectively) were also MOs for influenza immunization (see Table 2). Visits were further broken down into visit types by age range to get a better understanding of the high rates of MOs for influenza vaccination among certain groups.

Table 2

Missed Opportunities by Type of Clinic Visit and Age Range

	Year								
	2019			2020			2021		
Visit Type	MO	Total	Rate	MO	Total	Rate	MO	Total	Rate
Episodic	**28**	**35**	**80%**	**31**	**38**	**81.58%**	**19**	**30**	**63.33%**
6 months-4 years	1	4	25%	2	2	100%			
5-12 years	4	4	100%	1	1	100%	4	4	100%
13-18 years	3	3	100%	2	2	100%	2	2	100%
19-49 years	13	13	100%	13	15	86.67%	8	11	72.73%
50-64 years	4	4	100%	8	9	88.89%	1	2	50%
65 years and older	3	7	42.86%	5	9	55.56%	4	11	36.36%
Follow-up	**16**	**17**	**94.12%**	**4**	**6**	**66.67%**	**5**	**9**	**55.56%**
5-12 years	1	1	100%						
13-18 years	1	1	100%	2	2	100%			
19-49 years	4	4	100%	2	3	66.67%	2	4	50%
50-64 years	4	5	80%				2	3	66.67%
65 years and older	6	6	100%	1	1	100%	1	2	50%
DOT Physical	**2**	**2**	**100%**	**1**	**1**	**100%**	**5**	**5**	**100%**
19-49 years							3	3	100%
50-64 years							1	1	100%
65 years and older	2	2	100%	1	1	100%	1	1	100%
Pre-op/Sports Physical	**2**	**2**	**100%**	**1**	**6**	**16.67%**	**4**	**6**	**66.67%**
6 months-4 years				0	1	0%	1	1	100%
5-12 years				1	1	100%			
13-18 years							1	1	100%
19-49 years				0	1	0%			
50-64 years	2	2	100%	0	1	0%	1	2	50%
65 years and older				0	2	0%	1	2	50%
Medication Recheck	**10**	**15**	**66.67%**	**6**	**13**	**46.15%**	**5**	**10**	**50%**
13-18 years							1	1	100%
19-49 years	1	2	50%	1	1	100%	0	2	0%
50-64 years	5	5	100%	4	6	66.67%	2	2	100%
65 years and older	4	8	50%	1	6	16.67%	2	5	40%
Wellness Exam	**1**	**4**	**25%**	**6**	**11**	**54.55%**	**5**	**15**	**33.33%**
6 months-4 years	0	2	0%	1	3	33.33%	1	3	33.33%
19-49 years				0	1	0%	1	3	33.33%
50-64 years	0	1	0%	2	3	66.67%	1	3	33.33%
65 years and older	1	1	100%	3	4	75%	1	3	33.33%
Total	**59**	**75**	**78.67%**	**49**	**75**	**65.33%**	**43**	**75**	**57.33%**

Note. MO = missed opportunities, DOT = Department of Transportation.

The majority (87%) of visits for the age ranges 5-12 years and 13-18 years were for episodic or follow-up visits. Episodic and follow-up visits are two categories that had high rates of MOs in both 2019 and 2020 (see Table 2). Although there was an improvement in MOs during episodic and follow-up visits after project implementation in 2021, no change was seen in the age ranges of 5-12 or 13-18 years. All patients seen for a DOT physicals in 2019 (n = 2) and 2020 (n = 1) were 65 years or older, who typically have higher rates of vaccination. Whereas in 2021, the majority of patients seen for DOT physical (n = 3, 60%) were 19-49 years, who typically have lower rates of vaccination than older individuals. Although the overall vaccination rates for the age range 19-49 years improved after project implementation in 2021, patients seen for DOT physicals in this age range did not receive a flu immunization.

Barriers and Facilitators

Two additional open-ended questions were included on the Qualtrics survey to better understand participant's thoughts and feelings towards any barriers or facilitators with project implementation. None of the respondents identified any barriers to project implementation. Participants felt that the binders in each patient room acted as a reminder to assess flu vaccine status. They also felt having the necessary forms readily available facilitated efficient workflow for vaccination.

CHAPTER 5: DISCUSSION AND RECOMMENDATIONS

Summary

The purpose of this practice improvement project was to increase patient access and provider knowledge of flu vaccines and best practices regarding vaccine uptake in a primary care clinic in North Dakota, with the hope of improving influenza vaccination rates in the clinic. The outcomes of this project indicate that implementing more than one intervention towards increasing vaccinations can improve rates. The project included education for the provider and nurses on influenza vaccines, ACIP and CDC recommendations, and considerations during the COVID-19 pandemic; posters to advertise vaccine availability; and visual reminders for offering the flu vaccine.

A key finding was the positive results of the survey, which found that the provider and nurses were knowledgeable about the flu vaccine and felt comfortable recommending the vaccine using a presumptive approach. They also found that the interventions were helpful to remind them to assess for flu vaccine status in each patient and they plan to sustain use in future flu seasons. Chart review showed a decline in overall missed opportunities for vaccination, which correlates to improved influenza vaccination rates in the clinic over the implementation period. The results of this project indicate the importance of continued effort among healthcare personnel to improve vaccination rates.

Discussion

Objective One

The first objective was for the provider and nurses to identify patients eligible to receive the influenza vaccine and did not have any contraindications. Nurses and the provider that were included in this project reported that they were knowledgeable about the influenza vaccine and

recommendations for administration. However, this is a subjective measurement as they were not questioned on specific information. Their knowledge also was not assessed prior to project implementation, so it is unknown if there was an increase in knowledge. Regardless, their confidence in the knowledge they have is important for being able to communicate vaccine recommendations with patients. Misconceptions about the flu vaccine and impact of flu are commonly cited as reasons for not being vaccinated (Schmid et al., 2017). Schmid et al. (2017) also found that healthcare providers frequently report a lack of training and influenza-specific knowledge to be a barrier for increasing influenza vaccination rates. Regular education and training to remain up to date on the flu vaccine and its effectiveness will be important to combat misconceptions and vaccine hesitancy among patients regarding the flu vaccine for future flu seasons.

Objective Two

Objective two was to give recommendations using a presumptive approach for eligible primary care patients to receive the influenza vaccine. Project participants felt confident in making recommendations for flu vaccination using the presumptive approach verses the participatory approach, and that they made recommendations using the presumptive approach either all the time or most of the time. How often they were using this approach prior to project implementation is unknown. However, the increase in vaccinations from project implementation compared with prior to implementation is consistent with the studies that show improved vaccine uptake when recommendations are made using a presumptive approach (Hofstetter et al., 2017; Opel et al., 2015). The co-investigator did not track patients that were given a recommendation and declined vaccination. However, Opel et al. (2018) found that vaccine uptake increased over time with more exposure to recommendations with a presumptive approach. Therefore,

continued recommendations at clinic visits throughout the flu season and in future flu seasons should be done to further improve vaccination rates.

Training on giving recommendations using a presumptive approach should be done prior to each flu season. A refresher education session should also be considered part way through the flu season. The missed opportunity rate had initially decreased to less than 50% in October of 2021, which was right after the education session and project implementation. Rates of MOs then increased by over 22 PP from October (45.95%) to November (68.42%) during the two-month implementation period. Education occurred at the beginning of October. Refresher courses or reminders were not provided throughout project implementation. The increase in MOs from October to November could indicate that recommendations for flu vaccines to each patient became inconsistent or that the nurses and provider were not using a presumptive approach and returned to their previous communication habits. These findings not only highlight the importance of continued education with refreshers, but also the impact that education has on improving vaccination rates.

Objective Three

The third objective was to offer influenza vaccination to eligible patients at every office visit during the two-month implementation period. The flu posters were helpful to remind nurses and providers to assess flu immunization status of patients that were seen in the clinic. The combination of education and visual reminders were also useful to decrease the rate of missed opportunities to vaccinate patients in the clinic. These findings are consistent with the evidence that supports the use of multimodal approaches to improve vaccination rates.

Influenza immunization coverage rates in North Dakota had been steadily increasing until declines in coverage rates were seen with the 2020-21 flu season (NDDoH, 2022a). The 2020-21

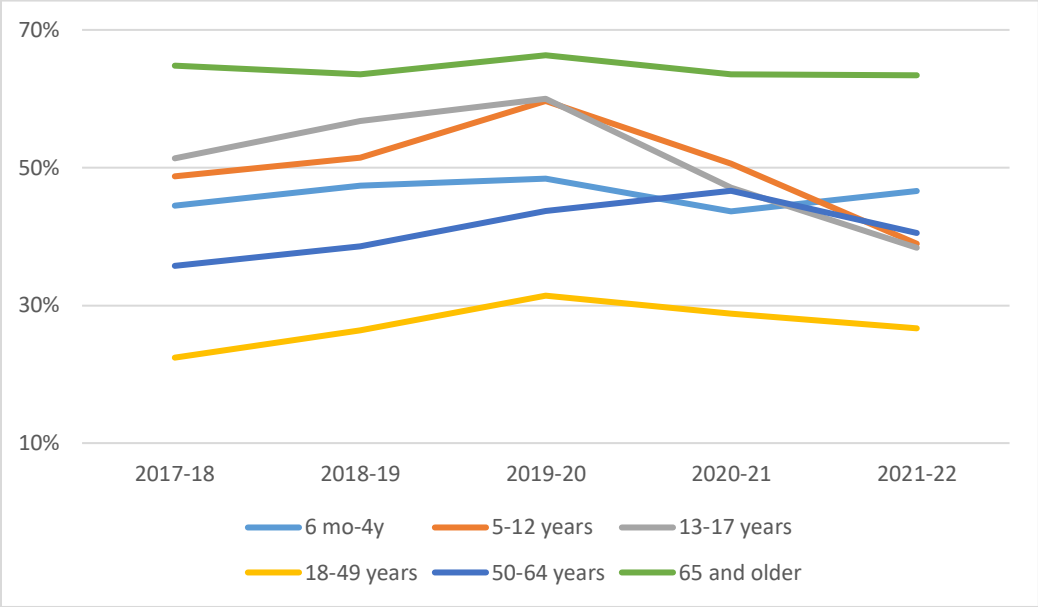
flu season was after the start of the coronavirus pandemic. There was also a decline in other preventive healthcare in the United States around that time, including childhood immunizations, colonoscopies, mammograms, and pap smears (Martin, 2021). The exact reason for the decline in flu vaccinations and preventive care is unclear but social distancing and isolation or mistrust in vaccines and healthcare could have contributed. Fisher et al. (2020) conducted a survey with US adults on intent to be vaccinated against COVID-19. Of the respondents that did not intend to be vaccinated, 41% cited general antivaccine attitudes including not believing in vaccines, fear about vaccines, and misconceptions or incorrect information about vaccines. Another 32% discussed a lack of trust in vaccines, the government and CDC, pharmaceutical companies, a general distrust, and conspiracy theories including the thought that a tracking chip would be implanted with vaccination. Google searches for anti-vaccination terms, including "mercury," "autism," and "dangerous," in the context of the COVID-19 vaccine have increased throughout the pandemic (Pullan & Dey, 2021). Anti-vaccine campaigns and messages are typically found towards the top of the searches and are generally easier to read and understand than scientific articles and pro-vaccine information. The correlation with increased distrust and anti-vaccination attitude and decreased rates of flu immunizations and preventive care practices emphasizes the importance of educating patients and implementing effective interventions to improve rates and prevent future pandemics. Healthcare professionals and health systems could consider producing easy-to-understand social media content to promote vaccine safety and efficacy to combat the plethora of misinformation that is readily available to patients.

The NDDoH reports mid-season influenza immunization coverage rates in January of each year based on data from the NDIIS. Mid-season flu immunization coverage rates were

increasing in Dickey County since 2017, which is the first year mid-season data was reported, and began declining in 2020 (Figure 7) (NDDoH, 2022b).

Figure 7

Mid-Season Influenza Immunization Coverage Rates for Dickey County Residents



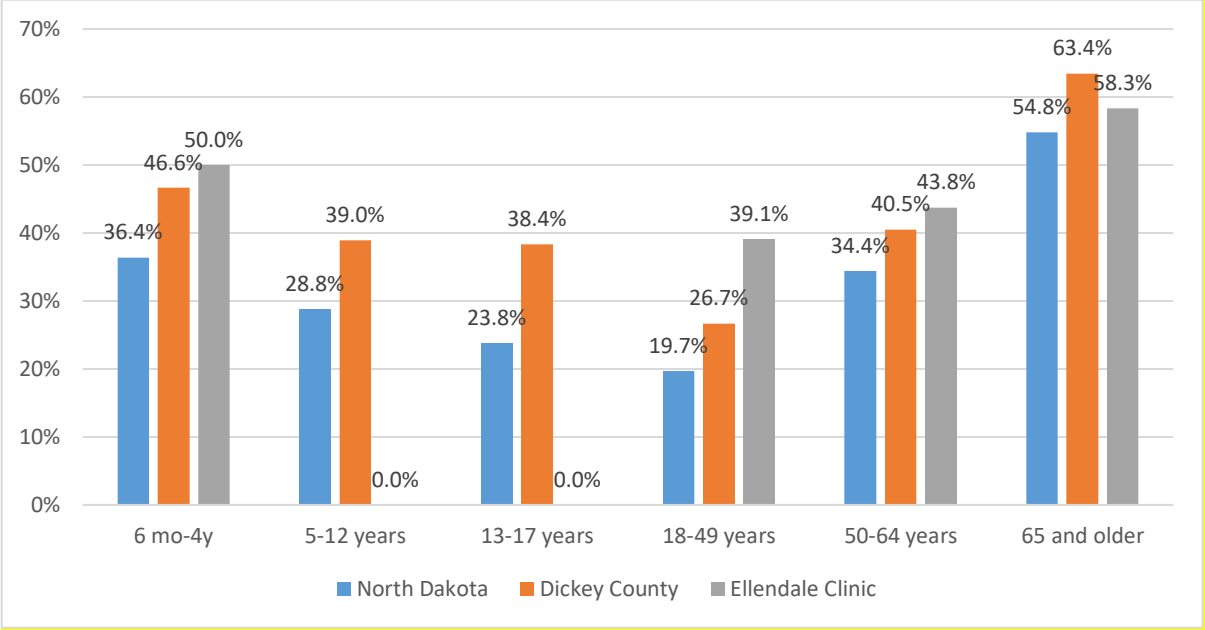
Note. Data source NDDoH, 2022b

Despite declines in vaccination in the state of North Dakota and Dickey County, improvements in the flu vaccination rate in patients 19 years and older were seen at the primary care clinic in Ellendale with project implementation. Excluding the age groups of 5-12 years and 13-18 years, higher vaccination rates were seen at the clinic in Ellendale with project implementation compared with state-wide and Dickey County mid-season rates in all age groups other than the Dickey County rate for those 65 years and older (see Figure 8) (NDDoH, 2022b). According to data from the NDIIS, the total number of influenza doses administered at the clinic between August 1 and January 31 also increased to 103 doses for the 2021-2022 flu season compared with 80 doses during the same time for the 2020-2021 flu season (Dykstra, 2022).

While interventions seemed to have an overall positive impact on vaccination rates, some groups did not see a change in the rate of MOs.

Figure 8

Mid-Season Influenza Immunization Coverage Rates for 2021-2022 Flu Season



Note. Data source NDDoH, 2022b. Data for Ellendale Clinic from Oct 1-Nov 30, 2021.

The rate of MOs decreased in all age groups greater than 18-years-old. However, there was no change from the 2020 MO rate of 50% in those aged 6 months to 4 years. Interestingly, none of the children aged 5 to 18 years were vaccinated against influenza in each year assessed. This finding differs from the state and county statistics that show the age group 18-49 years to consistently have the lowest vaccination rates (NDDoH, 2022a; NDDoH, 2022b). Most visits for the age groups 5-12 years and 13-18 years were for episodic and follow-up visits, which both had the greatest improvements in MOs for patients 6 months and older. Further investigation is needed to determine possible causes for the low rate of vaccination in these age ranges. Another group of patients that were unvaccinated against influenza in all three years assessed were patients seen for a DOT physical. Templates are followed for these types of visits which does not

include assessing vaccination status. The addition of an area to assess for immunization status within the template could be helpful in improving vaccination rates during DOT visits. However, it is unknown if patients presenting for a DOT physical receive their primary care elsewhere, which could impact their willingness to be vaccinated in that clinic. They may have a different primary care provider who they are more likely to trust and accept a recommendation for vaccination.

The types of visits with the lowest MOs were medication rechecks and wellness exams. Apart from wellness visits in the age range 6 months to 4 years, patients that are seen for medication rechecks and wellness exams are more likely to be older, which also correlates with greater rates of flu vaccination. A high rate of MOs was associated with episodic visits prior to project implementation but improved by over 16 PP and 18 PP from 2019 and 2020 to 2021, respectively. An episodic visit refers to a single encounter for which a patient was seen for a specific concern, such as acute illnesses, infections, and injuries, among others. Episodic visits tend to be shorter in length than medication rechecks or wellness exams and the priority of the visit is more focused on the current complaint rather than the overall health or preventive services. The improvement in rates after project implementation indicates that the posters helped remind nurses and providers to offer the vaccine to patients during episodic visits. However, the MO rate is still higher than many of the other visit-types, which could indicate that the typical visit format and lack of time for episodic visits does not allow for adequate education to be provided to patients.

Recommendations

Due to the positive results on MOs in the clinic, it is reasonable to recommend the multi-faceted approach to improve influenza vaccination rates in primary care clinics. This approach

could include the use of simple reminders through posters and visual aids and education to nurses and providers, as well as practice using the presumptive approach when encouraging vaccines. The participants in the practice improvement project indicated they plan on sustaining the use of these interventions in future practice and did not identify any barriers to implementation. Therefore, the continued implementation of interventions is likely to be sustainable. One potential challenge will be the development and dissemination or presentation of education and determining who would be responsible for this.

The CDC has multiple resources available for healthcare providers, including updates to ACIP's flu immunization recommendations, influenza fact sheets, and education on techniques to make a strong recommendation for patients to be immunized, as well as best practices for increasing vaccination rates in the clinic setting. These resources can be found online at cdc.gov/flu. The CDC also has multiple videos available online of providers explaining the way they recommend vaccines to patients. The video series can be found on YouTube by searching "#HowIRecommend" or by going to cdc.gov/vaccines/howirecommend. The use of a presumptive approach when recommending vaccines has consistently shown positive impacts on vaccine uptake (Hofstetter et al., 2017; Opel et al., 2015; Opel et al., 2018). Communication strategies and approaching vaccine recommendations presumptively should be introduced to nurses and nurse practitioners beginning in nursing program curricula.

As discussed previously, effective interventions to improve vaccine uptake will continue to be as important as ever. The current COVID-19 pandemic has led to high rates of misinformation, vaccine hesitancy, and delayed preventive care services. Steps need to be taken to reduce the level of mistrust surrounding vaccinations and prevent future pandemics. Primary care providers and nurses have a prime opportunity to contribute to vaccination efforts. Regular

education on communication techniques, facts to overcome vaccine misconceptions, and ways to make recommendations using a presumptive approach should be considered to improve vaccine uptake among primary care patients.

Documentation of declined vaccination, despite the flu vaccine being recommended, should be completed consistently. A drop-down menu to select the patient's reason for refusal could also be considered. Consistent EMR documentation of declined vaccination would provide further understanding of vaccine accessibility and uptake. Further examination regarding the extremely high rates of MOs in patients aged 5-18 years that were found during this project are also recommended. Improved documentation of reason for refusal would be helpful in determining methods to overcome low vaccination rates in the pediatric population.

It was difficult to establish a large data set to definitively conclude the true impact of project interventions on flu immunization rates in the clinic due to the need for manual chart review. This practice improvement project should be repeated with the use of a report that can be ran periodically in the EMR. Data fields to consider including in the report, beyond the ones used for this project, are gender, insurance coverage, and race. Frequent reports on the overall flu vaccination rate in the clinic and MOs depicted by age and visit-type should be made available to nurses and providers. Awareness of vaccination rates and MOs will serve as a reminder to assess for flu vaccination status and can provide an incentive for continued improvement or show areas where change is needed. Rates should be compared each flu season to determine trends over time.

Dissemination

Project findings, along with recommendations for future practice improvement projects related to influenza vaccination rates, will be shared with the manager of the clinic where the

project took place. Other health care providers will have access to the results of this project on ProQuest Dissertations & Theses Global once the dissertation is completed and has been approved. A summary of the project and results will also be presented at a poster presentation at NDSU in the Spring of 2022.

Limitations

A report of flu immunization status and injections administered in the clinic of all patients seen could not be created, so individual chart review was done to measure MOs. The number of data points was limited due to the time requirement to manually review charts. However, the accuracy of the data gathered manually is likely higher than a large report with aggregate data. The sample of patients analyzed during chart review was likely representative of the clinic population based on age. However, other demographic information that could impact the likelihood of vaccination including race, insurance coverage, and gender was not recorded for each patient. A chart review of over 1000 patients seen for an annual physical exam revealed that females were more likely than males to be vaccinated against influenza (Applewhite et al., 2020), which is consistent with influenza rates in North Dakota (Baber, 2018). Comorbidities were also not recorded during chart review, which could have a significant impact on vaccination rates. Medicare-covered patients considered high-risk were more likely to be vaccinated against influenza during the 2018-2019 flu season than those that are not considered high-risk (Cho et al., 2022). White beneficiaries were also more likely to be vaccinated than black or Hispanic beneficiaries during the same study.

The results of the post-intervention survey were prone to inflated responses due to recall bias and subjective measurements of knowledge and ability to use a presumptive approach. Investigators of future practice improvement projects could consider testing knowledge and

ability to identify a recommendation using a presumptive approach. Participants could answer multiple choice questions by selecting the option they believe is correct both pre and post-intervention. Responses could then be compared to determine if education was helpful in improving knowledge and to determine if they could accurately identify a presumptive approach.

The lack of dialogue due to the education being provided via an online presentation also created a limitation. Role playing scenarios with different ways of using a presumptive approach and communicating with vaccine hesitant patients would have been helpful to strengthen communication strategies and solidify new skills.

Conclusion

Influenza continues to be a burden to our health care system and economy. Efforts to improve low flu vaccination coverage rates are needed. Primary care clinics are a key location for vaccinations to occur. Nurse practitioners and other healthcare providers can provide education on influenza vaccine safety and efficacy and offer vaccination to patients 6 months and older during every clinic visit throughout the flu season. The results from this practice improvement project indicate that a combination of simple interventions aimed at nurse and provider education, communication strategies, and reminders can improve flu vaccination rates in primary care clinics.

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APPENDIX A: PERMISSION TO USE THE IOWA MODEL

Kimberly Jordan - University of Iowa Hospitals and Clinics <survey-bounce@survey.uiowa.edu>
Wed 1/27/2021 11:24 AM
To: Kreft, Kara

You have permission, as requested today, to review and/or reproduce *The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care*. Click the link below to open.

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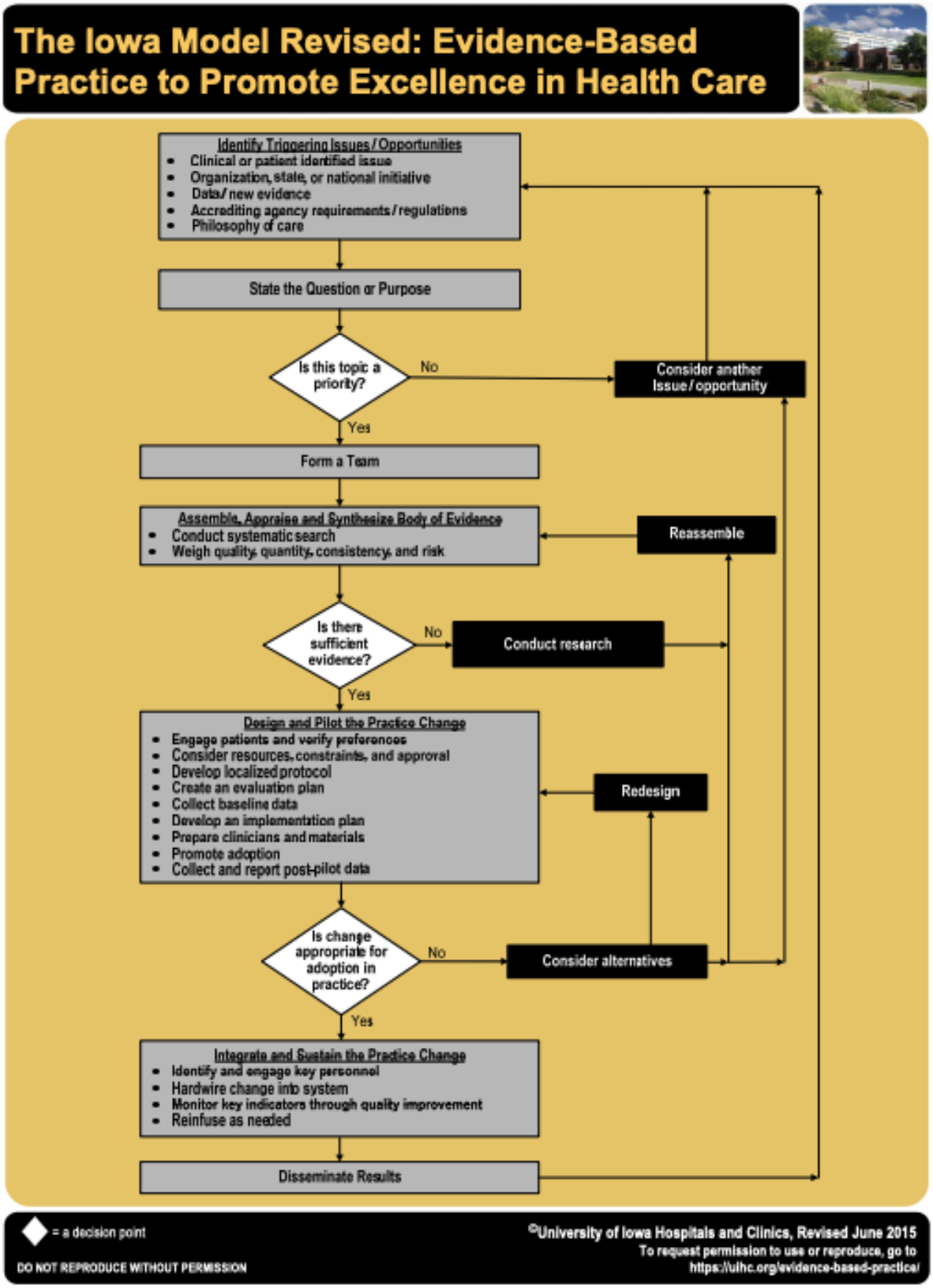
Please contact UIHCNursingResearchandEBP@uiowa.edu or 319-384-9098 with questions.

APPENDIX B: THE IOWA MODEL



APPENDIX C: LETTER OF SUPPORT

AGENCY LETTER OF SUPPORT

August 2, 2021

North Dakota State University
Institutional Review Board

To whom it may concern:

The Avera Clinic of Ellendale is writing to express its support for the proposed project: Influenza Vaccination Rates in Primary Care. We are supportive of implementing interventions to encourage increased uptake of influenza vaccination, including reminders to offer a flu vaccine at every appointment. We also support review of the electronic health record for patient vaccination status to determine changes to vaccination rates compared with the previous flu season. The project will begin in October of 2021 and end in December of 2021.

If you have any questions, please contact the Avera Clinic of Ellendale at 701-349-3666.

Sincerely,

Tanner White
Clinic Manager
Avera Clinic of Ellendale

APPENDIX D: COVER LETTER FOR CONSENT

My name is Kara Kreft. I am a Doctor of Nursing Practice student at North Dakota State University, and I am conducting a practice improvement project to improve provider and nurse knowledge of the influenza vaccine and increase patient access to receiving the flu vaccine.

You are invited to take part in this practice improvement project, where you will be asked to attend an educational session, utilize a paper reminder for offering the flu vaccine to primary care patients, give recommendations to patients using a presumptive approach, and complete an online survey after the 2-month project implementation period. Your participation is entirely your choice, and you may change your mind or quit participating at any time, with no penalty to you.

It is not possible to identify all potential risks in research procedures, but we have taken reasonable safeguards to minimize any known risks. These risks may include loss of confidentiality or emotional distress.

By taking part in this research, you may benefit by improving your knowledge of influenza vaccines and gaining better communication skills for discussing vaccines with patients. Benefits to others are likely to include improved understanding of the risks and benefits of the influenza vaccine and possibly decreased levels of flu activity in the community.

The survey should take less than 10 minutes to complete. Completion of the survey will constitute your consent to participate in the project. Your information will be combined with information from other people taking part in the study, we will write about the combined information that we have gathered. You will not be identified in these written materials. We may publish the results of the study; however, we will keep your name and other identifying information private.

If you have any questions or comments, please feel free to contact me by email at kara.s.lepp@ndsu.edu or phone at 701.535.0584. You may also contact my advisor, Dr. Mykell Barnacle by email at mykell.barnacle@ndsu.edu or phone at 701.231.7730. You have rights as a research participant. If you have questions about your rights or complaints about this research, you may talk to the researcher or contact the NDSU Human Research Protection Program at 701.231.8995, toll-free at 1-855-800-6717, or by email at ndsu.irb@ndsu.edu.

Thank you for your taking part in this project.

APPENDIX E: EDUCATIONAL POWERPOINT SLIDES

Influenza Vaccination Rates in Primary Care

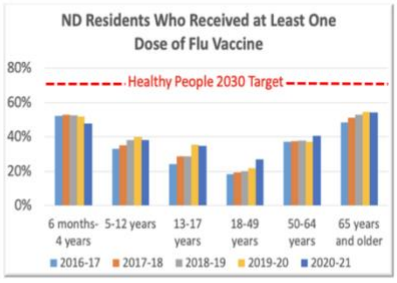
Kara Kreft
North Dakota State University

Objectives

- Review the burden of influenza
- Discuss the flu vaccine and recommendations
- Identify barriers to influenza vaccination
- Understand ways to educate and communicate with patients

Influenza

- Prior to COVID, flu had highest cost & economic burden of all VPDs
- Average of 37,463 deaths annually since 2010 in the US
- Pneumonia /influenza in the US in 2018 was in the top 10 causes of death in all age groups ≥ 1 year old
- 2019-20 flu season in the US, influenza was associated with:
  - Illness in 38 million people
  - 18 million medical visits
  - 400,000 hospitalizations
  - 22,000 deaths



Vaccine Recommendations

- Annually for everyone 6 months and older
  - Ideally by the end of October
- ≥ 65 years
  - High dose flu vaccine
- 6 months-8 years
  - 2 doses spaced ≥4 weeks apart IF they have not received ≥ 2 doses ≥ 4 weeks apart previously
  - Schedule 2nd dose right away

Contraindications & Precautions

- Contraindication
  - Previous severe allergic reaction to flu vaccine
- Precautions
  - Moderate or severe acute illness
    - Diarrhea, URI, etc. with or without a fever is not a precaution and vaccine should be given
    - Fever is from the vaccine or underlying acute illness?
    - Consider the chances of patient returning for vaccination
  - Guillain-Barre < 6 weeks after a previous dose of influenza vaccine
- Safe to receive
  - Egg allergy
    - Patients with known egg allergy can receive any of the recommended flu vaccines
    - If history of severe egg allergy→ vaccine should be given in an outpatient or inpatient medical facility under supervision of a healthcare provider able to recognize and manage allergic reactions
    - No need to monitor for 30 minutes (rate of anaphylaxis is 1.31 per one million doses)

Flu Vaccine & COVID-19

- Flu and COVID vaccines can be administered without regard to time
  - Administer each injection into different limbs if possible or separate injection sites by ≥ 1 inch
- If someone has moderate or severe COVID, flu vaccination should be delayed until they are no longer acutely ill and out of isolation

Vaccine Efficacy

- Effectiveness ranges from 40-60% when the vaccine strains closely match the flu strains that are circulating
- Decreases risk of severe illness, hospitalization, and death

Myths & Barriers to Vaccination

Low Concern of Illness

- Healthy children aged 5-18
  - Low risk of hospitalization or complications from flu
  - Typically have highest rates of illness during community outbreaks
  - Major source of transmission
- Full-time employees
  - Lose 3.5-5 days of work from symptomatic illness
- 2017-18 flu season
  - Cases relatively evenly distributed among age groups
    - 28 million flu cases and 9,600 deaths in 18–64-year-olds
- 2019-20 flu season
  - 188 lab-confirmed flu-related pediatric deaths
    - 141 children were ≥ 6 months old and 75% were unvaccinated

The Vaccine "Causes the Flu"

- The vaccines cannot give you the flu
  - Injections are made from inactivated (killed) flu viruses or only 1 protein of the virus
  - Nasal mist is an attenuated (weakened) virus that will not cause illness
- Influenza-like-illness
  - >200 viruses produce symptoms similar to influenza
- It takes ~2 weeks to produce immunity
  - May contract influenza before the vaccine is able to protect against it

Common Side Effects

- Injection site pain and redness, headache, fever, nausea, muscle aches, and fatigue
  - *Reactogenicity*- the body's immune response to the vaccine
  - Usually mild and go away in a few days

Improving Vaccination Rates

Reduce Missed Opportunities

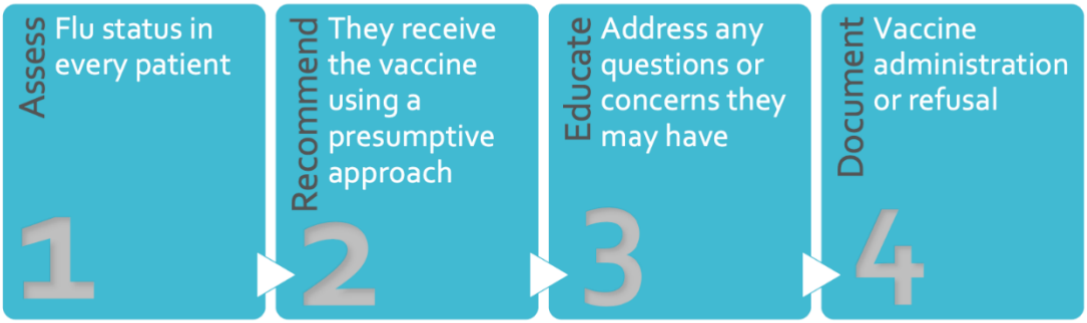
- Assess vaccination status for all patients
  - 6 months and older
  - Every type of visit

Presumptive Approach

- Presumptive approach
  - Assumes parents and patients will want the vaccine
  - Examples:
    - "We recommend you get your flu vaccine by the end of October. We will get it for you at the end of your visit."
    - "You will need the flu vaccine today."
- Participatory approach
  - Asks the parents and patients what they would like to do about vaccines
  - Examples:
    - "Have you thought about getting the flu vaccine today?"
    - "Would you like the flu vaccine?
- Significantly higher acceptance rates with presumptive
  - 2017 study: 94% vs. 28%
  - 2015 study: 90% vs. 16.7%

Vaccine Hesitancy

- If they refuse vaccination, ask about any questions or concerns they have
- Provide additional educational materials if needed
- Remain consistent in your recommendation and continue to discuss vaccination at every visit



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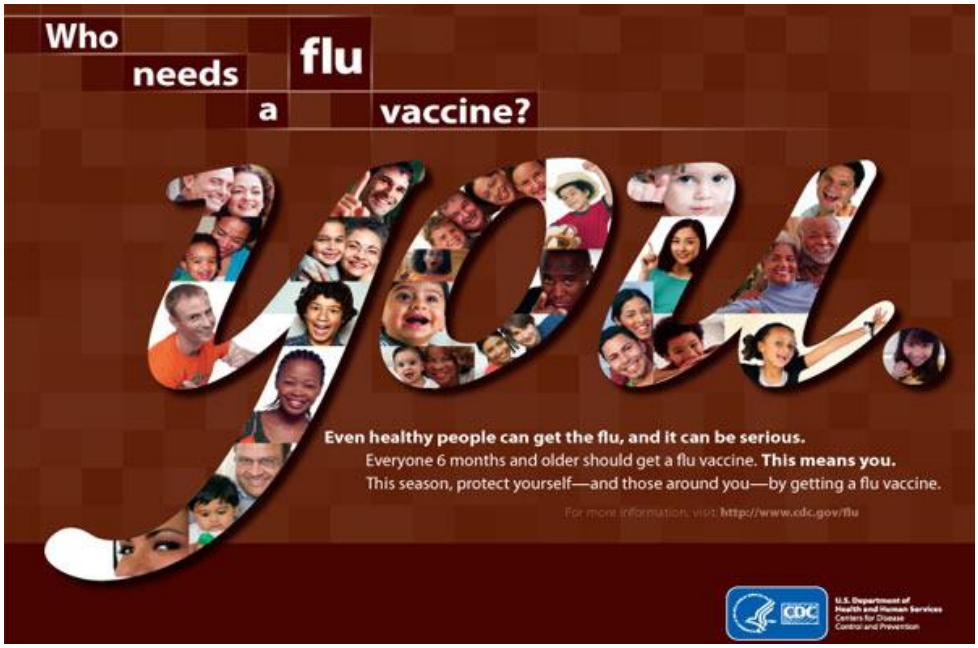
APPENDIX F: POSTERS



APPENDIX G: POST-IMPLEMENTATION SURVEY

Please complete the following survey with your feedback from the practice improvement project: Influenza Vaccination Rates in Primary Care

Please select the choice that most closely defines your feelings towards each statement.

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
I am knowledgeable about the influenza vaccine including its efficacy and common side effects.	○	○	○	○	○
I am knowledgeable about ACIPs recommendations for influenza vaccination including who should receive it, timing of administration, and contraindications to the vaccine.	○	○	○	○	○
I feel confident in making strong recommendations using a presumptive approach for patients to receive an annual influenza vaccine.	○	○	○	○	○
The paper reminder and posters helped remind me to assess flu vaccine status and offer the vaccine to every patient at every appointment.	○	○	○	○	○
I plan to sustain use of the paper reminders for flu vaccination in my future practice.	○	○	○	○	○

What were barriers to project implementation?

What went will with project implementation?

APPENDIX H: IRB EXEMPT LETTER

NDSU NORTH DAKOTA STATE UNIVERSITY

09/23/2021

Dr. Mykell M Barnacle
Nursing

Re: IRB Determination of Exempt Human Subjects Research:
Protocol #IRB0003829, “Influenza Vaccination Rates in Primary Care”

NDSU Co-investigator(s) and research team:

- Mykell M Barnacle
- Kara Kreft

Approval Date: 09/23/2021
Expiration Date: 09/22/2024
Study site(s): Avera Clinic of Ellendale in Ellendale, ND
Funding Agency:
The above referenced human subjects research project has been determined exempt (category 2,4) in accordance with federal regulations (Code of Federal Regulations, Title 45, Part 46, *Protection of Human Subjects*).

Please also note the following:

- The study must be conducted as described in the approved protocol.
- Changes to this protocol must be approved prior to initiating, unless the changes are necessary to eliminate an immediate hazard to subjects.
- Promptly report adverse events, unanticipated problems involving risks to subjects or others, or protocol deviations related to this project.

Thank you for your cooperation with NDSU IRB procedures. Best wishes for a successful study.

NDSU has an approved FederalWide Assurance with the Department of Health and Human Services: FWA00002439.

RESEARCH INTEGRITY AND COMPLIANCE
NDSU Dept 4000 | PO Box 6050 | Fargo ND 58108-6050 | ndsu.research@ndsu.edu
Shipping Address: Research 1, 1735 NDSU Research Park Drive, Fargo ND 58102

APPENDIX I: EXECUTIVE SUMMARY

INFLUENZA VACCINATION RATES IN PRIMARY CARE

Influenza is a highly contagious upper respiratory illness that affects an average of 8% of Americans each season.

During the 2019-2020 flu season in the US, influenza was associated with:			
38 million Illnesses	18 million Medical Visits	400,000 Hospitalizations	22,000 Deaths

The best prevention from influenza is an annual vaccine. The Healthy People 2030 goal is 70% of those 6 months and older be vaccinated. However, only 56.5% of North Dakota residents were vaccinated during the 2019-2020 flu season.

PURPOSE

The purpose of this project was to increase patient access and provider knowledge of the flu vaccine.

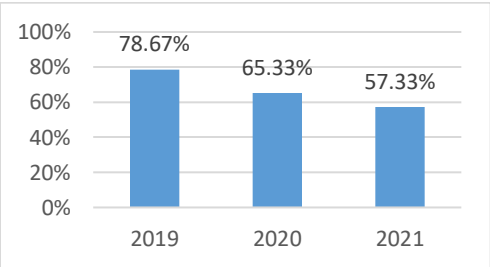
PROJECT DESIGN

- Education to provider and nurses on facts about the flu, vaccine safety and efficacy, vaccination recommendations and contraindications, and communication techniques including making recommendations using a presumptive approach
- Posters and reminders displayed in patient areas and exam rooms in the clinic
- Online survey to project participants
- Chart review of 75 random patient encounters during the months of October and November of the years 2019, 2020, 2021
    - Rates of missed opportunities during project implementation in 2021 were compared with the previous two years (Missed opportunity = any provider visit for a patient 6 months or older without a flu vaccination for the season and a vaccine was not administered during the visit)

PROJECT RESULTS

- Participants were knowledgeable about the flu vaccine, recommendations for vaccine administration, and contraindications to vaccination.
- Participants were confident making recommendations for flu vaccination using a presumptive approach and made recommendations this way during most patient encounters.
- Missed opportunities decreased after project implementation compared with the two previous years. The greatest impact was seen in October 2021, right after the education session.

Rate of Missed Opportunities



CONCLUSION & RECOMMENDATIONS

- Simple interventions can be effective to improve patient access to flu vaccines, and ultimately, influenza vaccination rates in primary care clinics.
- This project should be replicated with additional education throughout the flu season
- An automated report should be produced to ease the burden of manual chart review.