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A Quality Improvement Project on Increasing Hepatitis B Vaccination for Diabetic Patients

Ellen Musakwa
Walden University

Walden University

College of Nursing

This is to certify that the doctoral study by

Ellen Musakwa

has been found to be complete and satisfactory in all respects,
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the review committee have been made.

Review Committee
Dr. Lilo Fink, Committee Chairperson, Nursing Faculty
Dr. Courtney Nyange, Committee Member, Nursing Faculty
Dr. Janine Everett, University Reviewer, Nursing Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
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Abstract

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MS, University of Zimbabwe 2000

BS, University of Zimbabwe 1997

Project Submitted in Partial Fulfillment

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Abstract

Diabetes mellitus is characterized by high blood glucose levels (hyperglycemia) resulting in susceptibility to viral infections such as hepatitis B viral infections. The purpose of this doctoral quality improvement (QI) project was to train primary care providers (PCPs) and their medical assistants at the project site's clinic on implementing the recommended Centers for Disease Control and Prevention (CDC) guidelines for hepatitis B vaccination with the aim of improving vaccination rates for diabetic patients 18 years and older. The first practice-focused question addressed the evidence-base supporting the QI training of PCPs to improve awareness on implementing the recommended CDC guidelines. The second question explored if a QI training of PCPs would improve implementation of the CDC guidelines and increase hepatitis B vaccination rates in a primary care setting during a 12-week training period. The Donabedian model of structure, process, and outcome was used in this QI project to train project participants. Lewin's concept of unfreezing and freezing was used to refer to improving the low vaccination rates at the project site after training the PCPs on the recommended CDC hepatitis B vaccination guidelines. Pre- and postintervention surveys questions were used to collect data from 17 participants. Data from pre-training survey was compared to the post-training survey questions using a chi-square analysis done in Microsoft Excel. The result of the PCPs QI training was an increase of 2% in the hepatitis B vaccination rates at the project site. A positive social change was realized through lowering the incidence of hepatitis B infections through hepatitis B vaccination, and improved quality of life for the diabetic patients.

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Finally, I want to thank my family for putting up with all my years in graduation school. It is finished! My family was incredibly patient and understanding through the years and I know without their support I would have not accomplished this. I would also like to thank my friends who supported and encouraged me during the tough times. It takes a village to produce a Doctor of Nursing Practice because I could have not done it without all their incredible support and prayers.

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Section 1: Nature of the Project

Introduction

Diabetes is a chronic metabolic disease indicated by high blood glucose levels due to insufficient insulin (Type 2 diabetes) or lack of insulin production (Type 1 diabetes) by the pancreas (Berbudi et al., 2020; Hechter et al., 2019). An inflammatory response occurs because of the immune response to high blood glucose levels as well as the presence of inflammatory mediators produced by adipocytes and macrophages in fat tissue (Berbudi et al., 2020). This low and chronic inflammation damages the pancreatic beta cells and leads to insufficient or lack of insulin production, which results in hyperglycemia and susceptibility to infections due to reduced response of T cells, neutrophil function, and disorders of the humoral immunity (Berbudi et al., 2020). The objective of this evidence-based Doctor of Nursing Practice (DNP) quality improvement (QI) project was to improve hepatitis B vaccination rates for diabetic patients at a primary care setting by training primary care providers (PCPs) on utilizing the recommended Center for Disease Control (CDC) Guidelines for hepatitis B vaccinations.

The greater frequency of infections in diabetic patients is caused by the hyperglycemic environment that favors immune dysfunction (Hong et al., 2017). Some of the infections such as hepatitis B viral infections (HBV) may complicate to liver cirrhosis and hepatocellular carcinoma (Hong et al., 2017). HBV impairs key metabolic processes regulated by the liver, leading to the development of diabetes mellitus due to inflammatory mechanisms resulting in glycol-metabolic dysfunction and insulin resistance (Younossi et al., 2017). The American Diabetes Association (ADA) standards

of medical care in diabetes include current practice clinical recommendations such as maintaining a normal hemoglobin A1c at 5.7 mg/dl or lower, low cholesterol levels, normal blood pressure levels, foot and eye screening, and routine vaccinations including hepatitis B vaccination (ADA, 2021). According to the World Health Organization (WHO), hepatitis B is a life-threatening liver infection caused by the hepatitis B virus leading to cirrhosis and hepatocellular carcinoma (WHO, 2019). To decrease the risk of HBV infection, the CDC, in conjunction with the Advisory Committee for Immunization and Prevention (ACIP), has recommended that all diabetic patients, 18 years and older, should be vaccinated against HBV (Ferreira et al., 2018; Schilles et al., 2018). Pelullo et al. (2020) found that health care workers' knowledge gaps and poor attitudes regarding vaccinations have a negative impact on patients and the community leading to increased risk of infections. Hang et al. (2019) also found that most PCPs might not be vaccinating diabetic patients due to lack of awareness of the CDC-recommended guidelines on hepatitis B vaccination for diabetic patients. The benefits of training PCPs on using the recommended CDC guidelines on hepatitis B vaccination for diabetic patients may include empowering and motivating the PCPs to use the CDC guidelines resulting in reduced rates of HBV infection among diabetic patients.

Walden University encourages nursing scholars to promote positive social change through research, leadership, and translation of evidence-based knowledge into practice (Walden University, 2019). Such positive social change may transform the lives of individuals, families, and communities through QI of medical services and better patient outcomes (Walden University, 2019). The positive social change for this project was an

increased rate of hepatitis B vaccinations thus lowering the incidence of HBV infections and improving the quality of life for diabetic patients.

Problem Statement

PCPs in primary care settings have a critical role in vaccinating diabetic patients against HBV infection (Hechter et al., 2019). However, the PCPs lack awareness of the recommended CDC guidelines on hepatitis B vaccination for patients above 18 years with Types 1 and 2 diabetes (Abara et al., 2017; Ngamruengphong et al., 2015). The PCPs' nonadherence to the guidelines shows a gap in practice regarding the use of the CDC guidelines on hepatitis B vaccination of diabetic patients (Hechter et al., 2019; Schilles et al., 2018). The site's clinic data coordinator stated that "[the county] has a population of 64,312 based on the 2020 census" and that "14,500 patients are served by the American Native Indian Clinic and that out of the population serviced by this clinic, 600 patients were diabetic but only 17% of the diabetic patients aged 18 years and older received a hepatitis B vaccination in 2020." The low hepatitis B vaccination rate for diabetic patients at this project site may be related to the PCPs' gap in knowledge or lack of awareness of the CDC guidelines.

HBV infection is underrecognized as a risk for people with diabetes who are twice as likely to be infected with HBV compared to nondiabetic patients (Dan, 2017; Kim & Kim, 2018). According to Dan (2017), training PCPs on the CDC guidelines for hepatitis B vaccination of diabetic patients may enhance their awareness about the CDC guidelines and improve clinical practice. In spite of these CDC guidelines, the rate of hepatitis B vaccination of diabetic patients aged 19–59 years is estimated at 24.4%

nationally and 12.6% for diabetic patients above 60 years of age (CDC, 2018). Researchers have found that significant barriers that prevent the vaccination of diabetic patients are healthcare workers' attitudes about vaccination, wrong perception, and lack of awareness about vaccination measures to prevent HBV infections (Alvarez et al., 2017).

HBV infection causes liver dysfunction, leading to the development of Type 2 diabetes, a clinical syndrome associated with the deficiency of insulin secretion (Younossi et al., 2017). The number of the U.S. adults aged 18 years or older with diagnosed diabetes quadrupled from 5.5 million in 1980 to 21.9 million in 2014 (Lin et al., 2018). The economic cost of diabetes was $245 billion in 2012, and researchers have found that these health and economic burdens of diabetes would continue to increase in the future if the problem of lack of hepatitis B vaccination is not addressed in a timely manner (Lin et al., 2018). This evidence-based QI project's aim was to improve nursing practice at this project site by increasing the number of diabetic patients who received the hepatitis B vaccine.

Purpose Statement

This evidence-based DNP QI project sought to train PCPs on using the CDC-recommended guidelines and evaluated the impact of the training on the rates of hepatitis B vaccination of diabetic patients at a clinic in Northern California. The gap in practice was that there was a low hepatitis B vaccination rate for diabetic patients at this site. Literature showed that the problem of low vaccination rates was not unique to this practice site (Aroke et al., 2018; Karlsson et al., 2019; Yeluri et al., 2021). Successful

implementation of a QI project on using the recommended CDC guidelines on hepatitis B vaccinations might influence improved quality of patient care at other primary care settings. Hepatitis B is a life-threatening liver infection leading to cirrhosis and hepatocellular carcinoma (WHO, 2019). Through this QI evidence-based DNP project, an increase in the hepatitis B vaccination rates may protect patients from HBV infections, reducing liver disease and mortality.

The guiding practice-focused questions for this project were the following: Will the evidence from literature support a QI project on using the CDC-recommended guidelines on hepatitis B vaccination rates for diabetic patients? Will the QI project on training PCPs on the use of the recommended CDC guidelines on hepatitis B vaccination for diabetic patients improve vaccination rates at a primary care setting?

To address the gap in practice, I presented an evidence-based QI training on hep B vaccination for diabetic patients 18 years and older to the project participants. The aim of the evidence-based QI project was to increase the rate of hepatitis B vaccinations administered to diabetic patients 18 years and older using the CDC guidelines.

Nature of the Doctoral Project

This was an evidence-based QI project to (a) train PCPs on using the recommended CDC guidelines on administering the hepatitis B vaccine to diabetic patients 18 years and above and (b) evaluate the impact of the training on using the recommended CDC guidelines on hepatitis B vaccination of diabetic patients. Walden University's *Manual for Quality Improvement Evaluation* (2019), which informed this project, stated that the purpose of a QI project is to evaluate a practice change within an

organization and gain insight into the effectiveness of the initiative by examining, analyzing, and synthesizing data from the results of the project. The Walden University *Manual for Quality Improvement Evaluation* (2019) also informed this QI project in evaluating the impact of training PCPs on using the CDC guidelines for hepatitis B vaccination. The Donabedian model of structure, process, and outcome as outlined by LoPorto (2020), and the Lewin's 1951 change theory informed this DNP evidence-based project.

The Walden University Library was used to access peer-reviewed articles on topics that were closely related to hepatitis B vaccinations and diabetes that informed this project. To organize the evidence gathered from the literature review, the John Hopkins literature review matrix was used (see Appendix F). A pretraining survey was conducted on the PCP awareness and attitudes on the use of CDC guidelines for vaccinating diabetic patients 18 and older. At the end of the study, a post-training survey was conducted to analyze the impact of the training on the use CDC guidelines and the increase on hepatitis B vaccinations.

The purpose of this evidence-based QI project was to train PCPs on using the recommended CDC guidelines for hepatitis B vaccinations of diabetic patients to increase the hepatitis B vaccination rates at the project site. The gap in practice was that the hepatitis B vaccination rate for diabetic patients at the project site was low. The purpose of the findings of this project was to inform nursing practice on the value of using the recommended CDC guidelines for hepatitis B vaccinations for diabetic patients to reduce morbidity and mortality related to HBV infections.

Significance

The beneficiaries of this project included stakeholders such as the health care organization, Tribal Council, healthcare providers, nurses, medical assistants, patients, families, and the community. According to Ngamruengphong et al. (2015), a QI project may improve health care providers' knowledge and enhance competencies on hepatitis B vaccinations for diabetic patients. The CDC (2020) maintained that training PCPs on hepatitis B vaccination may minimize HBV infection and improve the quality of patient care delivery and patient satisfaction. HBV infection can cause not only serious health damage to patients and a heavy economic burden on families and society, but also a series of social problems that put a financial burden to the organization, interested stakeholders, and the nation (Younossi et al., 2017). This project would possibly reduce the financial burden to the organization, patient, family, and community at large by reducing HBV infections through hepatitis B vaccination for diabetic patients.

The goal of this project was to create a positive social change by empowering PCPs and other health professionals with information on the CDC guidelines for hepatitis B vaccination of diabetic patients. Walden University encourages nursing scholars to promote positive social change through research, leadership, and translation of evidence-based knowledge into practice so as to transform the lives of individuals, families, and communities for better health outcomes (Walden University, 2019). Training PCPs on using the recommended CDC guidelines for vaccinating diabetic patients with the hepatitis B vaccine supported social change through the prevention of HBV infections, reduction of morbidity and mortality, and reduction of the financial cost of treating HBV

infections. The significance of this doctoral project to nursing practice is the improved advocacy for patients, and efficiency in providing hepatitis B vaccinations to diabetic patients. Primary care providers have a significant role in informing, advising, and promoting vaccinations according to the CDC guidelines on hepatitis B vaccination, a preventative measure to reduce the risk of contracting vaccine-preventable infection-HBV (Pelullo et al., 2020). Based on the findings of this QI project, recommendations to improve nursing practice may be transferable to other similar primary care settings.

Summary

In this section, I introduced the QI project, stated the problem statement, identified the purpose of the project, described the nature of the DNP project, and explained the significance of the QI project. In Section 2, I described the background and context of the QI project, explained the concepts, models and theories, discussed the relevance of the project to nursing practice, and described the role of the DNP and the project team.

Section 2: Background and Context

Introduction

The WHO (2018) described HBV as a life-threatening liver infection caused by the hepatitis B virus leading to cirrhosis and hepatocellular carcinoma. HBV infection is underrecognized as a risk for people with diabetes who are twice as likely to be infected compared to nondiabetic patients (Dan, 2017; Kim & Kim, 2018). The CDC, in conjunction with the ACIP, has recommended that all diabetic patients 18 years and older should be vaccinated with the hepatitis B vaccine to decrease the risk of HBV infection (Ferreira et al., 2018; Schilles et al., 2018). However, most PCPs felt uncomfortable vaccinating diabetic patients due to lack of training on the recommended CDC guidelines about hepatitis B vaccination for diabetic patients (Hang et al., 2019). Health care workers' knowledge gaps and poor attitudes regarding hepatitis B vaccinations may lead to increased risks of HBV infections among diabetic patients (Pelullo et al., 2020).

This DNP project aimed to train PCPs on implementing the recommended CDC guidelines for hepatitis B vaccination of diabetic patients 18 years and older at the project site. The DNP practice-focused questions that guided this evidenced-based QI project on hepatitis B vaccination for diabetic patients were as follows: Will the evidence from literature support a QI project on improving hepatitis B vaccination rates for diabetic patients according to the recommended CDC guidelines? Will a QI training on PCPs' use of the recommended CDC guidelines on hepatitis B vaccination for diabetic patients improve vaccination rates in a primary care setting? The Donabedian model of structure, process, and outcome was used to conduct this project. In this section, the relevance of

the 1980 Donabedian quality of care model and the 1951 Lewin change theory was applied to the project and nursing practice. The concepts, models, and theories that inform this DNP project, as well as the relevance to nursing practice, the local background and context, the role of the DNP student, and the role of the project team members were discussed.

Concepts, Model and Theories

Donabedian Quality Care Model

The Donabedian model, used to guide this evidence-based DNP QI project, is a useful organizational framework for QI in healthcare (LoPorto, 2020). The 1980 Donabedian's quality of care model identified three domains relevant to high-quality client care: structure, process, and outcome (LoPorto, 2020). Donabedian's model identifies structure as the environment and the resources necessary to provide services (Ameh et al., 2017). In this QI project, *structure* referred to resources, facilities, equipment, availability of medications, vaccines, staff training, and monetary resources; *process* described the techniques and practices implemented to provide care, and *outcomes* were the end results realized by the recipient (LoPorto, 2020). According to Donabedian (1980), an established structure is a prerequisite to effective process, which is a prerequisite for high-quality outcomes (Ameh et al., 2017; LoPorto, 2020). Informed PCPs would recognize the importance of implementing the QI training on the CDC-recommended guidelines to vaccinate diabetic patients 18 years and older. In this QI project, Donabedian's structure referred to the PCPs, and process referred to vaccinating diabetic patients against HBV infections with the objective of improving the quality of

diabetes management. The outcomes were used in the evaluation of the efficacy of the QI intervention changes in the rates of hep B vaccinations at the clinic and patients' clinical outcomes.

Lewin's Change Theory

In 1951, Lewin described a theory of planned change conceptualized by two forces involved in change: driving forces and restraining forces (McEwen & Willis, 2019). Driving forces facilitate movement to a new direction, goal, or outcome, while restraining forces impede progress toward the goal (McEwen & Willis, 2019). Change is further defined as the process of altering or replacing existing knowledge, skills, attitudes, systems, policies, or procedures (Hussain et al., 2016). It is a dynamic process that necessitates alterations in behavior and may cause some conflict and resistance (Hussain et al., 2016). According to the Lewin change theory, there are three stages through which change agents must proceed before change became part of a system: (a) unfreezing (when change is needed), (b) moving (when change is initiated), and (c) refreezing or when equilibrium is established (McEwen & Willis, 2019). According to the clinic data coordinator, "A major concern at the project clinical setting was low hep B vaccination rates for diabetic patients 18 years and older," a status quo that needs unfreezing. Implementation of a QI training facilitated moving to the next level of vaccinating diabetic patients against HBV infection when change was initiated. As PCPs utilized the CDC-recommended hep B vaccination guidelines for diabetic patients 18 years and older, rates for hepatitis B vaccination rates would increase, leading to refreezing when PCPs would vaccinate all diabetic patients.

Relevance to Nursing Practice

In the United States, the prevalence of diabetes mellitus is estimated to be 34.2 million people of all ages (National Diabetes Statistics Report, 2020). The greater frequency of infections in diabetic patients is caused by the hyperglycemic environment that favors immune dysfunction, and results in severe hepatic diseases, such as liver cirrhosis and hepatocellular carcinoma (Hong et al., 2017). Safe and effective hepatitis B vaccines have been available since the 1980s (Hong et al., 2017). The hep B vaccines are available for people of all age groups and prevent acute and chronic infections with an estimated effectiveness of 95% (Alshammari et al., 2019). However, Hang et al. (2019) maintained that most primary care providers are not following the CDC-recommended guidelines to vaccinate diabetic patients against HBV infections. Gottlieb (2017) conducted a DNP evidence-based QI project on increasing vaccination rates for adults with Type 2 diabetes, using a four pillars of transformation protocol to align providers' practices with the recommended immunization guidelines. The results were that 62% of diabetic patients were screened and educated on immunizations. Out of these patients, 76% were vaccinated against tetanus and pneumonia. Gottlieb's recommendations included a need to continue educating staff and patients to increase vaccination rates for diabetic patients. A gap in practice exists as PCPs are not following the recommended CDC guidelines for vaccinating adult diabetic patients with the Hep B vaccine (Backhouse & Ogunlayi, 2020). The goal of this QI evidence-based DNP project is to improve nursing practice by promoting the PCPs' use of the CDC-recommended guidelines on vaccinating diabetic patients 18 years and older against HBV infections.

Local Background and Context

The project site's clinic data coordinator stated that, "out of a population of 64,312 based on the 2020 census, 14,500 patients were served by the clinic in Northern California and out of this number of patients, 600 patients were diabetic but only 17% of diabetic patients aged 18–59 years received a hepatitis B vaccination." The low hepatitis B vaccination rate for diabetic patients was related to the PCPs' lack of awareness to utilize the recommended CDC guidelines.

Role of DNP Student

I worked with diabetic patients as a nurse practitioner and was concerned about the low vaccination rates at this project site compared to the national level. My role in this project was that, as a DNP student coordinating the QI project, I was directly involved in developing this evidence-based QI project utilizing my leadership and collaborative skills as the project coordinator. A review of literature on nursing practice provided me with evidence-based practices that impacted the development of this project. According to the American Association of Colleges of Nursing (2006), advanced nurses should use their leadership skills to develop and evaluate care delivery approaches that meet current needs of patients based on scientific findings. My leadership and health management skills enabled me to create this project's objectives and implement the QI project by training the PCPs to meet the needs of diabetic patients' hep B vaccinations according to the recommended CDC guidelines. My interest in curbing HBV infections through vaccinating diabetic patients, influenced my bias toward this project's findings that supported using the recommended CDC guidelines. To overcome this bias, I

collaborated with the project site's information technology (IT) technician and the clinic data coordinator to provide the data for the pre- and post-QI project data.

Role of the Project Team

To implement this project, as project coordinator, I collaborated with the clinic's medical director, the IT technician, and the clinic data coordinator. I explained the QI project and timelines to the medical director, the IT technician, and the clinic data coordinator one month before the project. The project site's medical director introduced the project to the participants 1 month before the project implementation. I collaborated with the IT technician and the clinic data coordinator to retrieve hep B vaccination data from the electronic medical records (EMRs) for the last 6 months before the project. The IT technician and the clinic data coordinator compiled each participating provider's data on the hep B vaccination rates before, during, and 3 months after the training of PCPs on the use of the recommended CDC guidelines and gave these data to me. I met with the IT technician and the clinic data coordinator before the QI project implementation and once a week during the QI project implementation to review the progress of vaccination rates for diabetic patients. After the QI project implementation, I met with the IT technician and the clinic data coordinator once a month for a period of 3 months to review the progress of vaccination rates for diabetic patients.

Summary

The second section described Donabedian's model (1980) and Lewin's Change theory (1951) and their application to this mixed methods QI project in using the CDC-recommended guidelines to vaccinate diabetic patients against HBV infection. The

Donabedian model's concepts of structure, process and outcome informed this QI project. Lewin's change theory (1951) of unfreezing and freezing was used to introduce the QI training of PCPs on using the recommended CDC guidelines and to maintain the increase in vaccination rates as the PCPs improved their efficiency in vaccinating diabetic patients against HBV infections. Section 3 focuses on sources of evidence and methods used to retrieve, organize, and analyze pre- and post-QI project data.

Section 3: Collection and Analysis of Evidence

Introduction

Adults with diabetes mellitus are at a greater risk of contracting HBV infection with related morbidity such as increased risk of liver cirrhosis, hepatocellular carcinoma, accelerated disease progression, and death compared to those without diabetes mellitus (Hayer & Janssen, 2019). Kim et al. (2020) stated that HBV infection has an estimated worldwide prevalence of 257–291 million affected people, with diabetic patients accounting for 60% of the cases. The WHO, U.S. Department of Health, and Human Services (DHHS), and the CDC proposed strategies such as vaccinating, screening, and treating HBV infection (Kim et al., 2020). The development of this DNP evidence-based QI project focused on addressing the gap in practice at the project site where the PCPs were not following the recommended CDC guidelines of vaccinating all diabetic patients, 18 years and older, with the hepatitis B vaccine. At the project site, only "17% of diabetic patients were given the hepatitis B vaccines in 2020," according to the clinic data coordinator. This supported the evidence that PCPs needed to be equipped with knowledge to use the CDC guidelines on hepatitis B vaccination for diabetic patients 18 years and older, optimize outcomes, and improve the patients' quality of life.

The CDC and the ACIP annually published the immunization schedule to summarize updates as well as recommendations on vaccination of adults and to assist PCPs in implementing the current ACIP recommendations (Freedman et al., 2021). Freedman et al. (2021) explored why PCPs were not following the latest guidelines to keep up with changes in vaccination schedules as recommended by the CDC and the

ACIP. The above authors found that the providers' reasons for not vaccinating patients were (a) lack of awareness about the CDC guidelines, (b) negative perceptions about vaccines, (c) lack of time, and (d) shortage of vaccines. The development of this QI project was guided by the evidence in the literature review and the statistics on hepatitis B vaccinations at the project site. In this section, I explain the alignment of the practice-focused question to the purpose of the project, define the key terms of the project, discussed the sources of evidence, describe the research method and data collection, and describe how the data would be analyzed.

Practice-Focused Questions

At a primary care facility in Northern California, "17% of patients with diabetes had hepatitis B vaccination in 2020," according to the clinic data coordinator. The low hepatitis B vaccination rates provided a gap in practice which was an indication that PCPs were not using the recommended CDC guidelines. The practice-focused questions for this QI project were the following: Will the evidence from literature support a QI project on improving hepatitis B vaccination rates for diabetic patients according to the recommended CDC guidelines? Will a QI training of PCPs on the use of the recommended CDC guidelines on hepatitis B vaccination for diabetic patients improve vaccination rates in a primary care setting? The purpose of this DNP evidence-based QI training was to enhance PCPs' use of the CDC guidelines on hepatitis B vaccination for diabetic patients at the project site. The recommended CDC clinical practice guidelines on hepatitis B vaccination were to increase hepatitis B vaccination rates and improve the quality of care for diabetic patients (Wang et al., 2021).

Sources of Evidence

The sources of evidence gathered were peer-reviewed journal articles with topics closely related to diabetes and immunization. I accessed multiple databases at the Walden University Library, such as, PubMed, Medline, CINAHL, and ProQuest to find sources of evidence. The ADA, the CDC, and the ACIP websites were accessed for research pertinent to the project questions. Key search terms included *diabetes mellitus, hepatitis B vaccination, primary care providers' knowledge, their attitudes and practices, the CDC guidelines on vaccination,* and *the ADA standards of medical care*. The literature review from the scholarly articles was limited to the previous 5 years to prevent outdated research from being included and to ensure that the settings reflected current standards in primary care practices. With permission from the John Hopkins University (see Appendix E), a literature review matrix (Appendix F) was used to organize the evidence gathered from an exhaustive and comprehensive review of literature to saturation level. The tool enabled the comparison of the gathered evidence through documenting the sources of evidence used, the year of their publication, and the information gathered to help answer the practice-focused questions. Another source of evidence was the hep B vaccination data at the project site that was provided by the IT technician and the clinic data coordinator after Institutional Review Board (IRB) approval (IRB number 08-26-21-1021574) and permission by the medical director at the project site. The project site had EMRs where patient vaccination rates were documented. The data provided the baselines of the vaccination rates before the QI training and allowed for a comparison with the post-training data in evaluating the QI training on the vaccination rates at the project site.

Evidence From the Literature Review

An exhaustive review of literature was conducted to identify evidence that supports the relevance of this doctoral project to nursing practice. The evidence from the literature review provided the concepts that were used to create pre- and post-training surveys for this project. The emerging concepts from the literature review were the PCPs' lack of awareness about the guidelines, negative perceptions about vaccines, lack of time, and shortage of vaccines that may lead to disparities in hepatitis B vaccination for diabetic patients (Freedman et al., 2021).

Provider Awareness

Awareness is a concept of being conscious, cognizant, having informed alertness, or being knowledgeable of events and objects (Aroke et al., 2018). Aroke et al. (2018) conducted a study on awareness and vaccine coverage of hepatitis B among 714 Cameroonian medical students and found that 90% were aware of HBV infection but only 1 in 6 medical students completed the hepatitis B vaccination series. This showed a negative attitude toward the hep B vaccination. Mukhtar et al. (2017) also conducted a survey to evaluate provider knowledge, attitudes, and barriers to HBV infections, care, and management practices on 277 providers. The survey findings showed that 40% of the providers were unfamiliar with the guidelines for HBV management and 49% of the providers vaccinated 50% of their eligible patients against HBV infections. Mukhtar et al. recommended that the PCPs needed to be educated on the importance of implementing the CDC-recommended guidelines on hepatitis B vaccinations. Picchio et al. (2019), in a cross-sectional survey in Barcelona, evaluated the knowledge, attitudes, and beliefs of

342 PCPs about vaccinating their patients in primary care settings. A gap in vaccination knowledge was identified in 52.3% of the providers. Educating PCPs on the importance of vaccinating patients against hepatitis B was recommended to close the gap in vaccination knowledge (Picchio et al., 2019). Shresta et al. (2020) carried out a study involving 181 preclinical medical students on their hepatitis B vaccination status, knowledge, attitude, and practice regarding hepatitis B and found that only 37% were fully vaccinated. The majority were unvaccinated due to lack of knowledge and unavailability of the vaccination program (Shresta et al., 2020). This DNP QI project was supported by the evidence from findings in the studies conducted (Aroke et al., 2018; Mukhtar et al., 2017; Shresta et al., 2020) that demonstrated the need for an intervention to improve the PCPs' awareness to implement the CDC-recommended guidelines on hepatitis B vaccination for diabetic patients.

Provider Perception

Perception is the sensory experience of the world, which involves both recognizing environmental stimuli and actions in response to these stimuli (Marechal et al., 2017). The findings of a survey conducted by Marechal et al. (2017) on 1582 general practitioners to assess their perceptions of vaccination controversies in France were that the general practitioners' perception of vaccination controversies were not evidence-based. Education on most common controversies was needed for practitioners to improve their communication on vaccinations with patients (Marechal et al., 2017).

A structured approach to educating, training PCPs, and improving infrastructure and leadership is recommended to increase vaccination rates and curb the morbidity and

mortality of patients associated with HBV infections (Yeluri et al., 2021). Yeluri et al. (2021) conducted a study on 100 health care providers to evaluate their attitudes, beliefs, and perceived potential barriers for recommended adult immunization practices in patients with Type 2 diabetes mellitus. Of the interviewed health-care professionals, 49% perceived that educating patients about issues pertaining to adult vaccination was time consuming, 60% worried about vaccine safety, 83% were concerned about lack of educational material for patients, 75% shared that there was lack of training for health care providers, and 84% mentioned lack of administrative protocols. Yeluri et al. (2021) maintained that educating and training PCPs was necessary to improve vaccination rates. Attal et al. (2019) carried out a cross-sectional analysis of EMRs in 643 adult patients with Type 2 diabetes to assess standards of diabetes care at primary care level and compare the results to the reference benchmarks in the Behavioral Risk Factor Surveillance System. The findings of this cross-sectional analysis were that hepatitis B vaccination was at a low rate of 7.5% of 643 adult patients with Type 2 diabetes. Attal et al. emphasized the need for improving awareness, communication, and counseling skills among physicians and diabetes educators. Karlsson et al. (2019) investigated associations between 2,962 Finnish healthcare workers' confidence in the benefit and safety of vaccines, their decisions to accept vaccines for themselves and their children, and their willingness to recommend vaccines to patients. Karlsson et al.'s findings were that healthcare workers with higher confidence in the benefits and safety of vaccines were more likely to accept vaccines for their children and themselves, and to recommend vaccines to their patients. Paterson et al. (2016) conducted a systematic review of 185

studies on vaccine hesitancy among healthcare providers, the reasons for their reluctance, and the ways in which their own vaccine confidence and vaccination behaviors influenced their vaccination recommendations to others. Paterson et al. found that providers who were vaccinated were more likely to recommend vaccination to their patients and that providers with more knowledge about the vaccine were also more likely to recommend HBV vaccination to patients with diabetes. Collange et al. (2018), in their study of 2582 general practitioners on perceptions and practices regarding vaccinations in France, found greater hesitancy about vaccine utility and lack of trust in information source. This QI project training sought to address any hesitancy by PCPs to recommend vaccines to diabetic patients. A QI training with PCPs on using the CDC-recommended guidelines were to increase the PCPs' confidence in ordering vaccinations for diabetic patients.

Shortage of Vaccines

A cross-sectional study in Western Uganda on analysis of the immunization services was carried out on 311 participants and secondary data was retrieved from records at the headquarters and vaccination centers (Malande et al., 2019). These researchers found that there was an urgent need for improving vaccine supply, recruitment of health workers, and adequate communication among health workers. Pellulo et al. (2020) also investigated 392 healthcare workers' knowledge, attitudes, and practices regarding recommended vaccinations and factors affecting such outcomes in Italy. These researchers found that only 17.7% of the healthcare workers consistently recommended vaccinations to their patients and that vaccine shortage in healthcare

facilities was another contributory factor to low vaccination rates. The findings of a study involving 240 patients to identify vaccination rates of adult patients in ambulatory care clinics were that hep B vaccination rates were at a low 6.4% (Darr & Gottfried 2020). The researchers identified the shortage of vaccines because of lack of adequate storage and providers' lack of time to screen patients for vaccination. Alshammari et al. (2019) investigated 476 healthcare providers' knowledge, awareness, attitude, and practices on hep B vaccination in Saudi Arabia. Among the 476 healthcare providers, 48% mentioned the unavailability of vaccines, 31% were concerned about the safety of hepatitis B vaccine, and 10% mentioned that vaccination was not part of medical practice. Alshammari et al. concluded that there was a need to train healthcare providers on the importance of vaccinating patients against hep B viral infections.

Patient Sociocultural Barriers

Patient-related factors include sociocultural barriers, lack of health insurance, stigma attached to HBV infections, immigrant status, and lack of proficiency in the English language (Wang et al., 2021). The 2000-2013 National Health Interview Survey conducted by the National Center for Health Statistics reported that social and economic factors such as education, insurance status, age, poverty level, and birth affect vaccination rates among individuals with diabetes (Aytaman et al., 2016). The findings of a study by Hyun et al. (2021) were that sociocultural barriers, such as health literacy, were a crucial element that determined health-seeking behaviors and navigation of the healthcare system among Korean Americans. Low levels of health literacy were associated with decreased likelihood of seeking preventive health measures. Low vaccination rates are also partly a

result of lack of health insurance among low income and unemployed patients (Ayoola et al., 2019). Abara et al. (2017) conducted a literature review of random trial studies to assess hepatitis B vaccination, screening, and linkage to care. The researchers found that barriers, especially in foreign-born populations, included ignorance about the hepatitis B vaccine and its health benefits, cultural and language differences, lack of health insurance, lack of access to health care resources, and difficulty navigating the health care system (Abara et al., 2017).

The adult immunization schedule is published annually to consolidate and summarize updates to the ACIP and the CDC recommendations on vaccination of adults and to assist PCPs in implementing the current recommendations (Freedman et al., 2021). The purpose of this evidence-based doctoral project was to improve the quality of care for diabetic patients by presenting a QI training to PCPs on vaccinating all diabetic patients with the hepatitis B vaccine using the CDC-recommended guidelines. Implementing a QI intervention for the participants would build their capacity in hepatitis B prevention, control and dispel fears, and remove stigmas of patients and families about the hepatitis B vaccination (Hang et al., 2019). The collection and analysis of this evidence enabled gathering of findings on the PCPs awareness, perceptions, sociocultural barriers to using the recommended CDC guidelines on vaccinating diabetic patients at this project site and making of recommendations to improve nursing practice.

Participants

The project site was a Native American Clinic in Northern California. There were 17 participants including physicians, physician assistant, nurse practitioners, registered

nurse, dietician, community health services medical assistants, and clinical medical assistants. The inclusion criteria were that all the PCPs working with diabetic patients at the project site could participate in this project. The invitation to the QI training was on a flyer including the title, purpose of meeting, proposed dates, and the project coordinator's contact information. The invitation flyer for the QI project training was handed out to all participants and posted in the staff lounge.

Procedure

Consent to implement the training and to collect data was obtained from the medical director at the project site.

The Donabedian model of structure, process, and outcome informed this study. Donabedian defined structure as the material, intellectual, and human resources at the setting in which care occurs (LoPorto, 2020). Using Donabedian's concept of structure, the medical director at this project site introduced the project at a monthly staff meeting, one month before the start date of this QI training. In week one of this project, following IRB approval an informational flyer and consent forms were distributed to invite all participants. During distribution of the flyer, its contents—the title of the meeting, purpose of the meeting, proposed meeting dates and time-were explained, including the project manager's contact information, and the process of the project to provide informed consent. The participants were provided options to sign up for the day and time of when they were able to attend the QI training. Training times were between 11:30 am and 2:00 pm over three days in weeks four and five to accommodate the participants' lunch schedules. Signed consent forms were collected during week three before the QI training.

The demographic survey (see Appendix A) and the pre-intervention survey (see Appendix B) were administered at each QI training. Participants were assigned numbers to protect their identities on the surveys. Mukhtar et al.'s (2017) surveys on demographic, provider awareness, and attitudes on using the CDC Guidelines were used for this project because the surveys investigated factors influencing hepatitis B vaccination rates. The surveys were used to gather information such as provider characteristics, and provider knowledge and attitudes on hepatitis B vaccination and CDC Guidelines.

For this QI project, Donabedian's process referred to training PCPs on using the CDC-recommended guidelines on hepatitis B vaccination for diabetic patients. To implement the training, in week two of the project, the project manager met with IT technician and the clinic data coordinator to obtain each participating provider's hepatitis B vaccination data for diabetic patients in the past 6 months. The data were incorporated into this project in the form of a table (see Table 6) in Section 4 for a comparative presentation of the pre- and post-QI vaccination rates for hepatitis B at this site. In week three, a meeting between the project coordinator and the IT technician was organized to schedule and set up for the QI training based on the participants' selected times.

In weeks four and five, the QI training sessions were completed at the project site over three days between 11:30 am and 2:00 pm. The training sessions were conducted over three-day-lunch-time-options to accommodate participants' schedules. Lunch was provided during each training day. A PowerPoint presentation on diabetes mellitus, HBV infections, and the CDC Guidelines for hepatitis B vaccination of diabetic patients (Appendix E) was used in presenting the QI training. Participants were allowed a period

of 12 weeks to work with patients before the post-training survey (Appendix D) was administered

According to Donabedian's model applied to this project, the desired outcomes included increasing hep B vaccination rates of diabetic patients, increasing PCPs awareness of the CDC-recommended guidelines, and improving the PCPs attitudes towards vaccinating diabetic patients using the recommended CDC guidelines. In this QI project, Lewin's concept of unfreezing referred to changing the status quo of low vaccination rates by training the PCPs on using the recommended CDC guidelines on hep B vaccination of diabetic patients. Following Donabedian's concept of outcomes, in Weeks 1 through 12 post training of participants, the project coordinator met once a week with the project site's IT technician and clinic data coordinator to review each provider's hepatitis B vaccination data. The weekly vaccination rates were recorded on a table (see Table 6) for use in Section 4 for a comparative analysis of the hepatitis B vaccination trends during and after the implementation period of the QI project.

Twelve weeks after the implementation of the QI project, the post-training survey (Appendix F) was administered and the post-training hepatitis B vaccination data from the IT technician and the clinic data coordinator collected. Twelve weeks after the QI training, data collected from the IT technician and the clinic data coordinator were organized and analyzed using Microsoft Excel and the results of the QI project were presented to the stakeholders including Chief Executive Officer, and IT technician. The Tribal Council preferred to receive the project results from the chief medical officer.

Validity threats were countered through the use of two methods of collecting pre-training data (pre-training survey, and data provided by the IT technician and the clinic data coordinator). The two methods of collecting data, IT technician's hepatitis B vaccination data and pre- and post-training surveys, helped to reduce risks of making conclusions biased on a specific data collection method. Using both the IT technician and the data clinic coordinator provided reliability of collected data through triangulation.

Protections

According to Nguyen & Wu, (2020) the researcher must explain the purpose of this project to potential participants and guarantee that their information would remain confidential. Since this was a staff QI project with no patient involvement, the only ethical consideration was maintaining the anonymity of participants by assigning each participant a number. Each participant was assigned a number for all the forms and for the meeting to protect their identities. Before the project presentation, participants were informed that each participant could withdraw from the project without any repercussions. All pre- and postintervention survey responses were to be kept in a locked cabinet for a period of 5 years according to the Walden University guidelines for privacy and confidentiality.

Analysis and Synthesis

Demographic data such as the participants' profession, sex, age, and years of experience were summarized via relative frequencies and displayed in bar charts created in Microsoft Excel. Tables were used to summarize percentage changes in awareness and attitudes. Data from pre-training survey questions one through three was compared to the

post-training survey questions one through three using a chi-square analysis done in Microsoft Excel. Similarly, pre- and post-training vaccination rates were analyzed using percentages and chi-square analysis. Patients' vaccine status was provided by the IT technician and the clinic data coordinator to assure integrity of the evidence.

Summary

Section 3 outlined the plans on how the evidence was collected, organized, and analyzed. The methods of recruiting participants, maintaining participant anonymity, collection of pre- and post-training data and the presentation of the QI training were described. The outcome data evaluated the QI training on using CDC-recommended guidelines and the learner outcomes by comparing vaccination rates before and after the QI training. Section 4 outlines detailed findings of the QI training and their implications. The gap in practice related to CDC-recommended guidelines on hepatitis B vaccination for diabetics 18 years and older were addressed through recommendations. The strengths and limitations for the project will inform future similar projects in nursing practice.

Section 4: Findings and Recommendations

Introduction

During the implementation of this DNP evidence-based project, one of the problems identified at this project site was the gap in practice among primary care providers who were not following the CDC-recommended guidelines on hepatitis B vaccination of diabetic patients 18 years and older. As the project coordinator, I provided training to primary care providers on implementing the recommended CDC guidelines for hep B vaccination of diabetic patients 18 years and older. The practice-focused questions were: Will the evidence from literature support a QI project on improving hepatitis B vaccination rates for diabetic patients according to the recommended CDC guidelines? Will a QI training on the recommended CDC guidelines on hepatitis B vaccination for diabetic patients improve PCPs' vaccination rates in a primary care setting during a 12-week training period?

This DNP evidence-based QI project was developed to enhance PCPs' use of the recommended CDC guidelines on hepatitis B vaccination for diabetic patients 18 years and older, at the project site. The PCPs' implementation of the CDC guidelines would increase the hepatitis B vaccination rates and improve the quality of care for diabetic patients. Participation in this study was voluntary. I used a PowerPoint presentation to train participants on using the recommended CDC guidelines to give hepatitis B vaccine to diabetic patients 18 years and older. In this QI project, 19 participants voluntarily and anonymously completed the demographic and pre-intervention surveys.

Out of the four primary care providers who completed the surveys, one was excluded from the project for not returning the demographic and pre-intervention survey. The other provider was promoted to chief medical officer, a position which excluded that individual from patient care. The remaining 17 participants included two primary care providers, one registered nurse, one dietician, one social worker, and 12 medical assistants. I inputted the data collected through the surveys into Microsoft Excel 2010 for analysis using bar graphs and tables.

Findings and Implications

The participants' demographic data (see Figures 1–4) include participants' ages, gender, profession, and years of experience. The age of the participants (see Figure 1) ranged from18 years through 50 years or older. The largest number of participants (n = 7, 37%) were 50 years or older. Ninety-four percent (n = 16) of the participants were female and 6% (n = 1) were male (see Figure 2). Professionally (see Figure 3), the largest group (n = 12), constituting 71% of the participants, were medical assistants. Other participants were, one registered nurse (RN), one dietician, one social worker, one DNP, and one doctor of osteopathy. Participants' years of professional experience (see Figure 4) ranged from 6 to over 26 years. The largest group of participants' years of experience ranged from 6-10 years, constituting 32% of the participants. Ten percent of the participants had 16-20 years of professional experience, and 21% had over 26 years of experience, and this constituted 11% of the participants. This showed that the majority of participants (32%), medical assistants who worked with the PCPs had fewer years of experience. Two

out of five providers participated in the study, showing lack of motivation on hepatitis B vaccination of diabetic patients.

Figure 1

Participants' Age Range in Years

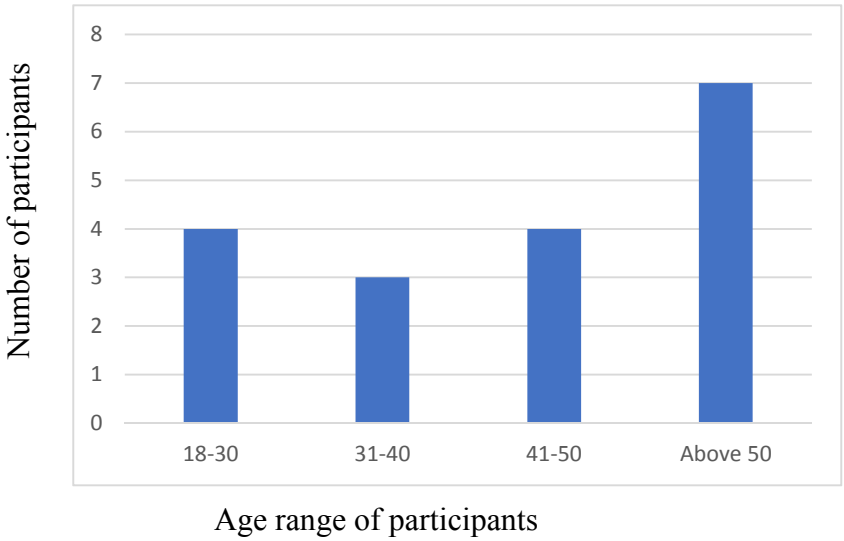


Figure 2

Gender of Project Participants

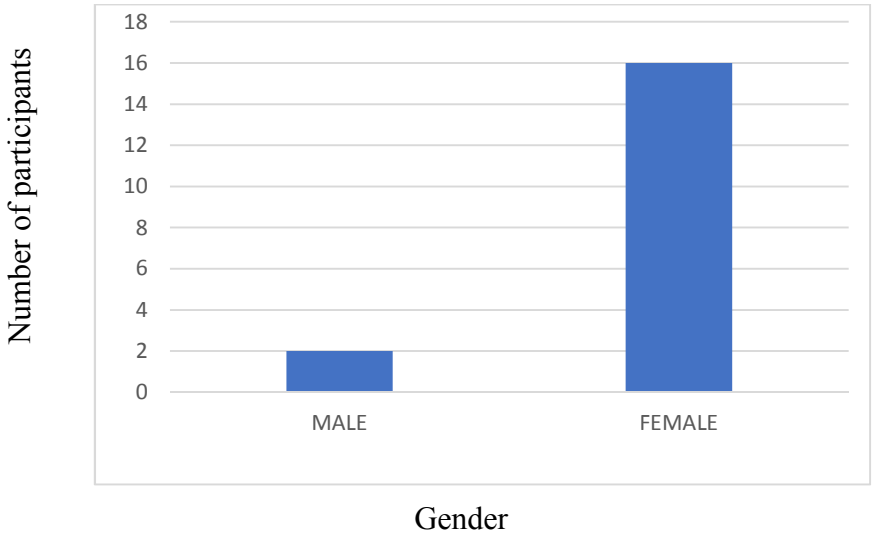


Figure 3

Profession of Project's Participants

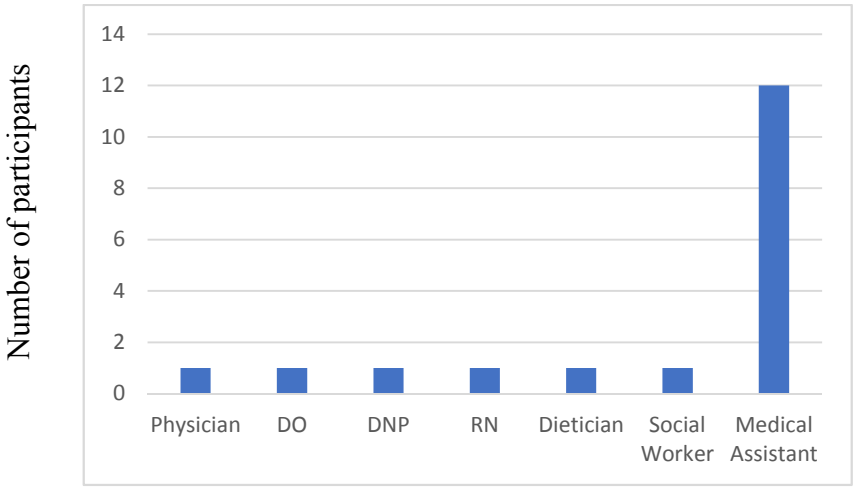
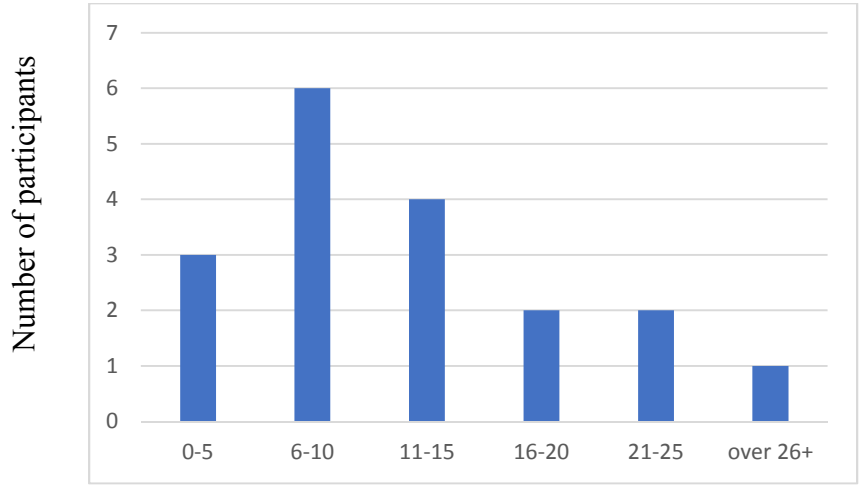


Figure 4

Years of Professional Experience of Project Participants



Pre-Intervention Survey

As shown in Table 1, most participants (*n* = 16, 89%) somewhat/strongly agreed that diabetic patients are at higher risk of HBV infection compared to nondiabetic patients. Other participants (*n* = 15, 84%) somewhat/ strongly agreed that the recommended CDC guidelines to vaccinate diabetic patients 18 years and older reduces diabetic patient morbidity and mortality. Most participants (*n* = 17, 100%) somewhat/strongly agreed that HBV infection among diabetic patients is preventable through vaccination. A large number of participants (*n* = 16, 89%) somewhat/strongly agreed that providers and their staff should be aware of the CDC-recommended guidelines to vaccinate diabetic patients 18 years and older with hep B vaccination. About half of the participants (*n* = 10, 56%) were aware that diabetic patients are at greater risk for HBV infections than nondiabetic patients and (*n* = 8, 44%) that hepatitis B vaccine prevents HBV infections.

Awareness of and Attitudes Toward CDC-Recommended Guidelines

Participants were asked to rate each question on a Likert scale (1 = *strongly disagree* to 5 = *strongly agree*). Although a higher percentage (72%) were aware and recommended hepatitis B vaccine for diabetic, 5% of the participants disagreed, and 11% were neutral about recommending hep B vaccination to diabetic individuals. These results showed that a gap in practice existed and training of PCPs on implementing the recommended CDC guidelines to vaccinate diabetic patients was needed for safe practice and better patient outcomes.

Knowledge of CDC Schedule for Hep B Vaccination

Participants were asked to describe the CDC schedule for hepatitis B vaccination for diabetic patients 18 years and older from the first dose to the last. Out of 17 participants in the pre-intervention survey, only three (18%) were able to state the CDC schedule for hepatitis B vaccination as "1st dose at first visit, 2nd dose in one month after the 1st dose, 3rd dose given 6months after 1st dose." The remaining 14 participants (82%) were unable to correctly state the CDC schedule for hepatitis B vaccinations. The following descriptions were common among the 14 participants, "not sure", "give vaccine when due", "three doses at 4-week intervals", and "give vaccine when its due if the person did not receive all doses in childhood." These responses show that more than 80% of the participants were not aware of the CDC schedule for hepatitis B vaccination, indicating that they were not using hepatitis B guidelines on a regular basis to give hepatitis B vaccination to diabetic patients. Training of participants would increase their awareness of the vaccination schedule.

Table 1

Participants' Pre-intervention Baseline Awareness of CDC-Recommended Guidelines

Item	SD	D	N	A	SA
1. Diabetic patients are at higher risk of HBV infection compared to nondiabetic patients.	-		2 (11%)	6 (33%)	10 (56%)
2. Using recommended CDC guidelines on hepatitis B vaccinations of diabetic patients 18 years and older reduces diabetic patient morbidity and mortality.	-	1(5%)	2 (11%)	3 (17%)	12 (67%)
3. Hepatitis B infections among diabetic patients are preventable through vaccinations.	-	-	1 (6%)	9 (50%)	8 (44%)
4. Providers and staff should be aware of the recommended CDC hepatitis B vaccinations schedule of diabetic patients 18 years and older	-	-	2 (11%)	3 (17%)	13 (72%)

Note. SD = *strongly disagree*; D = *disagree*; N = *neutral*; A = *agree*; SA = *strongly agree.*

Factors That Influence the Hepatitis B Vaccination Rates of Diabetic Patients

Participants were asked Questions 5 and 6 on the pre- and postintervention surveys to explain the factors that influenced the hepatitis B vaccination rates of diabetic patients under their care. Participants' responses were as follows:

- availability of vaccines at the clinic was not consistent
- high patient load for providers
- lack of time to explain importance of vaccines to patients
- lack of time for providers to screen patients for hepatitis B vaccination

- high provider turnover with different ways of practice and lack of awareness of the CDC guidelines
- lack of knowledge enhancement for patients on the importance of vaccination
- medical assistants and providers are not educating patients on the value of giving the hepatitis B vaccination.

Furthermore, some participants were unaware of the factors that influence the hepatitis B vaccination rates for diabetic patients. The pre- and postintervention survey results of the QI project showed that time constraints, shortage of vaccines, high patient load for providers, lack of awareness of the CDC guidelines on hepatitis B vaccination for diabetic patients, and high provider turnover were of concern to participants.

Posttraining Knowledge and Attitudes

Table 2 shows the major focus of this project's results on the impact of increasing awareness and improving the attitude of participants about implementing CDC-recommended guidelines on hepatitis B vaccination for diabetic patients 18 years and above. Providers and medical assistants who participated in this project training showed improved awareness of the CDC guidelines on hep B vaccination and a positive attitude towards vaccinating diabetic patients against hepatitis B Infections. Seventeen participants (100%) agreed/strongly agreed that diabetic patients are at higher risk of HBV infection compared to nondiabetic patients. Seventeen participants (100%) somewhat agreed/strongly agreed that they were fully aware of the use of the recommended CDC guidelines on hepatitis B vaccinations of diabetic patients 18 years and older. Providers and medical assistants who participated in the project training

showed an improved awareness and attitude towards vaccinating diabetic patients with hepatitis B vaccine.

Comparison of Pre- and Postintervention Scores

There was evidence of attitude change between the pre- and postintervention surveys as shown in Tables 2–5. For Question 1, "Diabetic patients are at higher risk of HBV infection compared to nondiabetic patients," only 10 participants strongly agreed in the pre-survey compared to 14 participants in the post survey. The chi-square test result implies there was some evidence of answers shifting towards stronger agreement (p = .12). Similarly, for Question 2, "Using recommended CDC guidelines on hepatitis B vaccinations of diabetic patients 18 years and older reduces diabetic patient morbidity and mortality", there was evidence of a shift upward towards strong agreement (p = .091). The strongest evidence of a shift towards strong agreement was in Question 3, "Hepatitis B infections among diabetic patients are preventable through vaccinations", where the number of participants who strongly agree increased from 7 to 14 (p = .002). This indicated that there was sufficient evidence that awareness and attitude of participants towards hepatitis B vaccination for diabetes had improved after the training.

Pre- and Post-training Attitude Scores of Participants

A comparison in the pre and post attitudes of participants showed change in answers given to the same survey questions. Note that only participants who completed both the pre- and postintervention surveys were included in the chi-square analysis. The results showed the impact of training as the attitude of participants was positively supporting prevention of HBV in diabetic patients through immunization.

Table 2

Postintervention Knowledge and Attitudes Toward CDC Hep B Vaccination Guidelines

Item	SD	D	N	A	SA
1. Diabetic patients are at higher risk of HBV infection compared to nondiabetic patients.	-	-	-	3 (18%)	14 (82%)
2. Using recommended CDC guidelines on hepatitis B vaccinations of diabetic patients 18 years and older reduces diabetic patient morbidity and mortality.	-	-	-	2 (17%)	15 (83%)
3. Hepatitis B infections among diabetic patients are preventable through vaccinations.	-	-	-	3 (22%)	14 (78%)
4. PCPs can reduce the risk of HBV infections by recommending hepatitis B vaccinations to diabetic patients.	-	-	-	3 (22%)	14 (78%)
5. I am fully aware of the use of the recommended CDC guidelines on hepatitis B vaccinations of diabetic patients 18 years and older.	-	-	1 (11%)	4 (22%)	12 (67%)
6. I recommend hepatitis B vaccinations to diabetic patients as part of my patient care routine.	-	-	1 (11%)	3 (17%)	13 (72%)
7. Participating in the evidence-based quality improvement intervention has changed the way I think about using the recommended CDC guidelines on hepatitis B vaccinations for diabetics	-	-	-	5 (29%	12 (67%)

Note. SD = *strongly disagree*; D = *disagree*; N = *neutral*; A = *agree*; SA = *strongly agree*.

Table 3

Pre/Post Comparison of Question 1: Diabetic Patients Are at Higher Risk of HBV Infection Compared to Nondiabetic Patients.

	SD	D	N	A	SA	Chi-square *p* value
Pre	0	0	1	6	10	0.12
Post	0	0	0	3	14	

Note. SD = *strongly disagree*; D = *disagree*; N = *neutral*; A = *agree*; SA = *strongly agree*.

Table 4

Pre/Post Comparison of Question 2: Using Recommended CDC Guidelines on Hepatitis B Vaccinations of Diabetic Patients 18 Years and Older Reduces Diabetic Patient Morbidity and Mortality

	SD	D	N	A	SA	Chi-square *p* value
Pre	0	1	2	3	11	0.091
Post	0	0	0	2	15	

Note. SD = *strongly disagree*; D = *disagree*; N = *neutral*; A = *agree*; SA = *strongly agree*.

Table 5

Pre/Post Comparison of Question 3: HBV Infections Among Diabetic Patients Are Preventable Through Vaccinations

	SD	D	N	A	SA	Chi-square *p* value
Pre	0	0	1	9	7	.002
Post	0	0	0	3	14	

Note. SD = *strongly disagree*; D = *disagree*; N = *neutral*; A = *agree*; SA = *strongly agree*.

Emerging Themes from the Postintervention Survey

The themes that were generated from participants' awareness and attitude towards hepatitis B vaccination for diabetic patients were (a) the CDC guidelines provide

evidence-based treatment, (b) hepatitis B vaccination for diabetics is essential, (c) participants were aware of the risks of HBV infection for patients with diabetes, (d) every diabetic patient needs to be vaccinated against HBV infection, (e) there is a connection between HBV and diabetes, and (f) training increased awareness about the importance of being vaccinated. The emerging themes from the postintervention survey show that participants had increased awareness on the importance of hepatitis B vaccination for diabetic patients and a positive attitude towards giving hepatitis B vaccination to diabetic patients.

Hepatitis B Vaccination for Diabetic Patients

Table 6 below shows that the vaccination rate increased during the 12 weeks of the project implementation when comparing with the baseline data over a period of 6 months prior to the project implementation. Provider A's vaccination rate increased by 2%, provider B's vaccination rate was lower than before the project showing need for further training for the providers and their medical assistants. The results of the project showed that implementing a practice change project of training the PCPs and staff within the clinic can help increase the PCPs' implementation of the recommended CDC guidelines on hepatitis B vaccination for diabetic patients. The final percentage comparisons by the project manager showed that the vaccination rate increased for one provider from 42% prior to the intervention to 44% after the intervention, showing an increase rate of 2%. However, the chi-square test *p* value of 0.928 showed that there was no evidence of a difference in patient vaccination rates between the pre- and postimplementation of the QI project. The results of this study imply that improved

awareness and a positive attitude toward implementing the recommended CDC guidelines on hepatitis B vaccination have the potential to influence quality patient care and outcomes for diabetic patients. The QI project's literature review conclusions were reflected in this project, implying that multiple interventions of training PCPs are necessary to create practice change that increases implementing CDC-recommended guidelines on hepatitis B vaccination for diabetics and improve vaccination rates in primary care settings.

The evidence-based DNP project's goal was to positively influence social change through the implementation of an evidence-based intervention to improve PCPs and staff's utilization of the recommended CDC guidelines on hepatitis B vaccination for diabetic patients 18 years and older and improve diabetic patients' outcomes through diseases prevention. The project's goal was achieved as findings show improved awareness of the CDC-recommended guidelines on hepatitis B vaccination for diabetics 18 years and older and an increase in hepatitis B vaccination rate.

Table 6

Hepatitis B Vaccination for Diabetic Patients: DNP Project Timeline

Variable	Provider A	Provider B	Total
Diabetic patients not vaccinated against HBV in 6 months before project intervention	66	106	172
Diabetic patients vaccinated against HBV in 6 months before project intervention	47	7	54
Percentage of diabetic patients vaccinated against HBV in 6 months before project intervention	42%	6%	24%
Diabetic patients vaccinated in week 1 after project intervention	1	0	1
Diabetic patients vaccinated in week 2 after project intervention	0 (Vaccines out of stock)	0 (Vaccines out of stock)	0
Diabetic patients vaccinated in week 3 after project intervention	0 (Vaccines out of stock)	0 (Vaccines out of stock)	0
Diabetic patients vaccinated in week 4 after project intervention	1	0	1
Diabetic patients vaccinated in week 5 after project intervention	0	0	0
Diabetic patients vaccinated in week 6 after project intervention	1	0	1
Diabetic patients vaccinated in week 7 after project intervention	1	1	2
Diabetic patients vaccinated in week 8 after project intervention	1	0	1
Diabetic patients vaccinated in week 9 after project intervention	1	0	1
Diabetic patients vaccinated in week 10 after project intervention	1	1	2
Diabetic patients vaccinated in week 11 after project intervention	1	0	1
Diabetic patients vaccinated in week 12 after project intervention	0	0	0
Total number of diabetic patients seen before and after project intervention	70	131	201
Total number of diabetic patients vaccinated against HBV before and after project intervention	55	9	64
Percentage of diabetic patients vaccinated against HBV before and after project intervention	44%	6%	24%

Table 7

Comparison of Pre- and Postintervention Vaccination of Diabetic Patients

Assessment	No. of patients not vaccinated	No. of patients vaccinated	Chi-square test *p* value
Pre-intervention	172	54 (23.9%)	.928
Postintervention	201	64 (24.1%)	

Recommendations

The clinic's pre-intervention hepatitis B vaccination rate for diabetic patients 18 years and above showed a low vaccination rate compared to the national averages indicating a significant need for QI training for PCPs. This evidence-based project focused on improving hepatitis B vaccination rate by creating awareness of participants on the recommended CDC guidelines on hepatitis B vaccination for diabetic patients 18 years and older. Not all providers participated in this project therefore there is need for further exploration to encourage all providers to participate and improve the quality of patient care and outcomes. Post assessment results demonstrate improved awareness and attitude towards use of the CDC-recommended guidelines on hepatitis B vaccination for diabetic patients. Participation by all providers would benefit patients and increase the vaccination rate for the clinic. The supply chain of hepatitis B vaccines needs to be maintained and be consistent to avoid future shortages of vaccines. This QI project could be replicated in other similar settings to improve the primary care providers' implementation of the CDC-recommended guidelines on hepatitis B vaccination for diabetics to protect patients at risk of getting vaccine-preventable diseases.

Contribution of the Doctoral Project Team

The IT technician and clinic data coordinator participated in the project by supplying hep vaccination data for each provider to me, the project coordinator, for compilation and analysis. IT technician and the clinic data coordinator concurred with the me that there was a need to modify the EMR to include alerts that indicate the patient's needs for hepatitis B vaccination as a reminder to providers to revisit the vaccination schedule and discuss with the patient the benefits of preventing HBV through vaccination.

Strengths and limitations of the Project

Support from the chief medical officer, information technician (IT) and the Tribal Council that was received throughout planning and implementation of this project was the greatest strength of this evidence-based project. The tribal council supported this project by allowing me to take days off from the busy clinic schedule to implement the project. The preceptor and the chief medical officer in collaboration with the project manager identified the need to increase hepatitis B vaccination rates for diabetic patients 18 years and older. Limitations to this project included lack of support for the training venue, training of participant was done away from the project site with participants driving to the training venue during their lunch time. The participant sample was very small with a 96 percent participation rate in the project. One of the major limitations of this project was that during my evaluation the clinic ran out of hepatitis B vaccines. Another limitation was the size of the sample of participants, a larger sample would have allowed for further analysis of the findings including how differences in age, experience,

educational level, or other demographic information could have influenced the results. Another limitation was the period of time for data collection, the time for this project was only 12 weeks which made it difficult to assess all diabetic patients as their visits are usually scheduled once every 3 months.

Summary

The gap in practice, identified as lack of provider awareness to implement the recommended CDC Guidelines on hepatitis B vaccination for diabetic patients 18 years and older was addressed through evidence-based training. Collaboration, planning and involvement of key stakeholders enabled realization of a practice change. Difficulties such as securing the training venue at the project site for participants did not deter the project implementation. Implementation of this QI project at the project site resulted in the clinic administration and Tribal Council adopting the project and mandating all providers to screen and vaccinate all diabetic patients 18 years and older who needed to be vaccinated, a positive social change that will improve diabetic patients' quality of life. Future recommendations to be considered include motivation and training of noninvolved providers to implement the recommended CDC guidelines on hepatitis B vaccination for diabetic patients for improved patient care, improved patients' lives and better quality of life for all diabetic patients.

Section 5: Dissemination Plan

The dissemination of project findings to stakeholders is necessary to facilitate the uptake and adoption of interventions to improve health care outcomes (Cunningham-Erves et al., 2020). At the project site, hepatitis B vaccination rates for diabetic patients 18 years and older were low (17%), so the QI project's purpose was to improve providers' awareness of the CDC-recommended guidelines on hepatitis B vaccination to increase the vaccination rates.

The dissemination of this QI project on hepatitis B vaccination for diabetic patients aged 18 years and above using the CDC-recommended guidelines included a PowerPoint slide presentation that I presented to the site administration, the chief medical officer, IT supervisor, physician, nurse practitioner, registered nurse, dietician and all the medical assistants who work with providers. A PowerPoint presentation is an effective way to support speech, visualize a complicated concept, and share research findings with a large audience (Cunningham-Erves, et al., 2020). The chief medical officer presented the project findings and recommendations to the Native Indian Tribal Council; this was the Native Indian Tribal Council's preference.

Providers at the project site were not following CDC guideline to vaccinate diabetic patients 18 years and above who were not vaccinated. The purpose of the project was to train health care providers on the importance of following CDC guidelines on hepatitis B vaccination and improve hepatitis B vaccination rates for diabetic patients 18 years and older. The most important outcome of this evidence-based DNP project was the adoption and initiation of the CDC recommendation on hepatitis B vaccination for

unvaccinated diabetic patients at the project site and keep it ongoing as one of the quality measures to be monitored at the clinic.

Further dissemination of this project would be for the *American Journal of Nurse Practitioners*, the ADA for publication, in health conferences, and to research groups. Nurse-led research knowledge and evidence promote safe, transparent, effective, and efficient healthcare provision and promotes meeting the expectations of patients, families and society, which is critical to practical and effective ways of improving patient outcomes (Curtis et al., 2017).

Analysis of Self

The last 2 years nurtured my academic, social, professional growth, and leadership competencies. I have been involved in working with the organization's management, staff and community, evaluating the cost effectiveness of care and redesigning effective and realistic care delivery strategies and policies. I have also been involved in analyzing clinical care guidelines, identifying systems' issues, and facilitating the organization's changes in practice delivery. During the evidence-based QI project planning, I was able to integrate knowledge from diverse sources and across disciplines to solve practice problems and improve health outcomes. As a family nurse practitioner, I worked with diverse patients, from infant to geriatric. It was during care of patients that I identified a gap in practice, hence the birth of my project on diabetes and hepatitis B vaccination according to the CDC guidelines. This DNP project has enlarged my scholarship of discovery and integration of knowledge sourced from literature as well as developed my competence in the application of evidence-based knowledge to practice.

One of the competences was improving providers' awareness of the CDC-recommended guidelines on hepatitis B vaccination for diabetics 18 years and older with the purpose of increasing hepatitis B vaccination rates at the project site clinic. This intervention aligns with the AACN (2006) Essential V11 of clinical prevention and population health to enhance the Nation's health and promote social change.

The challenges I faced during the project implementation were the Tribal Council's administrative problems, which delayed the initiation of participants' training by 2 weeks. One of the providers who attended the training, did not complete the pre-intervention and demographic survey; hence, was excluded from the project. Another provider declined to participate in the project. As participation in the project was voluntary as mentioned in the consent form, providers had the right to take their stand. Vaccine shortage was a major challenge too: after 2 weeks of implementing the project, the clinic was out of the hepatitis B vaccines for 2 weeks, which created a lot of missed opportunities for patients. Although rescheduling was done, the return rate was low. The issue was addressed through the registered nurse who is the supervisor for medical assistants who orders the vaccines.

Summary

As a DNP-prepared leader, my critical role was to translate research into practice through the application of the project's findings to the clinical setting and dissemination of findings to promote evidence-based nursing practice. Dissemination of the research evidence to clinical practice is essential for safe patient care and better outcomes (Curtis et al., 2017).

Diabetic patients are at higher risk of HBV infections compared to nondiabetic patients (Kim & Kim, 2018). Evidence-based literature showed that hepatitis B vaccination of diabetic patients protects them against HBV infections, reduced morbidity, and mortality from cirrhosis of the liver and hepatocellular carcinoma (Kim & Kim, 2018). Therefore, improving provider awareness of the recommended CDC guidelines on hepatitis B vaccination improved the vaccination rate for diabetic patients 18 years and older. Participation of the IT technician and the clinic data coordinator was effective in making data accessibility possible. Donabedian's model of structure, process, and outcome, which was applied in training healthcare providers on implementing the recommended CDC guidelines helped to increase the hepatitis B vaccination rate for diabetics at this project site clinic. The adoption of hepatitis B vaccination for diabetic patients as one of the quality measures to be implemented and monitored at the clinic was the most important outcome of the project

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Appendix A: Demographic Survey

PCP Identity Number_____

1. Sex? male ☐ female ☐ prefer not to answer ☐
2. Age?

   18-30 ☐

   31-40 ☐

   41-50 ☐

   above 50 ☐

3. Professional?

   Physician ☐

   Doctor of Osteopathy ☐

   Family Nurse Practitioner ☐

   Physician Assistant ☐

   Registered Nurse ☐

   Registered Dietician ☐

   Medical Assistant ☐

   Other ☐

4. Years of Experience

- 0-5 years ☐
- 6-10 years ☐
- 11-15 years ☐
- 16-20 years ☐
- 21- 25years ☐
- 26 years or more ☐

Appendix B: Pre-intervention Survey

Please read the following statements and check the appropriate box that corresponds to your awareness of and attitude towards using the recommended CDC guidelines in vaccinating diabetic patients 18 years and older against HBV infection, on scale of 1 to 5.

1=strongly disagree

2=somewhat disagree

3=neither agree nor disagree

4=somewhat agree

5=strongly agree

CDC-recommended guidelines awareness and attitudes		*Check* (√)				
		1	2	3	4	5
1	Diabetic patients are at higher risk of HBV infection compared to non-diabetic patients.					
2	Using recommended CDC guidelines on hepatitis B vaccinations of diabetic patients 18 years and older reduces diabetic patient morbidity and mortality.					
3	Hepatitis B infections among diabetic patients are preventable through vaccinations.					
4	PCPs can reduce the risk of hepatitis B infections by recommending hepatitis B vaccinations to diabetic patients.					
5	I am fully aware of the use of the recommended CDC guidelines on hepatitis B vaccinations of diabetic patients 18 years and older.					
6	I recommend hepatitis B vaccinations to diabetic patients as part of my patient care routine.					
7	What are your reasons for your answer choice on question 6	Write in your answer here				

Appendix C: Quality Improvement Poster

Quality Improvement Intervention on hep B Vaccination for Diabetic Patients 18 years and Above

Presenter: Ellen Musakwa
DNP Student

Introduction

Diabetes is a chronic metabolic disease characterized by hyperglycemia that causes successibilty to infections.

HBV is a life-threatening liver infection caused by hepatitis B virus.

U.S hep B infection (2020)

1.4 million people in the U.S are infected

26% of the infected people are diabetic.

Diabetic patients have a higher risk for HBV infections compared to non-diabetic patients.
Chronic hepatitis B virus (HBV) infection leads to cirrhosis and hepatocellular carcinoma in 20-30% of affected patients
The Center for Disease Control (CDC) and the Advisory Committee on Immunization Practices (ACIP) recommend hepatis B vaccination for diabetic patients (type I and II).
In this primary care setting, the hep B vaccination rate is low (20% in the year 2020).
This evidence-based quality improvement project aims to improve the hep B vaccination rates among diabetic patients 18 years and older.

Pre-Intervention Vaccination Rates

PCP	# of Diabetic Patients	#Vaccinated Patients
1		
2		
3		
4		

CDC Recommended hep B Vaccination Guidelines for Diabetic Patients

Vaccination Schedule	Vaccine Dosage	PCP Recommendations
First contact with unvaccinated patient	First dose	advise patient to return after 1 months for second dose
1 month	Second dose	advise patient to return after 6 months after the first dose
6 months	Third Dose	Patient has completed hep B vaccination series.

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Appendix D: Postintervention Survey

Please read the following statements and check the appropriate box that corresponds to your awareness of and attitude towards using the recommended CDC guidelines in vaccinating diabetic patients 18 years and older against HBV infection, on scale of 1 to 5.

1=strongly disagree

2=somewhat disagree

3=neither agree nor disagree

4=somewhat agree

5=strongly agree

CDC-recommended guidelines awareness and attitudes		*Check* (√)				
		1	2	3	4	5
1	Diabetic patients are at higher risk of HBV infection compared to non-diabetic patients.					
2	Using recommended CDC guidelines on hepatitis B vaccinations of diabetic patients 18 years and older reduces diabetic patient morbidity and mortality.					
3	HBV infections among diabetic patients are preventable through vaccinations.					
4	PCPs can reduce the risk of HBV infections by recommending hepatitis B vaccinations to diabetic patients.					
5	I am fully aware of the use of the recommended CDC guidelines on hepatitis B vaccinations of diabetic patients 18 years and older.					
6	I recommend hepatitis B vaccinations to diabetic patients as part of my patient care routine.					
7	Participating in the evidence-based quality improvement intervention has changed the way I think about using about using the recommended CDC guidelines on hepatitis B vaccinations for diabetics					
8	Give reasons for your answer choice for question 7					

Appendix E: Permission to Use JHNEBP Model and Tools

JHNEBP Model and Tools- Permission

Thank you for your submission. We are happy to give you permission to use the JHNEBP model and tools in adherence of our legal terms noted below:

- You may not modify the model or the tools without written approval from Johns Hopkins.
- All reference to source forms should include "©The Johns Hopkins Hospital/The Johns Hopkins University."
- The tools may not be used for commercial purposes without special permission.

If interested in commercial use or discussing changes to the tool, please email ijhn@jhmi.edu.

Appendix F: Literature Matrix

EBP: A Quality Improvement Project on Improving Diabetic Hepatitis B Vaccine Rates in Primary Care

Author/date	Research question/ hypothesis	Themes/ theoretical framework	Methodology	Analysis and results	Conclusion	Implications for practice
Abara, W. E., Qaseem, A., Schillie, S., (2017)	Best practice statements for hep B vaccination, screening, and linkages to care	Clinicians training	Literature review	Low hep B vaccination and screening for HBV infections among adults 19 years and older	A gap in practice on hep B vaccination exists among clinicians	Clinicians should routinely assess patients for HBV and give hep B vaccination to unvaccinated patients
Alshmmari, T., Aljofan, M., Subaie, G., Hussain, T., (2019)	Evaluate health care professionals' knowledge, awareness, attitude, and practices toward hep B vaccination	Health care professionals training to improve knowledge, awareness, and attitude	Cross-sectional study of 496 health care professionals using survey questionnaires	Percentage of vaccinated health care professionals is below internationally accredited standard	Frequent training of health care professionals to improve rate of hep B vaccination	Health care professionals to improve on knowledge awareness, attitude, and practices on hep B vaccination for improved patient outcomes
Alvarez, C. E., Clichici, L., Guzman-Libreros, A P., Navarro-	Assessment of vaccination practices and perceptions among diabetic		A cross-sectional study involving 279 patients with diabetes	Significant attitude barriers in health care workers and patients	Low vaccination rate against preventable diseases in	Health care providers' positive attitude recommended

Frances, M., Javier, E. (2017)	patients and health care providers managing patients with diabetes			towards vaccination against preventable diseases	patients with diabetes mellitus	towards vaccination against preventable diseases for diabetic patients.
Ameh, S., Gomez-Olive, F. X., Kahn, K., Tollman, S. M., Klipstein-Grobusch, K., (2017)	Relationship between structure, process and outcome to assess quality of integrated chronic diseases Management	Donabedian's Framework	Cross-sectional study of 435 chronic disease patients' satisfaction	Structure correlated with process and outcome	Donabedian's theoretical framework can be used to provide evidence for quality systems	Application of Donabedian's framework to patient care promotes evidence-based quality care and better patient outcomes
Aroke, D., Kadia, B. M., Anutebeh, E. N., Belanquale, C. A., Misori, G. M., Awa, A., Mbanga, C. M., Ngek, L. T., (2018)	Evaluating knowledge and attitudes on Hep B vaccination among medical students.	Medical students training	Cross-sectional study using semi-structured questionnaire to 714 medical students	Knowledge about hep B vaccination and HBV infection did not correlate with vaccination status of medical students as majority were not vaccinated	Low hep B vaccination rate among medical students even though they were knowledgeable about the vaccine	Medical students need reinforcement on importance of Hep B vaccination to improve patient care
Ayoola, R., Larion, S., Poppers, D. M.,	Investigate clinical factors associated with	Standard of care	Retrospective review of electronic	55.7% diabetic patients were	Patients at high risk for HBV are not	Standard of care should be improved for

Williams, R., (2019)	hep B screening and vaccination in patients at high-risk for HBV		medical records of 999 patient at high risk for HBV	Screened for HBV infections and 43.5% were vaccinated	adequately screened and vaccinated	better patient outcomes
Aytaman, A., Ojime, N., Zizi, S., Pandi-Perumal, S. R., Lukolic, I., Bhanvadia, A., Nwamaghinna, F., Kamran, H., Akivis, A., Bankole, O., Salifu, M. O., & McFarlane, S. I. (2016)	To compare the rates of hepatitis B vaccination among racial, demographic categories and to evaluate the hepatitis B vaccination rates for various co-morbid conditions	Training of health care workers	Cross-sectional survey	The overall rate of hepatitis B vaccination among adults 19–60 years old was 20.2%.	Higher hepatitis B vaccine utilization was more marked among Asians, and Blacks, when compared to Whites. Individuals without a college level degree or health insurance coverage also had lower rates of health care utilization.	Health care workers to target individuals with lower vaccine coverage.
Backhouse A; Ogunlayi F. (2020)	Quality improvements into healthcare practice	Standard of care			Incorporating QI principles into healthcare practice to ensure better patient care.	Better patient care

Darr A.Y., Gottfried S. (2020)	To assess vaccination rates of ambulatory care pharmacy clinic patients aged 19–64 years and to compare the rates between three clinics and to Healthy People 2020 goals	Training of health care providers	Baseline retrospective analysis	Percentage of patients with vaccination documented in the medical record was 25%	Vaccination rates remain low in adults 19–64 years of age.	Ambulatory care health care providers should provide comprehensive care including vaccination programs.
Gottlieb R.P., Dols J.D. (2018)	To implement processes to facilitate providers' adherence to immunization guidelines for adults with type 2 diabetes mellitus.	Quality Improvement through the Four Pillars Transformation Program	Education project Implementation	Ten weeks post project implementation, increased screening and education resulted in 64% of the eligible patients being vaccinated	Formal printed education on diabetes and vaccines increased vaccine uptake in eligible patients by 76%.	The Four Pillars Transformation Program allows each practice the ability to modify and select interventions best suited to the practice needs, making it a feasible tool for any clinic.
Hang Pham T.T., Le T.X., Nguyen D.T.,	To examine healthcare workers'	Training of Healthcare providers	Cross-sectional survey	Among the 314 health care workers, 75.5%	Need to implement an effective	Health care workers need to improve

Luu C.M., Truong B. D., Tran P.D., Toy M., Bozkurt S., So S. (2019)	(HCWs) knowledge, attitude and practices regarding HBV prevention and management.			did not know HBV infection at birth carries the highest risk of developing chronic infection. The median knowledge score was 25 out of 42 (59.5%).	hepatitis B education and training program to build capacity among healthcare workers in hepatitis B prevention	their knowledge to improve patient care outcomes
Hechter R. C., Qian L., Luo Y., Ling Grant D.S., Baxter R., Klein N. P., Valdez Nunley K., Aukes L., Hogea C., Krishnarajah G., Patterson B. J., Im T.M., Tseng H.F. (2018)	Assess the impact of implementing electronic provider reminders on Hep B vaccine initiation and 3-dose series completion rates among insured adults with diabetes aged 19-59 years old.	Standard of care	Observational retrospective cohort study	The analysis demonstrated a statistically significant difference between the intervention and the control site. The coverage increased significantly at the intervention site while it remained low at the control site.	Use of provider reminders is highly effective in increasing both Hep B vaccine initiation and series completion rates among adults with diabetes	Provider reminders essential for quality improvement and better patient care
Hyer R. N., & Janssen R. S. (2019)	Assessing the safety and efficacy of HBsAg/CpG	Standard of care	Randomized clinical trial of participants with type 2	A two dose Hep B vaccine is as beneficial	Two-dose HBsAg/CpG 1018 provides a higher level	Health care providers should be aware of the

	1018 among adults with type 2 DM who are aged 60–70 years compared with HBsAg/alum.		diabetes mellitus aged 60-70 years (n = 153)	as a three-dose vaccine.	of seroprotection against HBV than does a 3-dose vaccine (HBsAg/alum) with a similar safety profile in patients aged 60-70 years with type 2 diabetes mellitus.	importance of giving the correct hep B vaccination dosages for patients with diabetes to protect them against HBV infections
Hyun, S., Ko, O., Kim, S., Ventura, W. R. (2021)	To identify and evaluate various sociocultural factors and how they interact with health literacy to impact chronic hepatitis B (CHB) care and health seeking in a Korean American population.	Health literacy education	Focus group discussions with patients	Three themes that emerged from these discussions: low risk perception and knowledge of CHB and its complications; language, immigrant status, and stigma; and financial and institutional barriers.	There are culture-specific barriers to health literacy governing individuals' health behavior in accessing hepatitis B care.	Need for culturally tailored resources and programs when screening and education in immigrant populations.
Ngamruengphong , S., Horsley-Silva, J. L., Hines S.	To evaluate knowledge and practice regarding HBV	Primary care residents' education	Randomized cohort survey	The experimental group had a significant	A combined educational program was effective in	Educational initiatives need to be incorporated

L., Pungpapong S., Patel T. C., Keaveny, A. P. (2015)	and to assess the effectiveness of a multifaceted educational program			increase in knowledge scores from a mean of 29% at baseline to 70% ($P <$ 0.001) that was sustained 6 months post intervention (65%; $P <$ 0.001). In the Control group, 6-month post intervention scores were not different from baseline (38% compared to 29%).	enhancing knowledge about HBV and vaccination in DM but had limited influence on physicians' practice	into the training system of health care workers to enhance improvement in clinical practice.
Nguyen, M., & Guey-Hau W. U. (2020)	to measure knowledge, health beliefs, and self-efficacy among adult patients with Hepatitis B	Patients' education	Cross-sectional correlational design	Results demonstrated self-efficacy differed significantly based on age (F = 3.383, p = .011), marital status (t = −2.1, p = .037), and exercise habits (t = 4.174, $p <$ .001). More	Educational programs focusing on knowledge and health beliefs should be designed to encourage patients to improve their lifestyles and behaviors	Nursing profession should educate diabetic patients to be aware of their risks and encourage vaccine uptake by patients for better patient outcomes

				accurate health beliefs were positively correlated with higher levels of knowledge (r = .248, p < .01). No significant relationships were observed between knowledge or health beliefs and self-efficacy.		
Paterson, P. Meurice, F. Stanberry, L. R., Glismann, S., Rosenthal, S.L., Larson, H. J., (2016)	to review studies on vaccine hesitancy among healthcare providers, and the influences of their own vaccine confidence and vaccination behavior on their vaccination recommendations to patients	Systematic Review of literature	The search strategy was developed in Medline and then adapted across several multidisciplinary mainstream databases including Embase Classic & Embase.	A total of 185 articles were included in the literature review. 66% studied the vaccine hesitancy among HCPs, 17% analyzed concerns, attitudes and/or behavior of HCPs towards vaccinating others, and 9% were about	Overall, knowledge about particular vaccines, their efficacy and safety, helped to build HCPs own confidence in vaccines and their willingness to recommend vaccines to others.	The need for shared involvement in establishing vaccine recommendations between authorities, policymakers and healthcare practitioners

				evaluating interventions.		
Pelullo, C. P., Della-Polla, G., Napolitano, F., Di Giuseppe, G., Angelillo, I. (2020)	To assess the knowledge, attitudes, and practices regarding the recommended vaccinations among healthcare workers (HCW) in public hospitals	Training of HCW	Cross-sectional survey among HCW in public hospitals	14.1% HCW knew all the recommended vaccinations for health care workers 57.3% agreed that the information received about vaccinations was reliable. 17.7% of respondents always recommended vaccinations to their patients	Health promotion programs and efforts are needed to improve the level of knowledge about vaccinations and immunization coverage among HCWs.	HCW can only increase coverage of vaccines if knowledgeable about the vaccines.
Yeluri, S. R., Gara, H. K., Vamsi, G. S., Vanamali, D. R. (2021)	To analyse the knowledge, attitude, practices and behaviour of the healthcare professionals (HCPs) regarding the pneumococcal, influenza and hepatitis B vaccination in	Training of Health care practitioners	Cross-sectional survey	53% HCPs perceived difficulty in identifying patients eligible for vaccination. 63% HCP believed vaccination believed to be more important in children than adults, 93%	A structured approach encompassing education and training, identification and elimination of potential barriers and improving infrastructure and leadership is the need to	Barriers preventing health-care practitioners from vaccinating individuals are important to know and to eliminate and should be addressed in

	patients with type-2 DM			HCPs agreed that vaccination provided protection against vaccine preventable diseases. Perceived barriers to vaccination were urgent concerns of the patients (79%), lack of time for explaining (49%), vaccine safety (60%), cost of vaccine (58%), lack of records (65%), lack of recall system (62%), lack of educational material for patients (83%), lack of training for HCPs (75%) and lack of 'standing orders' (84%).	curb the mortality and morbidity associated with vaccine-preventable diseases in diabetics	clinical practice.

Zhang, X., Zhu, X., Ji, Y., Li, H., Hou, F., Xiao, C., & Yuan, P. (2019)	To assess the magnitude of the risk and the incidence of HBV infection amongst the general diabetic population in China	Standard care	Retrospective cohort analysis	Amongst newly infected Hepatitis B patients, those with diabetes were older than those without diabetes (61.8 ± 9.4 compared with 49.4 ± 14.5 years, *P*<0.001. The proportion of female subjects was higher amongst those with diabetes than amongst non-diabetics (60.4 compared with 50.0%, *P*<0.05)	Hepatitis B vaccination practices help to reduce HBV infection in diabetic patients.	Improved Hep B vaccination practices by health care providers will help reduce HBV infection in diabetic patients