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## Improving Vaccination Rates in Pediatric Primary Care

Lauren E. Osbeck  
*Grand Valley State University*

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**TITLE PAGE**

**Title of Manuscript:** Improving Vaccination Rates in Pediatric Primary Care

**Authors:** Lauren Osbeck, BSN, RN; Christina Quick, DNP, APRN, CPNP-PC/AC; Sandra Spoelstra, PhD, RN, FGSA, FAAN; Kim Fenbert, DNP, CPNP-PC

**Authors affiliations:** Kirkhof College of Nursing, Grand Valley State University

**Conflicts of Interest:** None

### ABSTRACT

**Objectives:** In a small, rural pediatric primary care clinic, the effectiveness of electronic patient portal reminders were evaluated at improving vaccination rates for school required immunizations.

**Methods:** A quality improvement project was initiated utilizing The Social Ecological Model. All pediatric patients were sent reminders who were under-immunized. This QI project evaluated the effectiveness of vaccine reminders on the improvement of immunization rates in the clinic

**Results:** Total number of fully-vaccinated patients within the practice improved (2%) and patients under-immunized decreased by 1%. 87 immunizations were given to patients were given to patients who were under-immunized and an average of 10% of recorded unvaccinated patient prior to intervention received at least one immunization.

**Conclusions:** Implementation of vaccine reminders into a rural primary care pediatric practice improved patient compliance with school-required vaccines. Although immunization rates improved, the practice continues to see higher rates of under-immunized patients compared to state reporting data.

**Key Words:** Vaccines, improvement, pediatric, primary care, portal reminder, vaccination rates

**Author Note:** The terms immunization and vaccine/vaccination are used interchangeably in this paper.

## IMPROVING VACCINATION RATES

### **Improving Vaccination Rates in Pediatric Primary Care**

Immunizations have decreased rates of vaccine-preventable disease by greater than 95% (Gust et al., 2004). Not only are vaccines one of the greatest public health achievements, they are one of the most cost effective ways to prevent disease processes and advance welfare among communities (Sabnis & Conway, 2015). Despite a rise in immunization rates over the last few decades, there are still missed opportunities for immunizations in vaccine eligible children (Sabnis & Conway, 2015). Vaccine hesitancy is a behavior influenced by the lack of trust in the medical community, concerns about safety, efficacy and necessity or convenience (Nabet et al., 2017). Vaccine hesitancy has become a barrier to children receiving immunizations on time. These attitudes, beliefs and behaviors are indicative of vaccine safety concerns and directly impact vaccination rates in the pediatric population (Gust et al., 2004). Countering vaccine hesitancy and improving vaccination rates can be challenging. Vaccine reminder/recall efforts have shown to be a useful intervention to increase immunization rates in both the pediatric and adult populations. These directed and personalized interventions have the ability to offer parents, caregivers and guardians the education needed to make informed decisions regarding vaccinations for their children (Frew & Lutz, 2017).

Prior researchers have evaluated reminder message implementation. Personalized messages regarding the need for the immunization resulted in an increased vaccination rates to 67% in one quantitative and qualitative program evaluation focused on Human Papilloma Virus (HPV) vaccines (Berenson et al., 2018). Another study regarding improvement of influenza immunizations utilizing email reminders revealed promising results for increasing vaccination rates for patients who received reminders versus patients who did not (Dombkowski et al., 2017).

Patient portals, which connect providers and families through the electronic health record

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offering an direct outlet for reminders and recall for vaccinations (Lerner et al., 2021). Through vaccine reminders for parents, an evaluation of electronic reminder scripts to providers can appraise how effective the reminder strategy may be. A random control trial (RCT) was conducted utilizing simple or elaborate prompts for vaccination reminders in an attempt to differentiate which is was associated with higher vaccine rates (Zimet et al., 2018). The simple prompt did have a higher rate of patients immunized, 59% vs. 45%, compared to those who received a message with an elaborate or lengthy message (Zimet et al., 2018). This allows for an understanding the type of message patients and parents are receptive to and how the message correlates with increasing immunizations rates.

National immunization rates are 68.3% for all school-required vaccines (CDC, 2021). The West Michigan pediatric primary care clinic believed to be averaging about 50% of their patients to be fully vaccinated. Due to the lower rates of immunizations, this puts patients at risk for contracting preventable diseases and spreading those diseases to others, therefor decreasing overall health and well-being as well as increasing risk of morbidity and mortality.

The purpose of this quality improvement project is to evaluate the utilization of electronic patient portal reminders for school-required vaccinations and to assess overall patient vaccination rates and immunization status.

## METHODS

### Study Design

The project occurred over a period of three winter months to evaluate the effect of reminder message interventions sent to all pediatric patients for school required immunizations ages 0 months to 21 years within a rural pediatric primary care practice in west Michigan. This west Michigan pediatric primary care clinic does not require their patients to be fully-vaccinated

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in order to receive care. The organization believes to be averaging about 50% of their patients to be fully vaccinated. Due to the lower rates of immunizations, this puts patients at risk for contracting preventable diseases and spreading those diseases to others, therefor decreasing overall health and well-being as well as increasing risk of morbidity and mortality.

The Social Ecological Model (Kolff et al., 2018) guided the project as a framework because it serves as a powerful tool in addressing health behaviors. Through this model, we can assess factors and barriers to vaccine promotion on several levels including individual, interpersonal, organizational, community and society and how each of these levels interact. This model addresses vaccine coverage across populations, identifies barriers at each level and how interaction between the levels occur to improve vaccination rates. A SWOT (strengths, weaknesses, opportunities and threats) analysis was conducted of the organization highlighted how the organization was conducive to change and their EHR had the capabilities to send patient portal reminders but was not utilizing the feature.

The organizations' Institutional Review Board (IRB) determined this project did not classify as research.

### **Study Participants**

Participants of this study were all pediatric patients at the west Michigan pediatric primary care clinic.

### **Intervention**

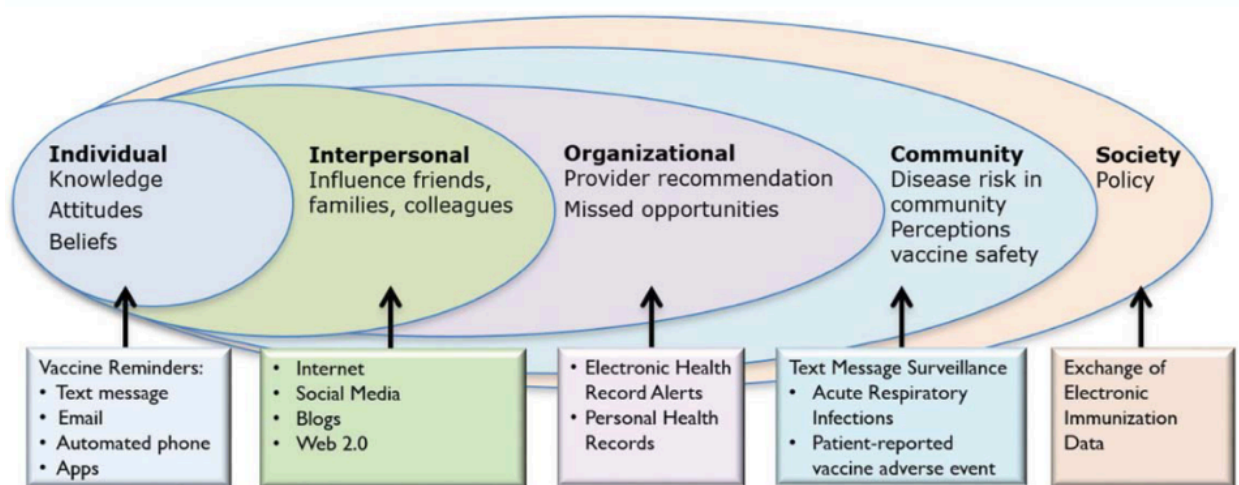
All patients within the practice who were classified as under-immunized, regardless of age were sent a monthly portal reminder message to come to the office to receive a vaccination or to call the office and schedule a vaccination only appointment. The portal reminder message was a standard message sent to all under-immunized patients and did not include any patient

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specific information. The message contents were in English, included that the patient was due or overdue for an immunization and ways to communicate with the clinic in order to schedule an appointment or receive the vaccine during a “drop-in” time. Patients within the practice who utilized the portal and were under-immunized per ICD-10 code, Z28.3 (under-immunization status) were sent a standardized reminder message that the patient was due or over-due for an immunization.

The Social Ecological Model (Kolff et al., 2018) (see figure 1.) provided the framework for the scripted message as well as evidence-based information from Spoelstra et al., regarding the importance of adherence messages (2016). The message was then delivered based on a “gain-frame” approach that parents may be more receptive to vaccinating their child with a positive attribute versus a negative message (Lerner et al., 2021). Also in accordance with decreasing vaccination mis-information (Shen & Dubey, 2019), hyperlinks from The Children’s Hospital of Philadelphia (CHOP) and The American Academy of Pediatrics (AAP) were to provide evidence-supported information for parents .

Figure 1. Social Ecological Model



Social Ecological Model

(Kolff et al., 2018)

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### **Data Collection**

A patient's vaccination record is obtained from the Michigan Care Improvement Registry (MCIR) for all new patients. This information is added to the patient's EHR. Once a vaccine is administered, the ICD-10 code, Z3.0 (encounter for immunization) is input into the EHR for each patient. A billing code, specifically a CPT code, which are numbers assigned for health services, is documented for the vaccine given. If a patient has not received a vaccination or has not received all of the immunizations, the ICD-10 code Z28.3 (under-immunized) is input into their medical record. For chart reviews, a digital report was obtained based on ICD-10 code Z28.3. The report showcased the patient's medical record number (MRN) which aided in guiding which charts needed to be evaluated for vaccination status.

### **Measures and Analysis**

This project involved the analysis of five measures of patient immunization status including patients who were unvaccinated who received vaccine, number of total vaccines due over project period, percent of under immunized patients, number of patients with vaccine status change each month, and overall number and percent of patient's vaccination status within the practice. Measures were chosen to evaluate vaccination status and compare to current state and national pediatric averages while also evaluating immunizations received and number of patients with a vaccination status change. An analysis of all measures was obtained from percentages and counts.

50 random patient charts were reviewed pre-implementation regardless of vaccination status and 10 random charts were evaluated monthly throughout the project period. Monthly chart assessed for patient vaccination status and identified if vaccines were received. Monthly, immunization status of either un-vaccinated or partially-vaccinated was evaluated. This was compared to the number of patients who were fully-vaccinated. Finally, the overall number and percentage of patients within the practice and their vaccination status was calculated.



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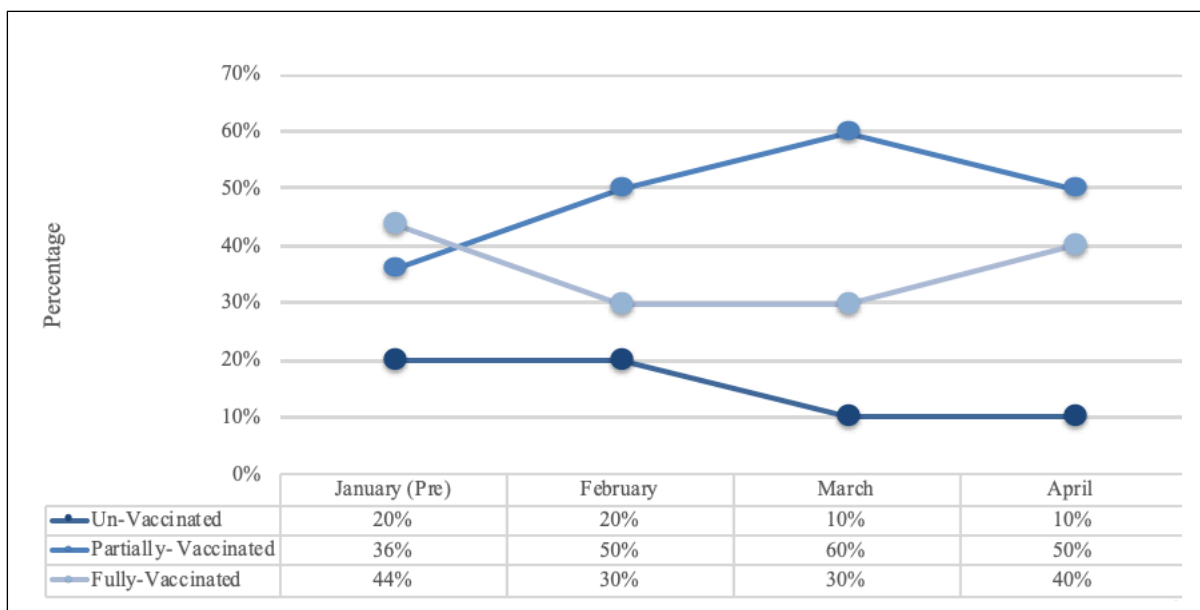
All data was obtained from the EHR reports based on ICD-10 code Z28.3 documentation. These reports were obtained monthly and contained medical record numbers (MRN) for all patients who had a Z28.3 code associated with their chart.

### RESULTS

#### Patients Previously Not Immunized Who Were Vaccinated

Table 1 displays the percentage of patients previously not immunized who received at least one vaccination during the implementation period. Of the 50 charts reviewed, 20% were unvaccinated, 36% were partially-vaccinated and 44% were fully-vaccinated. After the portal vaccine reminder was initiated, 10 random charts were assessed and 20% of patients were unvaccinated, 50% were partially-vaccinated and 30% were fully-vaccinated. The second month, 10% of patients were un-vaccinated, 60% partially-vaccinated and 30% were fully-vaccinated. In the third month, chart review showed 10% un-vaccinated, 50% partially-vaccinated and 40% fully-vaccinated.

*Table 1: Results: Patients That Were Not Immunized Who Were Vaccinated*

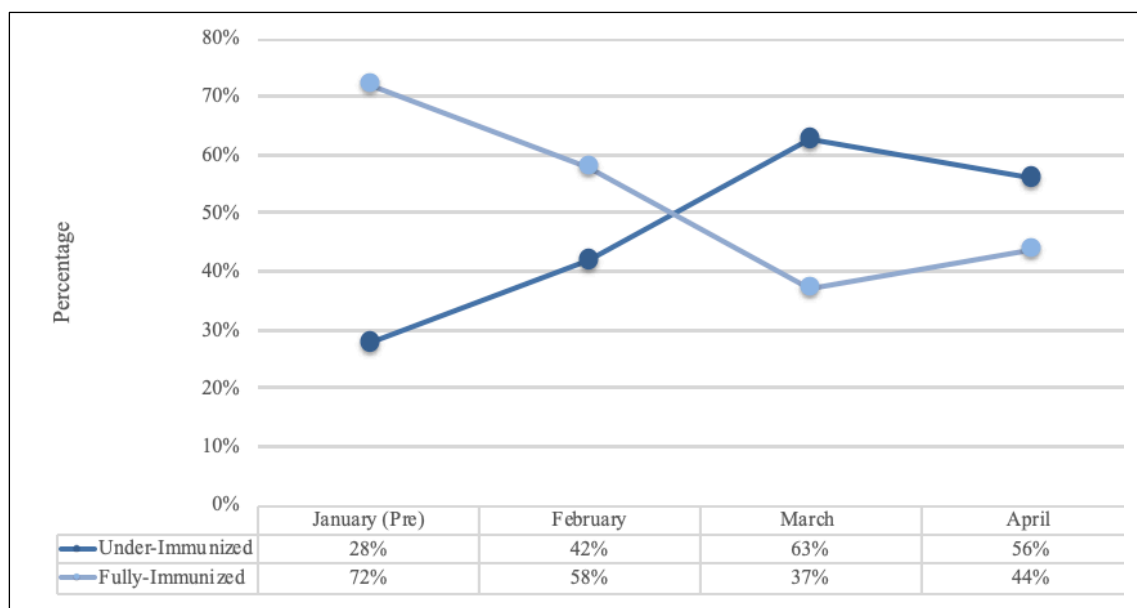


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### Percentage of Patients that Received School Required Vaccines

Table 2 displays the percentage of patients who received a vaccination with differentiation of fully and under-immunized patients. Prior to the intervention, 63 total patients received a school required immunization. 28% were under-immunized and 72% were fully-immunized. In the first month, 46 patients received at least one immunization, 42% were under-immunized and 58% were fully-immunized. In month two, 73 patients received at least one immunization, 63% were under-immunized and 37% were fully-immunized. In the final month, 27 patients received at least one immunization, 56% were under-immunized, and 44% were fully-immunized. These results demonstrate a decline in the percentage of patients who are unvaccinated and that 10%, or 1 patient received a vaccination that was not previously immunized. Patients under-immunized and fully-immunized were almost 50/50 which could be attributed to patients utilizing a “catch up” vaccination schedule or may represent patients who were already fully-immunized for age and received their vaccines at the recommended administration time.

*Table 2: Results: Patients Who Received School Required Vaccines*

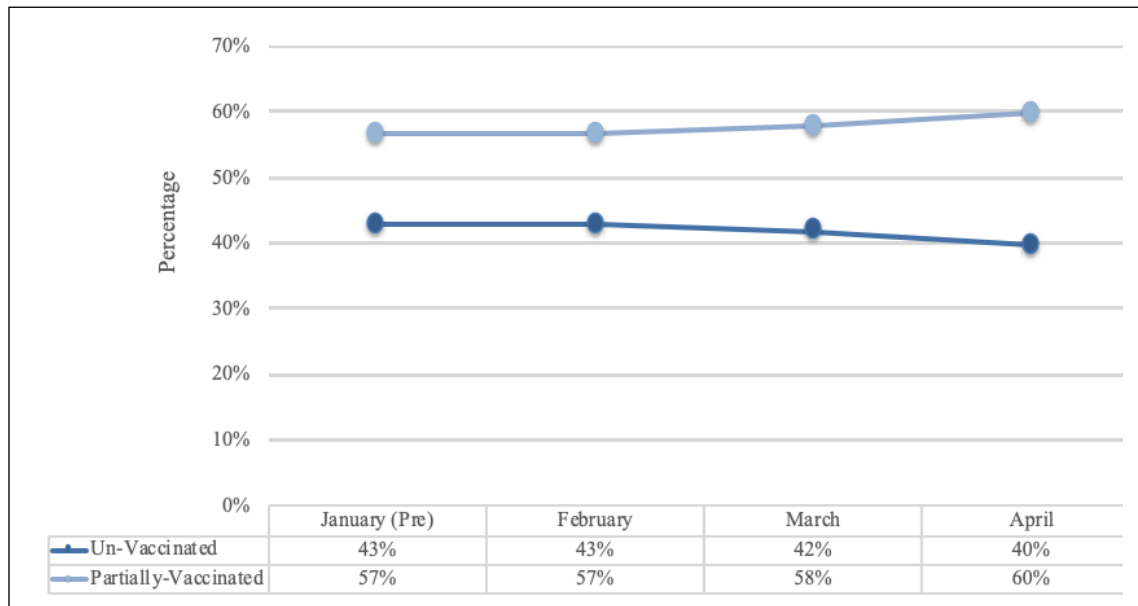


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### Percentage of Patients Under-Immunized for School Required Vaccines

Table 3 displays total percentage of under-immunized patients and how their immunization status compared. 462 charts were reviewed in the pre-implementation phase. 43% of those patients were un-vaccinated patients and 57% were partially-vaccinated or received at least one school-required vaccine. In February, 460 charts were reviewed. 43% of patients were un-vaccinated, 57% were vaccinated. In March, 456 charts yielded that 42% of patients were un-vaccinated, 58% partially-vaccinated. In April, 441 charts reviewed found 40% un-vaccinated and 60% partially-vaccinated patients. Although percent of partially-vaccinated patients remain high, there was a decrease in the percent of un-vaccinated patients over time.

*Table 3: Under-Immunized Patient Percentage Per Vaccination Status*



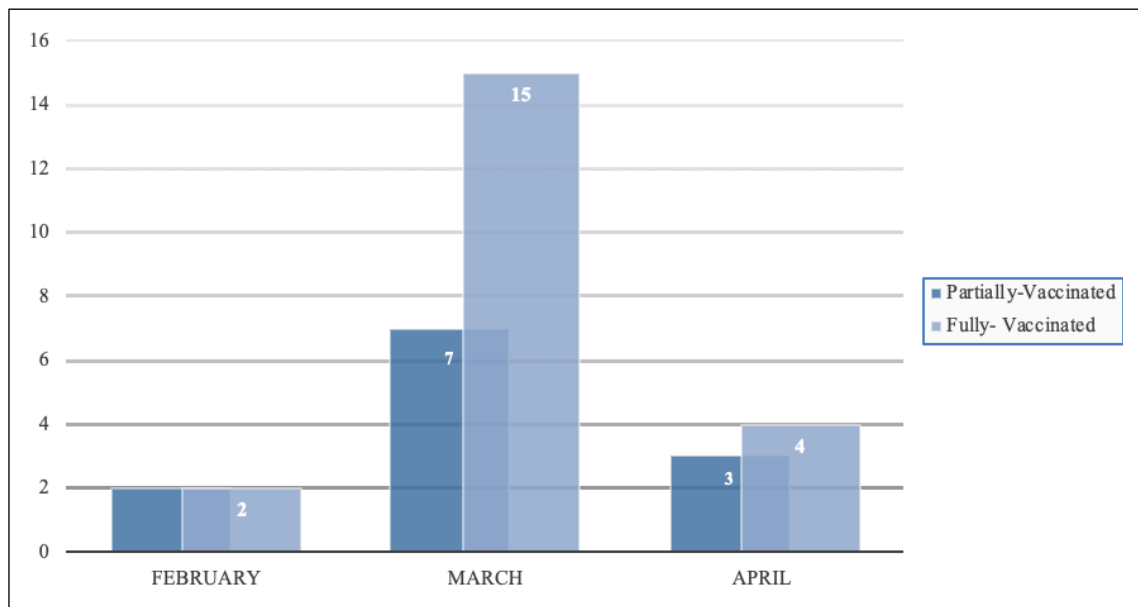
### Number of Patients with a Vaccination Status Change Per Month

Table 4 displays the number of patients who had a vaccination status change. After implementation in month one, 462 charts were evaluated for a change in vaccination status. Of those patients, 2 were un-vaccinated and became partially-vaccinated; 2 were partially-vaccinated

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and became fully-vaccinated. Again, in month two, 460 charts were reviewed for the same criteria and 7 patients were un-vaccinated and became partially-vaccinated and 15 patients who were partially-vaccinated became fully-vaccinated. In month three, 441 charts reviewed revealed 3 patients received immunizations and are now partially-vaccinated, while 4 patients became fully-vaccinated for all school required immunizations. 21 patients previously partially-vaccinated became fully vaccinated and 12 patients previously un-vaccinated became partially vaccinated over the duration of the project period.

*Table 4: Patient Vaccination Status Change Per Month*



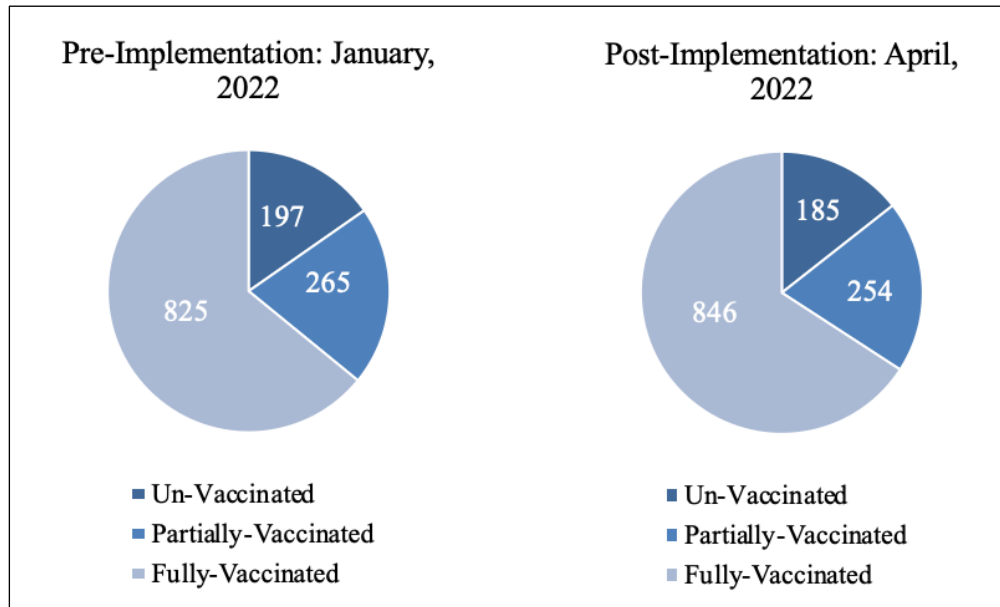
### Organization's Overall Vaccination Status

Table 5 displays the overall vaccination status of all patients in the practice. Pre-implementation chart reviews yielded that 825 patients (64%) were fully-vaccinated for school required immunizations, 265 (21%) were partially-vaccinated and 197 (15%) were un-vaccinated. At post-implementation, 846 (66%) patients were fully-vaccinated, 254 (21%) were partially-vaccinated and 185 (14%) were un-vaccinated. The organization's overall fully-

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vaccinated rate of patients increased 2% over the implementation period while both partially-vaccinated and un-vaccinated groups decreased by 1%. The total patients served in the practice may have changed slightly over the period of this project for a number of reasons, however, new patients, newborns and adolescent transitions to adult practice was not assessed.

*Table 5: Overall Vaccination Status Pre-and Post-Implementation*



## DISCUSSION

The purpose of this project was to determine if the implementation of vaccine reminders improved immunization rates at a pediatric primary care clinic and increased immunization rates to be more comparable to the current state and national averages of fully-vaccinated patients. The implementation of portal vaccine reminders did increase the overall percentage of patients fully-vaccinated, however the practice still falls short of current state average of 74% (Rossman, 2020),,. Notably, the practice immunization rates are more comparable to the national average of 68.3% (CDC, 2021). A statistical analysis of data collected was not done, however there is broad clinical significance to increased number of patients within the organization who are fully-

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vaccinated that can inform future projects.

Although this study did not investigate any patient demographics while acquiring data, the effect of age on the results cannot be overlooked. During the first two years of life, patients are seen at least 10 times by their primary care provider. During these scheduled visits, children are offered immunizations according to the CDC's recommended vaccination schedule. If a patient is up-to-date per age, they are not classified as under-immunized despite not receiving all school-required vaccinations. After age three, patients are seen in most cases annually for a well-child visit and otherwise only as needed. Due to this, younger children have more frequent opportunity to receive or catch up on their immunizations. Since age of under-immunized patients was not assessed, there may be missed opportunities to educate older children on the importance of vaccinations or to tailor educational reminders based on patient age.

To increase immunization rates among pediatric patients the effect of vaccine hesitancy cannot be overlooked. Efforts to decrease vaccine hesitancy and vaccine information were made by including evidence-based immunization information from CHOP and the AAP. It is unclear if this contributed to the improvement of vaccination rates. Researchers have demonstrated that vaccine reminder utilization with a combination of in-person provider education is essential to combating the effects of vaccine hesitancy (Lerner et al., 2021). The incorporation of provider conversations with patients who are vaccine hesitant helps to combat vaccine misinformation and allows patients and parents to ask questions and receive valuable, evidence-supported information while engaging them in their own health care decisions (Edwards et al., 2016).

### **LIMITATIONS**

There were a few notable limitations to this quality improvement project. First, not all patients have established access to their electronic medical portal. Without access to patients did

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not receive vaccination reminders. The decision to use only portal vaccine reminders was made given the accessibility implementing this intervention within already existing EHR capabilities. Additional considerations was made to literature that supports the utilization of patient portal reminders as a promising technique for vaccine compliance (Ueberroth et al., 2021). Other methods of communication were considered including mailed reminders, however these were more time consuming and costly impacting project sustainability. Additional limitations of electronic patient portal reminders were limited indications of message receipt. Without polling the patients/parents who received reminder, it is difficult to assess if the message was accepted or acknowledged.

Another limitation was that portal reminders only were sent to patients with an under-immunized ICD-10 code in their EHR. Patients who were fully-vaccinated did not receive a reminder which may lead to the patient missing an upcoming vaccination. An evaluation could be made of patients who have a vaccination due in the upcoming month and if they benefit from a reminder message. If parents are aware their child is due for an immunization prior to their scheduled appointment, they are able to prepare themselves and their child for visit as well as bring forth any questions or concerns they may have.

Other challenges to this project continue to be the effect of vaccine hesitancy and vaccine refusals among patients and parents. Combating misinformation surrounding vaccines requires more attention to detail than can be incorporated in a vaccine reminder message. Realistic guidelines for tackling parental vaccine hesitancy includes starting early, offering vaccination as the default approach, building trust, being straightforward about side effects, delivering reassurance on a healthy vaccine safety system, centering on protection of the child and community, telling stories and addressing pain (Shen & Dubey, 2019). Undoubtedly, the Covid-

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19 pandemic has had a direct correlation on vaccine hesitancy and vaccine refusal from parents. At this point in time, it is difficult to gauge the true effect. Through the under-immunized chart reviews, there were some patients who were not vaccinated for school-required immunizations but did receive the recommended doses of the Covid-19 vaccine. This raised the question if more patients are willing to receive other vaccines if they received the Covid-19 immunization and vice-versa with other vaccines? Finally, lack of provider investment in vaccine promotion within the practice remained a significant barrier for this project.

### IMPLICATIONS

The practice's percentage of patients who are fully-vaccinated for school required vaccinations did increase 2% over the implementation period. This was the organization's goal. However, more time is required to assess the full-effect of the reminder implementation. An understanding of specific time periods throughout the year when patients received the most immunizations will aid the organization if a more timed approach to reminder implementation is necessary. By assessing the portal reminder implementation for longer than its three month initiation, the organization will hopefully be able to identify if the patient portal reminder is successful in increasing immunization rates for non-school required vaccines as well, such as the influenza vaccine and newly adopted Covid-19 vaccine which are administered yearly.

### CONCLUSION

The use of vaccine reminders through the electronic medical record portal clinically improves immunization rates at a rural pediatric primary care practice, however, more information is needed to establish statistical significance and assess sustainable improvement in vaccine compliance compared to the state average. Future strategies to improve pediatric vaccination rates through portal vaccine reminders should include the utilization of consistent



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provider messaging, active communication with parents regarding vaccine hesitancy, and age specific messaging . Vaccines are a proven and time tested public strategy to combating disease and every child who receives vaccines has the ability to reduce morbidity and mortality.

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# Improving Vaccination Rates in Pediatric Primary Care

Lauren Osbeck, BSN, RN  
DNP Project Defense  
April 28, 2022



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- Kim Fenbert, DNP, CPNP-PC
  - Project Site Mentor



## Objectives for Presentation

1. Present the clinical phenomenon.
2. Evaluate the phenomenon in the perspective of the organizational assessment and literature review.
3. Review the project implementation plan.
4. Examine project results and sustainability.
5. Discuss how the Doctor of Nursing Practice (DNP) Essentials were incorporated into the project.



## Introduction

- The immunization rates for patients at a West Michigan pediatric primary care clinic are lower than state and national averages.
  - State average is 74% (Rossman, 2020).
  - National average is 68.3% (Centers of Disease Control and Prevention [CDC], 2021).
- Pediatric patients within the practice are at risk for contracting many preventable diseases.
  - Leads to a decrease in health and well-being.
  - Increases risk of morbidity and mortality.
- Vaccinations For Children Program (Whitney et al., 2014).
  - Decreases illnesses, hospitalization and death.
  - Suggests an estimated net savings cost in \$295 billion over the lifespan of children born between 1994-2013.

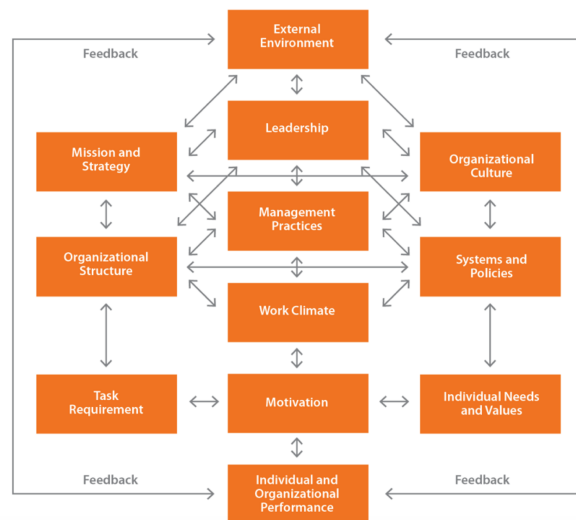


# ORGANIZATIONAL ASSESSMENT



## Framework for Organizational Assessment

Burke- Litwin Model for Organizational Performance and Change (1992)



## Current State of the Organization

- The pediatric primary care clinic is one of a few pediatric focused clinics in the area that does not require their patients to be vaccinated in order to receive care.
- There is no standardized process of documenting or billing codes if the patient is under-immunized or not vaccinated.
- Currently, the clinic's immunization rate of patients around 50%, which is below state and national averages.





## SWOT Analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>The organization has clearly defined goals and missions.</li> <li><b>Experienced organizational leadership.</b></li> <li>Staff share a common goal of increasing health within the population.</li> <li><b>Work atmosphere is conducive to change.</b></li> <li>Staff training applicable during office hours.</li> <li><b>Electronic health record (EHR) reminder utilization.</b></li> </ul>	<ul style="list-style-type: none"> <li><b>Multiple codes are utilized for billing</b></li> <li>MAs have multiple responsibilities in the clinic.</li> <li>Past attempts for increasing vaccination rates have not proved successful.</li> <li><b>Back-to-back scheduling.</b></li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>Pairing with local schools.</li> <li><b>Providing vaccine immunization sessions.</b></li> <li>Work with OB providers.</li> <li><b>Increasing public and community awareness.</b></li> </ul>	<ul style="list-style-type: none"> <li><b>COVID-19 pandemic.</b></li> <li><b>Vaccine mis-information.</b></li> <li>Receptivity of reminders.</li> <li>Not scheduling well-child appointments.</li> <li><b>Parental refusal of vaccines.</b></li> </ul>

## Clinical Practice Question

*Does the implementation of vaccine reminders for pediatric patients improve immunization rates compared to not receiving a reminder in a West Michigan pediatric primary care clinic over a three-month period?*

# LITERATURE REVIEW

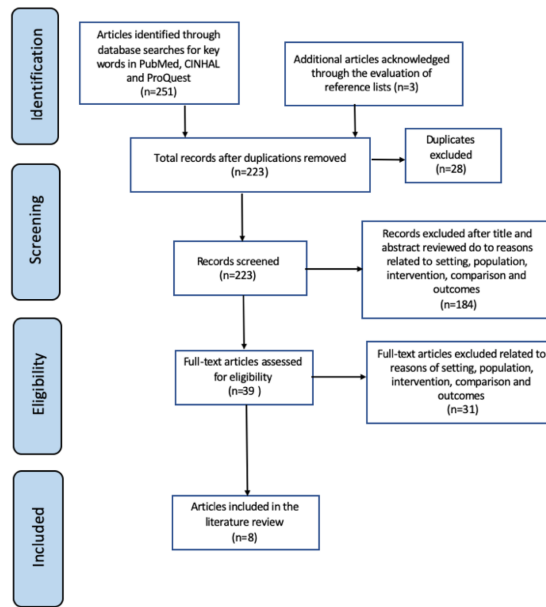


## Available Knowledge

- **Purpose:** Perform a complete synthesis of academic literature related to improving immunization rates among pediatric patients in the primary care setting utilizing reminders.
- **Aims:**
  1. Do parents find immunization reminders helpful in knowing when their child is due for a immunization?
  2. Do immunization reminders correlate with increased immunization rates?



# PRISMA Figure



(Moher, Liberati, Tetzlaff, Altman, & PRISMA Group, 2009)

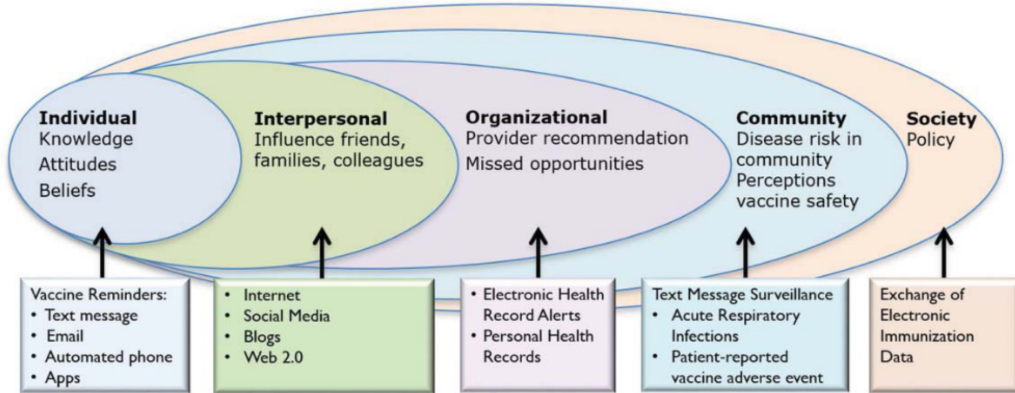


## Literature Results & Synthesis

<h3>Barriers for Immunization Compliance</h3>	<ul style="list-style-type: none"> <li>• Parent awareness of immunization schedule (Bauer et al., 2021).</li> <li>• Lack of education regarding vaccinations for patients and parents (Rand et al., 2018).</li> <li>• Anti-vaccination and vaccine misinformation (Nabet et al., 2017).</li> <li>• Scheduling availability (Bauer et al., 2021).</li> </ul>
<h3>Multicomponent Interventions</h3>	<ul style="list-style-type: none"> <li>• Education and reminder are significant factors (Bauer et al., 2021) (Frew &amp; Lutz, 2017).</li> <li>• Scripted reminder providing education (Lerner et al., 2021).</li> <li>• Appointment and result reminders (Kahn et al., 2018).</li> </ul>
<h3>Reminder Advantages</h3>	<ul style="list-style-type: none"> <li>• Personalized messages (Berenson et al., 2018).</li> <li>• Education regarding positive consequences versus negative consequences within the reminder (Lerner et al., 2021).</li> <li>• Multiple reminders (Dombkowski et al., 2017) from different outlets (Kahn et al., 2018).</li> </ul>



## Phenomenon Model



Social Ecological Model  
(Kolff et al., 2018)



# PROJECT PLAN



## Project Design

“Quality improvement collaboratives can accelerate quality improvement and patient safety efforts. These improvement collaboratives will enable the pediatric healthcare community to continue to evolve and maximize the benefits of children.”

*-Terao et al., 2019*



## Purpose and Project Type

A quality improvement project:

- Improve immunization rates for school required vaccines at a West Michigan pediatric primary care clinic by implementing education-based vaccination reminders.
- Utilization of patient portal messages.
- Increase patient/parent education regarding immunizations.
- Decrease community risk for contracting preventable diseases.



## Methodology

### Setting:

- Small pediatric primary care clinic in West Michigan.
- Affiliated with a small, rural healthcare system.

### Participants:

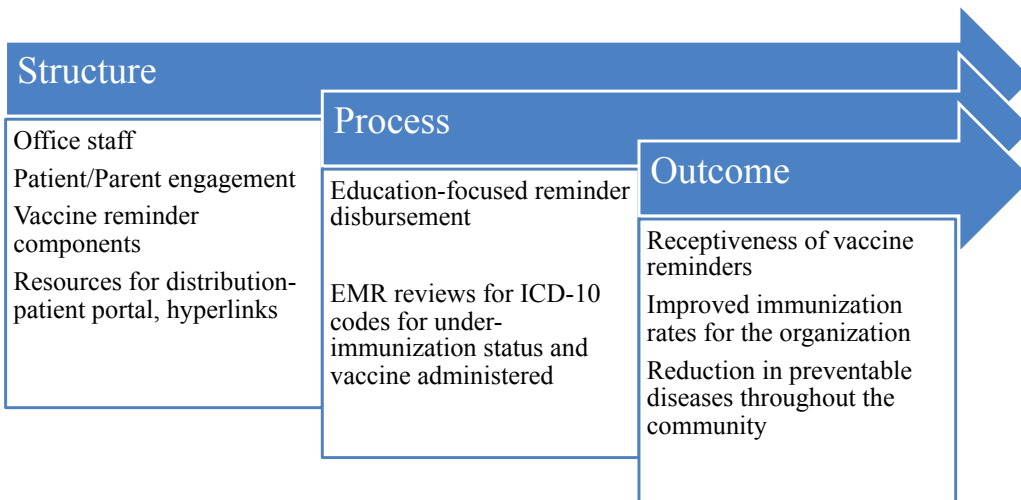
- One physician and nurse practitioner.
- All patients with an under-immunization status for school-required vaccinations

### Source of Information:

- Patient charts.
- Billing report for ICD-10 code, Z28.3.



## Implementation Framework



The Donabedian Model (Donabedian, 1988)



## Implementation Strategies & Elements

Implementation Strategies <small>(Powell et al., 2015)</small>	Implementation of Protocol	Framework Alignment
Assess for readiness and identify barriers and facilitators	SWOT analysis, EMR review, staff meetings	Structure
Promote adaptability	Provider billing code congruency	Structure
Develop reminder	Utilize evidence-based education to develop a reminder	Structure




## Implementation Strategies & Elements

Implementation Strategies <small>(Powell et al., 2015)</small>	Implementation of Protocol	Framework Alignment
Distribute educational materials	Provide education through reminders to patients/parents: electronic medical portal	Process
Promote adaptability	Identify if the reminders are successful and tailor appropriately	Process and Outcome
Conduct local needs assessment	EMR review for increase or decrease of immunization rates	Process and Outcome



## Evaluation & Measures

Topic	Concept	Tools for Measurement	When Measured	Who Measures
Implementation Strategies	Organization readiness	Observations, EMR review	Pre- implementation	Student
	Reminder prompt determination/ evaluation	Discussion with providers	Pre- and Post-implementation	Student, Advisor
	Conduct needs assessment	EMR review, provider and staff feedback	Pre- and Post- implementation	Student
Patient Outcome	Number or percentage of patients in regards to vaccination status	EHR audit	Pre-, Mid and Post-implementation	Student
System Outcomes	Billing for immunization; Coding	EHR audit	Pre-, Mid and Post-implementation	Student
	Reminder modification	Provider feedback	Post- implementation	Student
Policy Outcome	New policy implementation for vaccine reminders based on increase of immunization rates	EHR audit	Post-Implementation	Student


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## Vaccine Reminder Message

Hello,

This is a reminder that your child is due or overdue for an immunization.

Immunizations are an important way to keep your child healthy and free from disease. Remember that immunizations work best when they are given on time.

We recommend that you come in next week to take care of these important immunizations. No appointment is necessary, however, please call ahead.

If you have any questions regarding any immunizations, please feel free to call our office at [REDACTED], send us a message through the portal or visit the links below.

These websites from the Children’s Hospital of Philadelphia and American Academy of Pediatrics offers up-to-date information regarding immunizations and immunization schedules.

<https://www.chop.edu/centers-programs/vaccine-education-center/resources/vaccine-and-vaccine-safety-related-qa-sheets>

<https://www.healthychildren.org/English/safety/prevention/immunizations/Pages/default.aspx>

- Scripted reminder message:
  - Evidence-based prompt (Spoelstra et al., 2016).
  - Educational hyperlinks included.
- Administered:
  - Patient Electronic Health Portal.
  - Monthly.
  - All patients with an ICD-10 code of Z28.3 (under-immunized).



## IRB Determination

- Patient information was protected and student compliant with HIPAA.
  - Organizational computer/laptop.
  - CITI training.
- IRB determination was completed by the GVSU's review board.
- De-identified data collected and was stored within the organization.
  
- Available upon request.



## Analysis Plan

- **Data Collection:**
  - Pre- and Post-Implementation.
    - Mid-evaluation.
  - EHR audit: immunization status codes.
    - ICD-10 code Z28.3 (under-immunization).
    - ICD-10 code Z23 (vaccine administration).
- **Data Analysis:**
  - Percentages and Counts; Run-charts.
    - Percentage of patients who were not immunized, who received a vaccine.
    - Percentages of patients who received immunizations.
      - Un-vaccinated vs. partially-vaccinated.
    - Number of patients who had an immunization status change.
  - Patient number/percentage comparison.
    - Unvaccinated, partially-vaccinated, fully-vaccinated.

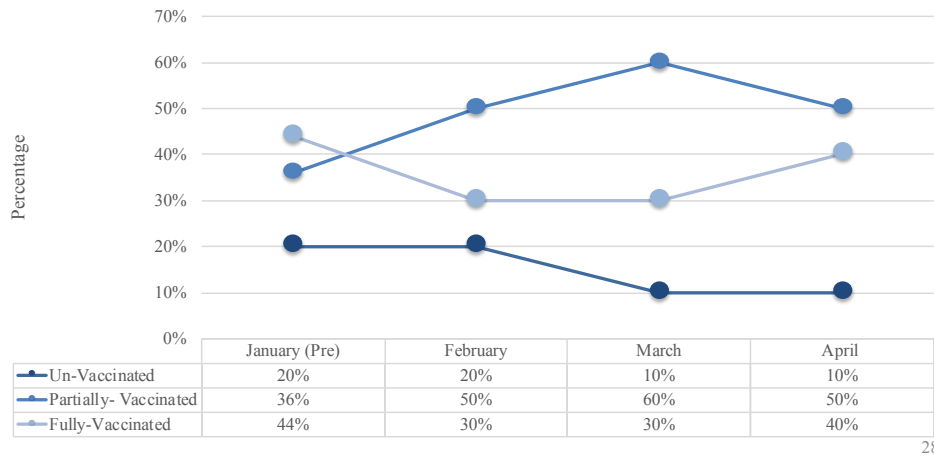


# RESULTS



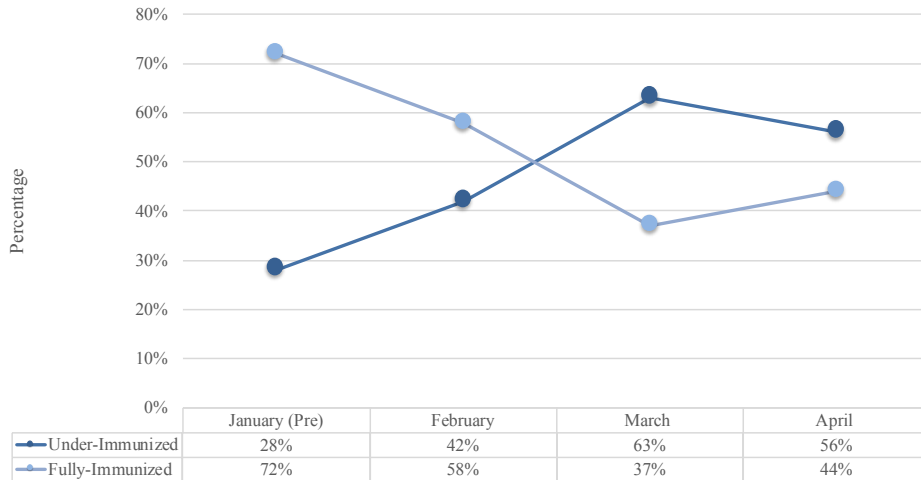
## Results: Vaccination Provided

Pre/Post Implementation Percentage of Early Childhood School Required Patients That Were Not Immunized Who Were Vaccinated



## Results: Vaccines Provided

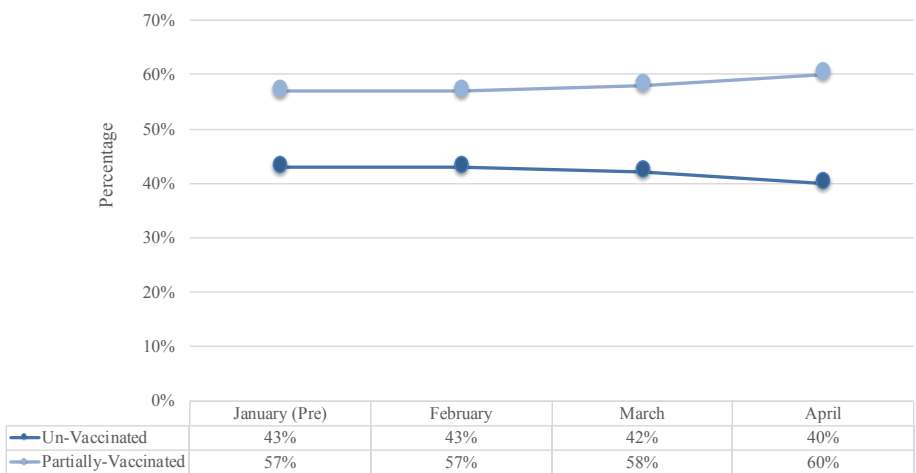
**Pre/Post Implementation Percentage Early Childhood School Required Vaccines Provided via Billing Code z28.3 and z23**



29

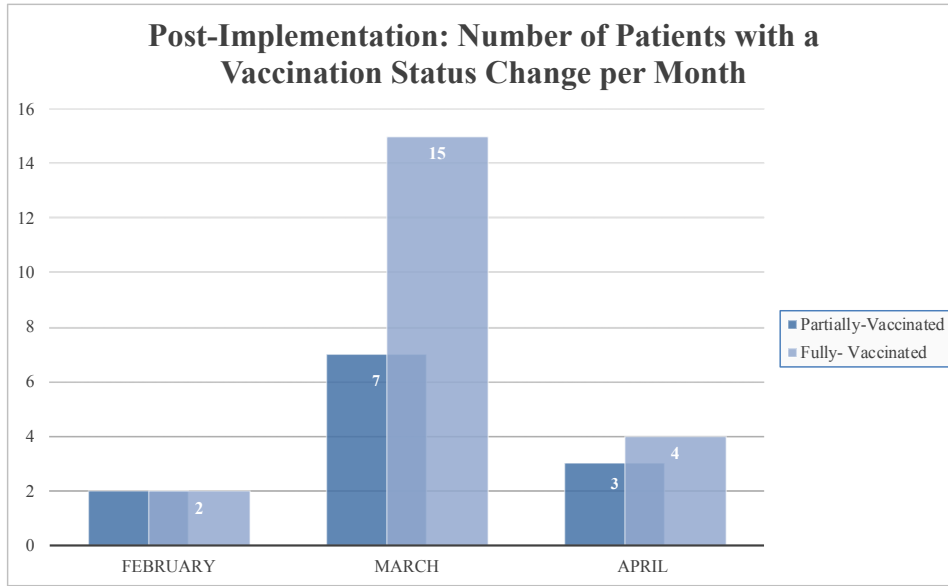
## Results: Vaccination Outcome

**Pre/Post Implementation Percentage of Early Childhood School Required Vaccines of Under-immunized via Billing Code z28.3**



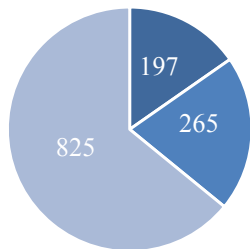
30

## Results: Vaccination Status Change



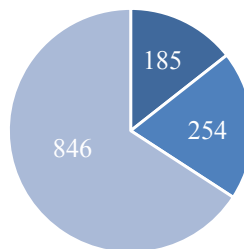
## Results: PPCC's Overall Vaccination Status

Pre-Implementation: January, 2022



- Un-Vaccinated
- Partially-Vaccinated
- Fully-Vaccinated

Post-Implementation: April, 2022



- Un-Vaccinated
- Partially-Vaccinated
- Fully-Vaccinated



## Results: Patient Outcomes

- 87 vaccines were given during the implementation for under-immunized patients
  - 21 patients became fully-vaccinated.
  - 12 patients received at least one immunization who had not previously been vaccinated.
- Percentage of patients vaccinated increased.
  - Fully-vaccinated: 2% increase.
  - Partially- vaccinated: 1% increase.
  - Un-vaccinated: 1% decrease.



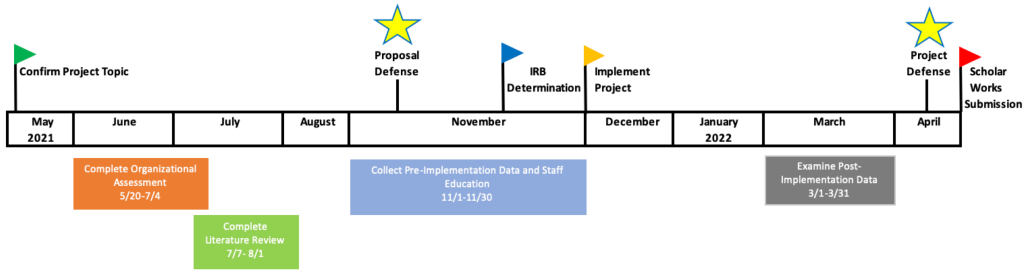
## Results: Measured Outcomes

- Patient Outcomes:
  - 91 patients with an under-immunized status presented in the office during implementation.
  - Patients received the most immunizations during March.
- System Outcomes:
  - Providers did receive feedback from parents.
  - Coding structure cohesion.
- Policy Outcomes:
  - More information required.



# Timeline

## 2021-2022 DNP Project Timeline



## Budget & Resources

Doctor of Nursing Practice Project Financial Operating Plan	
Improving Vaccination Rates in Pediatric Primary Care	
<b>Revenue</b>	
Project Manager Time (in-kind donation)	\$ 6,300.00
Medicaid Reimbursement for Vaccines For Children Program (VFC)	
Vaccination (\$50 per injection, for 50 immunizations)	\$ 2,500.00
Each additional component (\$25 per component, for 50 immunizations)	\$ 1,250.00
Private Insurance Reimbursement (Blue Cross Blue Shield- HMO)	
Two-year old who is fully vaccinated (24-25 immunizations); 2 patient	\$ 800.00
<b>TOTAL INCOME</b>	<b>\$10,850.00</b>
<b>Expenses</b>	
Project Manager Time (in-kind donation)	\$ 6,300.00
Team Member Time	
DNP prepared Nurse Practitioner (site-mentor)	\$ 1,675.00
Education for physician (1 hour total)	\$ 73.00
Education for two medical assistants (1 hour total)	\$ 32.00
Education for one office staff member (1 hour total)	\$ 14.00
Education for one IT personnel (1 hour total)	\$ 37.00
Consultations	
Office Manager (1 hour total)	\$ 24.00
Cost of EMR reminder	\$ -
<b>TOTAL EXPENSES</b>	<b>\$ 8,155.00</b>
<b>Net Operating Plan</b>	<b>\$ 2,695.00</b>

### Proposed Revenue:

- 50 immunizations for patients under the VFC program.
- 2 patients who complete the requirements for BCBS reimbursement.

## Discussion

- Clinical significant increase in vaccination percentages after portal reminders.
- Age of patient.
  - Correlation with the vaccine status.
  - Timing of scheduled office visits.
- Limited known effect on countering vaccine hesitancy.
- Combination intervention.
- Opportunity for engaging patients/parents.



## Limitations

- Electronic patient portal.
  - Not all patients utilize.
  - Other patient outreach.
  - Tracking if reminder is read.
- Vaccine hesitancy.
  - Misinformation.
  - Pandemic effects.
- Provider vaccine promotion



## Implications for Practice

- Reminders aided in a vaccination percentage increased.
- Longer implementation period.
- Potential for higher percentage increase during different implementation season.
- Addressing consistent provider vaccination promotion.



## Conclusions

- Implementation period showed clinical significance but did not show substantial increase in vaccination percentage.
- Potential for increased results with consistent provider messaging.
  - Patient/parent questions.
  - Views of support.
- Possible acceptance by institution to incorporate vaccine reminders.
- Knowledge gained from project implementation was crucial to gaining competencies in DNP essentials.





# SUSTAINABILITY PLAN



## Sustainability Plan

- Continued utilization of Donabedian's Structure, Process, Outcome model to evaluate immunization rates periodically.
  - Increased? Decreased? Plateaued?
  - Report easily manifested from ICD-10 code search.
- Cost analysis data- Return on investment.
  - Configure cost from VFC or insurance reimbursement.
- Continued evaluation of CDC guidelines and immunization schedules.
  - Changes to the reminder prompt.
  - Changes to reminder distribution.
  - Non-school required vaccine integration.
- Additional DNP project.
  - Improve specific vaccination compliance (Influenza or Covid-19).
  - Survey if patients respond to portal message or would prefer another form of reminder.
  - Evaluation of patient education.



## Dissemination

- **Organization.**
  - Providers will receive a final copy of the results of the project.
  - Presentation to the office staff with handouts.
  - Completed manuscript will be provided to project site mentor.
- **Scholarly.**
  - Public defense.
  - Manuscript will be submitted to Scholarworks for public dissemination.



## DNP Essentials Reflection

DNP Essentials (AACN, 2006)	Reflection
I. Scientific Underpinnings for Practice	Literature Review Evidence to support the utilization vaccination reminders
II. Organizational and Systems Leadership for Quality Improvement and Systems Thinking	Organizational assessment Collaboration with the organization Project planning and implementation Leadership throughout all phases of the project
III. Clinical Scholarship and Analytical Methods for Evidence-Based Practice	Identification of evidence-based interventions Conceptual model integration Analyzed outcomes and gaps in evidence
IV. Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care	Electronic-based intervention EHR data collection Evaluated patient health information sources



## DNP Essentials Reflection

DNP Essentials (AACN, 2006)	Reflection
V. Health Care Policy for Advocacy in Health Care	Leadership provided for implementation of an institutional policy Education provided to stakeholders for improved patient care outcomes
VI. Interprofessional Collaboration for Improving Patient and Population Health Outcomes	Ongoing communication throughout project implementation Collaborated with providers/staff in planning, proposing and execution of project
VII. Clinical Prevention and Population Health for Improving the Nation's Health	Analysis of immunization data Implementation strategies for increasing health promotion
VIII. Advanced Nursing Practice	Ongoing assessment of pediatric health Facilitated optimal care for increased patient outcomes



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