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Evaluating the effectiveness of a standardized mobile vaccination clinic training program for team leaders in reducing vaccination administration errors.

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Evaluating the Effectiveness of a Standardized Mobile Vaccination Clinic Training Program for Team Leaders in Reducing Vaccination Administration Errors

by

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Dedication

This manuscript is dedicated to my beloved husband, Carl, for his unwavering love, immeasurable support, and patience throughout this remarkable journey. To my precious daughters, Neysa and Eliana, you are my greatest inspiration in life, and I want you to know that you can do all things through Christ who strengthens you. To my dearest mother, Regina, I am thankful for all your prayers, sacrifices, and for always encouraging me to pursue my wildest dreams. To my sister, Inozentia, my confidante and best friend, thank you for always being there when I needed it most, and finally to my late father, Bernard, I know that I have made you proud, continue watching over us from heaven. From the depths of my heart, I express profound gratitude to you all. This achievement stands as a testament to your love, and I love you all deeply.

Acknowledgments

I would like to express my sincere gratitude to my DNP project chair and committee, Drs. Ross and Huntington-Moskos, for their dedication and guidance throughout this transformative journey. Your exceptional support has played a pivotal role in the successful completion of this project. I would also like to extend my heartfelt appreciation to Delanor Manson, the CEO (Chief Executive Officer) of the Kentucky Nurses Association (KNA), for your invaluable collaboration and support. Special thanks are due to the team leaders, whose valuable feedback and active participation were instrumental in the development and evaluation process of this project. Their commitment to excellence and dedication for the well-being of vaccine recipients did not go unnoticed. Furthermore, I would like to acknowledge the tremendous support received from the Louisville Metro Public Health and Wellness (LMPHW) department, Louisville community leaders, members, and local volunteers. Your trust in our team to safeguard your health, one vaccination at a time, has been both humbling and inspiring. Once again, I extend my deepest gratitude to all who contributed to this project's success.

Abstract

In response to the urgent need for mobile COVID-19 vaccination clinics, the Kentucky Nurses Association (KNA) developed a standardized training program aimed at equipping nurse leaders with the necessary tools and resources for safe and efficient vaccine administration, free of vaccination errors, during mobile vaccination clinics. The purpose of this study was to assess the process effectiveness of the training program as perceived by team leaders and evaluate the number and types of vaccination errors during these clinics. The CDC's Logic Model served as the framework for this project. The interventions included team leaders undergoing standardized training outlined in the standard operating procedures; this training included multiple and regularly updated training materials used to enhance the training process and the recording of vaccination errors as they occurred. A 7-item Likert scale (Cronbach alpha = .82), one select-all-that-apply question, and an open-ended question based on the Logic Model were used to measure the training program's effectiveness as perceived by participants. Results showed that all 12 team leaders strongly agreed on the necessity of a standardized training process, the importance of staying up to date on vaccine administration, and their feelings of preparedness and competence in running a vaccination clinic. Statistical significance was not found at the item and scale levels between nurses with different years of experience in vaccine administration. Analysis of KNA records showed that only 9 vaccination errors occurred for a total of 8086 administered vaccines over a 16-month period of mobile vaccination clinics, yielding a low error rate of 0.001%. These findings suggest that the training program was successful at preventing vaccination errors and that team leaders collectively perceived the training program as effective.

Keywords: Mobile vaccination, mass vaccination, vaccination equity, immunization, vaccination, COVID-19 pandemic, community, emergency preparedness, public health, nursing, nurse leader

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Background

The COVID-19 pandemic has disproportionately affected vulnerable populations, leading to higher hospitalization and mortality rates both locally and globally (Attipoe-Dorcoo et al., 2020). To address this, COVID-19 vaccinations have become crucial, particularly in low socioeconomic communities facing barriers to healthcare access. In Kentucky, where 12.2% (850,400) of residents live in poverty and 5.6% (246,078) of residents lack healthcare coverage, ensuring equitable access to vaccinations is vital (Bureau, n.d.). Vaccination equity plays a crucial role in preventing SARS-CoV-2 infections among vulnerable individuals, emphasizing the need for error-free administration. It is imperative to prioritize accurate and precise vaccination efforts to mitigate the impact of the pandemic and safeguard vulnerable populations. The map in Figure 1 depicts the poverty rate per zip code of Jefferson County and the location where mobile vaccine clinics were held.

The COVID-19 pandemic has pushed healthcare across the nation and internationally to its limits. Local responses to the SARS-CoV-2 virus required multiple innovative approaches such as mass drive-through events, which served as the original training platform for nurse team leaders during subsequent mobile vaccination clinics. In this paper, team leaders are defined as registered nurses (RNs) or advanced practice registered nurses (APRNs) responsible for training volunteers and overseeing mobile vaccination operations. These leaders play a crucial role in coordinating and supervising the vaccination process, ensuring that volunteers are well-prepared and that the mobile operations run smoothly. As mass drive-through vaccination events decreased, mobile vaccination clinics became a more challenging part of vaccination efforts. Mobile clinics compensated for major shortcomings in the United States healthcare delivery system (Attipoe-Dorcoo et al., 2020). These clinics provided solutions to bring vaccinations to underserved communities with traditionally lower vaccination rates, higher poverty rates, and large uninsured populations. The flexibility and adaptability of mobile clinics make them an ideal approach to responding to pandemics, such as COVID-19 (Attipoe-Dorco et al., 2020).

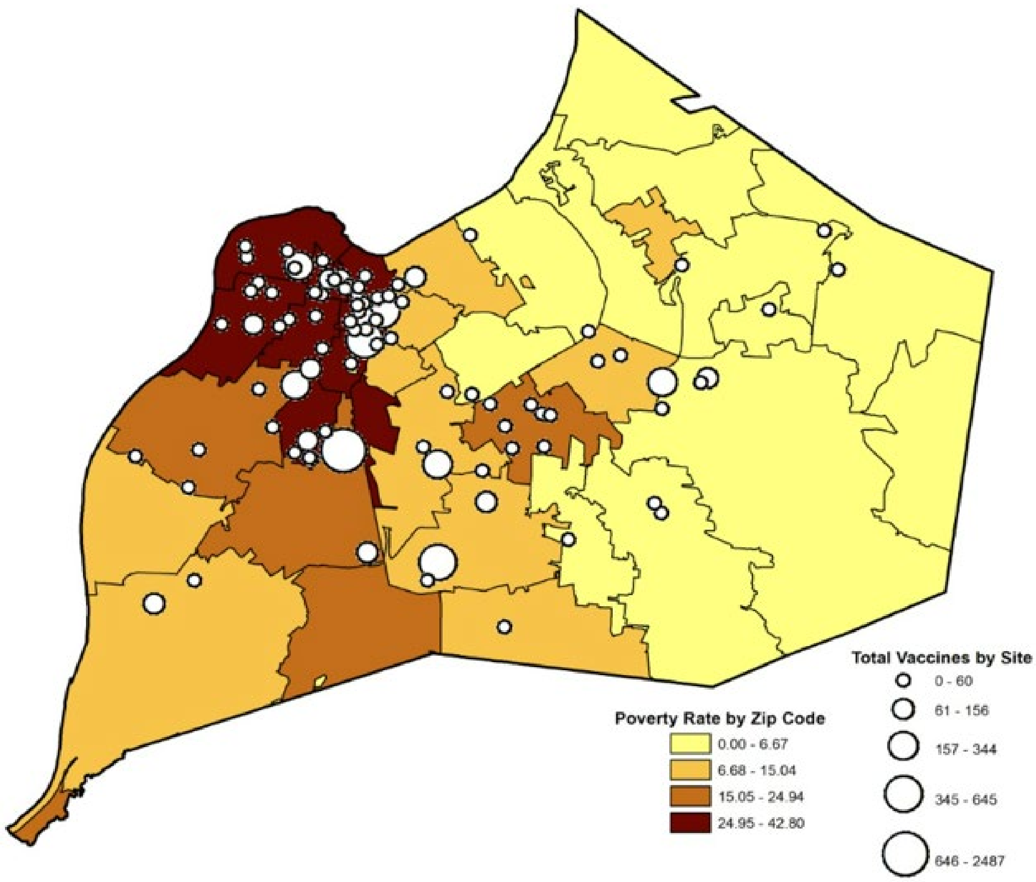
The concept of drive-through mass vaccinations served as the foundation for the development of the mobile vaccination team leader training program. This approach provided the initial framework for safe, efficient, and large-scale vaccine administration. Building upon this success, a specialized training program was devised specifically for team leaders of mobile vaccination clinics. Recognizing the unique challenges and requirements of delivering vaccines in mobile settings, this program aimed to equip team leaders with the necessary knowledge and skills to effectively coordinate and oversee vaccination operations. By tailoring the training to the specific needs of mobile clinics, this program aimed to ensure safe, efficient, and equitable delivery of COVID-19 vaccines to diverse and underserved minority communities.

Vaccination errors are preventable events (Hibbs, et al., 2015). The Centers for Disease Control and Prevention ([CDC], 2021) defines a vaccine administration error as any preventable event that may cause or lead to inappropriate medication use or patient harm. The CDC (2022) suggests that all healthcare staff need training in COVID-19 vaccination even if they are already administering routinely recommended vaccines.

During mobile vaccination clinics, a standardized vaccine administration training was developed focusing on educating nurse team leaders with the knowledge and skills necessary to operate mobile vaccination clinics towards patient safety and free of avoidable vaccination administration errors. This training manual contained the standard operating procedures and became the primary guidance for all mobile vaccination clinics serving Louisville's most underserved populations. The purpose of this project was to evaluate the process effectiveness of a COVID-19 vaccine administration errors prevention training program as perceived by trainees (team leaders) and to assess the number and types of vaccination errors that occurred during mobile vaccination clinics.

Figure 1.

Map of total mobile clinics showing vaccination administrations by site and zip code



Literature Review

Multiple databases were used to locate relevant studies addressing this review's purpose. Mesh search terms on CINHL containing publication dates for full text academic journals from the year 2000 to 2021 for ("mobile clinic" OR "mobile clinics") AND (vaccines OR vaccination OR immunization OR injection) AND (safety OR "adverse events" OR "side effects"). No filters were applied to these searches. Mesh searches for (mobile) AND (vaccines OR vaccination OR immunization OR injection) AND (safety OR “adverse events” OR “side effects”) only generated four articles of which none were relevant. This search process was repeated in PubMed, yielding an additional four articles. After discarding literature previously produced in the CINHL search, none of the articles were deemed pertinent to this review. Articles were reviewed on the CDC’s website that pertained to mobile vaccination administration errors. Any articles referenced was explored and four journals were found in this manner. Of the entire literature search, 8 articles were included in this integrative review as mobile vaccination is a new approach. The gap in research literature on error reduction during mobile vaccination clinics supports this program evaluation project.

Problem

The adult immunization schedule continues to expand rapidly and may lead to increased opportunities for vaccine administration errors (Reed et al., 2019). With several adult vaccines on the horizon, vaccination administration error prevention initiatives should focus on ensuring that mobile vaccinations are operated safely and without preventable vaccination errors.

Evidence shows that vaccine administration errors can result in unexpectedly increased costs to the practice and the public health system, including needs for additional doses, and inconvenience to the patient (Reed et al., 2019). Vaccine errors can have more serious impacts including inadequate immunological protection, injury, and reduced confidence in the healthcare delivery system (Hibbs et al., 2015). With an increase in vaccine hesitance and little to no confidence in vaccines among target communities with low vaccination rates, preventing vaccine administration errors has become a top priority. Rates and factors contributing to vaccine administration errors have been examined. A study (n= 552), designed to track the absolute number of vaccine administration error rates over time, found that the highest error rates occurred in children ages 2, 3, and 19 years old (Reed et al., 2019). It is unknown why errors were higher among this age group. A review of 541 cases of vaccine misuse identified 18 reports (3%) that were associated with adverse events and, even though vaccine errors may be very uncommon when they occur, they can be serious (Smith, 2012). The literature that highlights vaccine administration errors include inappropriate schedules with vaccines administered at the incorrect interval, making the interval between doses too short, and inadvertent administration of an extra dose or a vaccine being given at the incorrect age (Smith, 2012). This amplifies the need for proper vaccine schedule interpretation training for staff that administer vaccines. Barboza et al. (2020) found that frequent types of errors were inadequate interval between doses (18.2%) and errors in the administration technique (14.2%). However, no study has outlined COVID-19 vaccine administration errors prevention program along with an assessment of the program process effectiveness, hence, the present study.

Intervention

The literature supports strong recommendations to establish ongoing education for safe vaccination administration. The literature suggests multiple interventions that can prevent vaccination errors such as establishing ongoing education of staff who dispense, prepare, and administer vaccines. One way for health services to establish an effective vaccination infrastructure is to monitor and promote safe immunization practices (Barboza et al., 2020). Ongoing training engages new team leaders and volunteers and sharpens competencies of existing team leaders and volunteers (Brown et al., 2023). Vaccination errors tend to occur at ages where vaccines are not commonly given therefore, additional safety checks should be implemented for vaccines that are rarely used or given off-schedule, (Reed et al., 2019). Using multiple resources and teaching methods is a good approach to engaging adult learners. In addition, embedding systematic strategies to supplement current manufactured product limitations will contribute to additional safety nets for safer vaccine administration (Samad et al., 2020). Furthermore, according to Hampton (2020), introducing auto-disable syringes into immunization programs will help prevent vaccine handling and administration errors. Even though severe immunization-related errors are rare, the benefits of immunization remain significantly greater than the problems that may eventually occur (Barboza et al., 2020) (Reed et al., 2019).

Summary

To Err Is Human asserts that the problem is not bad people in healthcare, it is that good people are working in bad systems that need to be made safer (Institute of Medicine, 2000). Administering vaccinations in mobile settings can be equally safe and effective as when vaccines are administered in traditional settings when a standardized training program is incorporated. Furthermore, COVID-19 vaccination administration errors can be prevented (Hibbs, et al., 2015). Vaccine administration error reports usually only include errors that have been documented. Therefore, the true numbers of errors occurring may be much higher (Hazell & Shakir, 2006). This creates inconsistencies and gaps in the literature when looking to compare national or statewide vaccination error rates. According to Reed et al. (2019), vaccine administration errors tend to occur at ages when vaccines are not commonly given, have age-specific dosing, and when vaccines are given less often because staff are less likely to make errors with vaccines that are given frequently such as influenza vaccines (Reed et al., 2019). In the past two decades, the number of vaccine-preventable diseases has doubled and the number of vaccine doses for children and adults has increased (Condon & Hayney, 2016). The COVID-19 pandemic has added additional vaccines to the pediatric and adult vaccine schedule. Vaccine administration errors may cause inadequate immunological protection (CDC, 2021) (Reed et al., 2019) (Smith, 2012). Therefore, it is crucial that a vaccine administration errors prevention training program is offered to support the involved healthcare providers and that the program is evaluated.

Rationale

Needs Assessment

External Evidence

The COVID-19 pandemic revealed several racial health disparities, particularly related to access to healthcare and health equity. Racial and ethnic minority groups have been disproportionately impacted by SARS CoV2 virus (Tai et al., 2020). Systemic racism plays a significant role in perpetuating healthcare disparities by creating barriers such as financial constraints, limited healthcare insurance, and discriminatory practices within the healthcare system (Tai et al., 2020). Minority groups that contract COVID-19 are likely to have poor access to healthcare and seek care later, potentially resulting in more severe illness. A study found that among hospitalized COVID-19 patients, (n=580) approximately 45% were white, 33% were black, and 8% were Hispanic. This suggests that black populations are disproportionately impacted by COVID because the black population only represents 18% in that geographical area (Garg et al., 2020). Limited access to healthcare and increased hospitalized rates of minority groups underscore the importance of mobile clinics as an important approach in addressing racial and health disparities related to vaccine access in the community.

Internal Evidence

COVID-19 mobile vaccination clinics were implemented across a total of ten zip codes, with most clinics in the western and southern impoverished areas of Louisville. Due to systemic racism, ethnic minorities in the United States often lack health access, have greater comorbidities, predominantly live in poor, and low-income neighborhoods (Lopez et al., 2021). To demonstrate that mobile clinics were in high poverty communities, where COVID-19 needs were the greatest, a map of Jefferson County in Kentucky (Figure 1) shows the number of vaccinations given by the mobile clinic team in each zip code by the poverty distribution of Jefferson County. This map serves as an illustration of promoting vaccine equity in Jefferson County by taking the vaccine directly into the most impoverished areas of the city (Bureau n.d.). Even though providing vaccines to minority communities was important, ensuring that vaccines were managed, prepared, and administered safely was pertinent. Vaccine administration errors can affect the efficacy and immunological response of the vaccine, this reduced the effectiveness of the vaccine and inadequate protection against SARS-Co-V2 is provided to the vaccine recipient. Ensuring that the vaccine administration training program for team leaders was one that was not only effective but also covered all aspects of providing safe injection practices including no vaccine administration errors.

Planning for mobile vaccination clinics started in spring of 2021. During this time, the CDC had not yet released any guidance on mobile COVID-19 vaccination clinic operations or requirements. With existing COVID-19 vaccines gaining increased emergency use authorization and expanded use, preparation, and storage recommendations, a major challenge to such a response involved the development of an education and training program for team leaders who trained a volunteer workforce and oversaw mobile vaccination clinic operations and activities. Vaccination clinics were staffed by a multidisciplinary volunteer workforce consisting of retired nurses, pharmacists, and physicians. Due to the pandemic, healthcare had suffered an immense loss of workforce and was experiencing shortages in all settings. Training team leaders to train and retrain a retired healthcare workforce underscores the importance of a sustainable training program. Preventing vaccination administration errors during mobile vaccination clinics required immediate attention and this was how a training manual with 15 total updates was created.

The need for patient safety includes multiple factors, such as safe and effective vaccination production, cold chain maintenance during transportation and storage, correct preparation of the vaccine, and the correct administration to the correct recipient (Smith, 2012). The team leader training was crafted with the understanding that due to the ever-changing nature of mobile vaccination clinics, the lack of a constant environment, and the skillset variability of team leaders and the mobile vaccination volunteer workforce, there was an increased risk for the occurrence of vaccination administration errors. An outcome of this understanding was the development and implementation of a standardized education and training approach for mobile vaccination team leaders.

Purpose & Specific Aims

The objectives of this project were to:

1. Evaluate the process effectiveness of a COVID-19 vaccine administration error prevention training program as perceived by the trainees (team leaders).

2. Assess the number and types of vaccination errors that occurred during mobile vaccination clinics.

Program Evaluation Framework Model

The CDC's Logic Model was implemented as a basis for developing a survey questionnaire to assess the effectiveness of a standardized training program for team leaders in preventing vaccination administration errors during COVID-19 mobile vaccination clinics. Following the logic model, key components for evaluation were determined, including inputs, activities, outputs, outcomes, and impact (CDC, 2017). For the inputs, information was gathered on the training program materials, resources, and participant characteristics. The activities involved conducting standardized training sessions and distributing the training materials. The outputs included the completion of the training program by team leaders. To assess outcomes, a survey questionnaire based on the CDC's logic model was developed. The questionnaire focused on team leaders' perceptions of the training program's effectiveness and reported vaccination errors during mobile clinics over 16 months of the mobile vaccination clinic lifespan. The logic model provided a structured framework for aligning project implementation steps with the desired outcomes, ensuring a comprehensive evaluation of the training program's effectiveness.

Methods

Design

This project is a program evaluation of a mobile vaccination team leader training program focused on reducing COVID-19 vaccine administration errors. The aim was to evaluate the process effectiveness of a COVID-19 vaccine administration error prevention training program as perceived by the trainees (team leaders) and to assess the number and types of vaccination errors that occurred during mobile vaccination clinics. The CDC's logic model is a good fit for this program evaluation project because the model of mobile clinics is relatively new and the only way to discover how successful the program is, is to evaluate it systematically.

Therefore, the CDC's logic model framework for program evaluation in public health is used to guide this project (CDC, 2017). The framework comprises steps in evaluation practice and standards for effective program evaluation.

Setting

Vaccination clinic sites were effectively coordinated by local community leaders, including the Louisville Metro Public Health and Wellness (LMPHW) and the Kentucky Nurses Association (KNA). These clinics were strategically held in a variety of accessible locations, such as outdoor spaces, well-ventilated indoor settings, local clinics, parking lots, libraries, halfway homes, adult daycares, gyms, and community and faith-based organizations. The mobile clinics were thoughtfully placed in walk-through and handicap-accessible sites to ensure easy accessibility for community members. Furthermore, to accommodate individuals working second and third shifts, the mobile vaccine clinics offered flexible hours and operated on various days, prioritizing convenience, and inclusivity for all members of the community.

Sample

Nurses are recognized as the most trusted profession for two decades consecutively (Gaines, n.d.), which constituted the sample for this study. Twelve team leaders comprised of a group of highly qualified professionals consisting of twelve advanced practice registered nurses (APRNs) and registered nurses (RNs) with specialized expertise in immunization, infection control, and education. Team leaders had nursing experience serving adult, geriatric, and pediatric populations. Team leaders played a crucial role in overseeing the operations of the mobile clinics. To ensure efficient clinic functioning, clinical and nonclinical volunteers were trained by the team leader before assuming their designated roles prior to every mobile vaccination clinic, without exception.

Context

As large drive-through mass vaccination events such as LouVax-Broadbent started dwindling down in Louisville, the most challenging part of COVID-19 vaccination efforts began with multiple smaller community outreach initiatives through mobile vaccination clinics. The goal of planning mobile vaccination clinics was to take COVID-19 vaccines directly into the hard-to-reach, underserved, low socio-economic areas of Louisville, directly to the people that needed it the most. The planning team was comprised of a multidisciplinary team consisting of researchers, clinicians, epidemiologists, infection preventionists, information technologists, and emergency preparedness personnel from the University of Louisville, Kentucky Nurses Association (KNA) and a host of planners at the Louisville Metro Department of Public Health and Wellness (LMPHW).

A major barrier was the community's distrust of the government due to the political discourse at the time, related to local protests and riots regarding the death of Breonna Taylor in Louisville. This increased vaccine hesitance, and low confidence in vaccines among minority communities with low vaccination rates. To foster a culture and environment of change, we conducted over fifty virtual and in-person listening sessions in Louisville and across the Commonwealth, to engage and educate prominent community leaders and members of the communities about the importance of vaccinations that we held repeated mobile clinics in. During these sessions, we learned that vaccine hesitance was a barrier to vaccination. During community listening sessions conducted by the author in majority African American communities, minorities expressed that past historical events such as the Tuskegee Study deterred them from obtaining COVID-19 vaccines that were encouraged by the government. We were able to debunk myths and promote confidence in vaccines through question-and-answer sessions and by building a report. We also asked if they were willing to receive the vaccine from us through mobile clinics and the majority agreed that they would. Therefore, mobile vaccination clinics were fully operated beginning March 2021 and continued for 16 months with the last day of operation being July 2022, when federal grant funding that supported mobile vaccination clinics ended.

Ethical Considerations

The project proposal was submitted to the University of Louisville's Internal Review Board (IRB) and it was approved, and project permission was granted.

Intervention Implementation

Mobile COVID-19 vaccine clinics attempted to adopt training methods used during LouVax Broadbent drive-through vaccine clinics. However, we quickly learned that the development of a standardized training approach for team leaders was necessary for mobile clinics to be successful and sustainable. Effective implementation of team leader training included one overarching goal with associated procedures: to ensure the protection of the COVID-19 vaccine. This project focuses on evaluating the effectiveness of the team leader training program in reducing vaccination administration errors during mobile vaccination clinics. Aspects of training for team leaders were focused on all the competencies required for distinct roles during the clinic. Vaccine recommendations for handling, storage, and preparation were guided by the CDC (CDC, 2022), while training procedures, manuals, tools, and resources for training were created by infectious disease experts and nurses with the KNA. Initial training resources were developed by the Center for Education and Training in Infection Prevention

(CETIP) personnel and updated frequently by personnel at the Kentucky Infection Prevention Training Center (KyIP) and the Kentucky Nurses Association (KNA) as part of continuous performance assessment and quality improvement.

Protecting the Vaccine

The Louisville Metro Public Health & Wellness (LMPHW) personnel delivered all vaccines and supplies to the mobile site using vaccine-grade transport refrigerators accompanied by data loggers for temperature monitoring. A designated LMPHW transporter remained with the vaccine cooler during the entire clinic and completed the hourly vaccine cooler temperature monitoring log as standard practice. The vaccine cooler containing the vaccine was never left unattended to ensure the safety of the vaccine. Prior to the session, the team leader would verify that the vaccine cooler was plugged into a functioning power outlet, the vaccine type, the number of doses received, the vaccine lot number, and the expiration date on each vaccine vial. This information was verified and compared to the stickers containing vaccine information that were placed on the CDC vaccine card. When all the information matched, the stickers were distributed to the appropriate vaccination stations. Transport refrigerators contained a single type of vaccine from a single lot. If multiple lots or vaccine types were delivered, they would each be in a separate transport refrigerator and would remain separated throughout the vaccine event day. Due to a constantly changing environment with each clinic, ambient temperatures were monitored to ensure that prepared doses of vaccine were not subjected to unfavorable or harsh temperatures that will negatively affect the integrity of the vaccine.

Preparing the Vaccine

Differences in vaccine dosages, dilution processes, and preparation logistics made vaccine preparation a particularly challenging process that required a more focused approach and attention to detail. To facilitate efficiency and prevent vaccine error, the processes were divided into multiple steps with personnel assigned specific responsibilities. Individuals responsible for vaccine preparation reviewed the vaccination preparation guide resource prior to beginning vaccine preparation. Prior to vaccine preparation, table surfaces were disinfected, and hand hygiene was performed. Syringe and needle packages were opened and handled in a way that prevented contamination or touching of sterile areas of those items. The needle was immediately connected to syringes when packages were opened. Prepared syringes were placed on a dental bib in preparation for filling. When filled, syringes were placed into plastic storage containers where the team leader would assess each filled syringe prior to distribution to the vaccine tables. Unfilled syringes were not stored in plastic containers to prevent inadvertently sending unfilled syringes to the vaccination table.

Vaccine protective training activities

The training utilized a blended learning approach, incorporating a comprehensive 4- hour in-person session complemented by hands-on activities and simulation scenarios. To cater to diverse learning styles, preferences, and logistical constraints, online modules like the CDC's "You Call the Shots" vaccine web-based raining course were also included. This hybrid methodology guaranteed optimal engagements and flexibility for team leaders, enabling them to participate fully in the training program. The training manual included topics focused on: 1) checking expiration dates of vaccine; 2) monitoring the temperature and environmental conditions of the vaccine throughout the preparation and dilution processes; 3) selecting and using appropriate needle and syringe combinations for preparation and administration; 4) drawing up all doses from a reconstituted vial before distributing it to vaccination stations; 5) preparing vaccine so that each syringe was ready for injection; 6) labeling and delivering syringes to the vaccination table; 7) maintaining the filled syringes through delivery to the vaccination stations and until administration to the vaccine recipient; 8) monitoring of time between vaccine vial removal from the refrigerated environment and vaccine administration; and 9) utilizing color-coded visual cues to differentiate between various vaccine types and doses.

During large vaccination events with multiple vaccine types, doses, and formulations present, vaccine safety was enhanced by color-coding syringe labels and table clothes. This was done to clearly separate the adult from the pediatric doses as with the Pfizer vaccine or when there was a difference in dosages between the primary series and booster doses as seen with Moderna.

To facilitate efficiency and prevent error, the processes were divided into specific steps, with personnel assigned specific responsibilities (Carrico et al., 2022). Training included a review of infection control basics (such as hand hygiene, safe injection practices, syringe and needle review emphasizing safety retractable needle), PPE including masks and glove availability, and any process updates such as dosage changes for the Moderna booster versus its primary series dose. The team leader included worker safety elements in continuous monitoring real-time intervention, as appropriate.

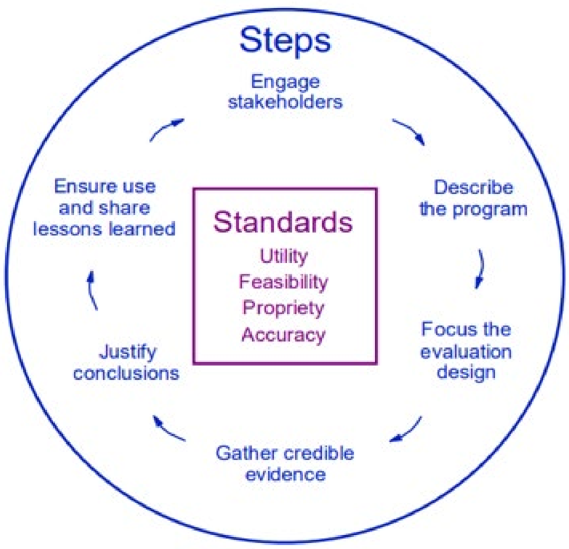
Data Collection and Data Analysis

Through Redcap, a secure survey link was sent out via email to all 12 team leaders. Data were anonymous and were exported into a spreadsheet for analysis.

Measures

The CDC's logic model framework for program evaluation in public health served as the foundation for evaluating the effectiveness of the training program in this project (CDC, 2017). In this project, effectiveness was defined as the extent to which the trainees perceive the COVID-19 training program as successful in terms of its utility, feasibility, propriety, and accuracy.

Figure 2. *CDC Logic Model for Public Health*



This model was developed by the Centers for Disease Control and Prevention in 2018. It depicts the relationship between your program's activities and its intended effects. From Centers for Disease Control and Prevention. (2018, December 18). Logic Models - Program Evaluation - CDC. Centers for Disease Control and Prevention. Retrieved November 14, 2022, from https://www.cdc.gov/evaluation/logicmodels/index.htm

Demographic data

Demographic data were collected by two questions about the number of years working in the nursing field and the number of years of vaccination administration. Frequency, percentage, mean, and standard deviation was calculated to generate descriptive results.

Perceptions on process effectiveness of training program

A 9- item survey of the study was constructed by the DNP student to measure the effectiveness of the training program process as perceived by team leaders (trainees). The tool incorporates a 7-item Likert scale, one select-all-that-apply question, and an open-ended question. based on its suitability for capturing nuanced responses and allowing participants to express their level of agreement with specific statements. Questions 1, 4, and 9 were designed to gauge the utility of the program, focusing on its practicality, usefulness, and value. Questions 2, 3, and 8 focused on the feasibility of the evaluation tool itself, examining its ease of use, clarity, and resource requirements. Question 7 targeted the accuracy of the evaluation, ensuring that the assessment aligned with the intended goals and objectives of the program. Finally, questions 5 and 6 addressed the propriety of the program, considering ethical and cultural appropriateness. Subsequently, the faculty chair and faculty member who are PhD-prepared with the skills and knowledge of tool development management reviewed the survey. Then the DNP student revised the scale based on the faculty's comments to finalize the survey. See Appendix C.

To examine the reliability of the survey, Cronbach's alpha coefficient was calculated on the 7 Likert-typed items, using R statistical software. Cronbach's alpha indicates internal consistency of a set of survey items to determine if the items in the survey consistently measure the same underlying construct or characteristic. A higher Cronbach's alpha coefficient suggests greater agreement between the survey items, indicating that the items in the survey instrument reliably measure the intended construct. By calculating Cronbach's alpha coefficient, the reliability of the survey instrument in measuring team leaders' perceptions of the training program's effectiveness was ensured. The high internal consistency indicated by the coefficient enhances the confidence in the survey results, providing a robust measurement of the effectiveness of the team leaders' perception of the training program. The resulting Cronbach's alpha coefficient for the Likert scale survey used in this study was found to be 0.82. This value indicates good internal consistency among the items.

Number and types of vaccination errors

The number and types of vaccination administration errors obtained from KNA were entered into an Excel file and were analyzed to generate frequency, percentage, rate by month, and total error rate (Table 3). All analyses were done in Microsoft Excel.

Results

Demographic results

All 12 team leaders responded to the survey, and all had 10 or more years of experience in nursing. About 5 out of 12 reported having 0-5 years of experience administering vaccines and 7 out of 12 had 10 or more years of experience (Table 1).

Process evaluation results

Participants reported using multiple training materials resources, averaging high mean scores. Participants used 4.4 resources out of 5. All respondents strongly agreed that a standardized training process is necessary for team leaders. Overall, participants reported positive perceptions on the Likert-typed questions as evidenced by high mean scores on all items. See Table 2. The importance of staying up to date on vaccine administration was strongly agreed on, followed by feelings of being prepared and competent to run a vaccination clinic. Based on the open-ended question, team leaders provided suggestions on strategies that they felt would improve training. Suggestions included focus groups, feedback opportunities, continuing education potential, yearly training requirements, longer training session requirements, and the inclusion of scenario-based discussions during training.

The Mann-Whitney U test was used to examine the difference at the item and scale levels. A p-value of (.465) suggests no statistical significance ($p > 0.05$) was not found regarding the effectiveness of the training program between nurses with different years of experience in vaccine administration (Table 2).

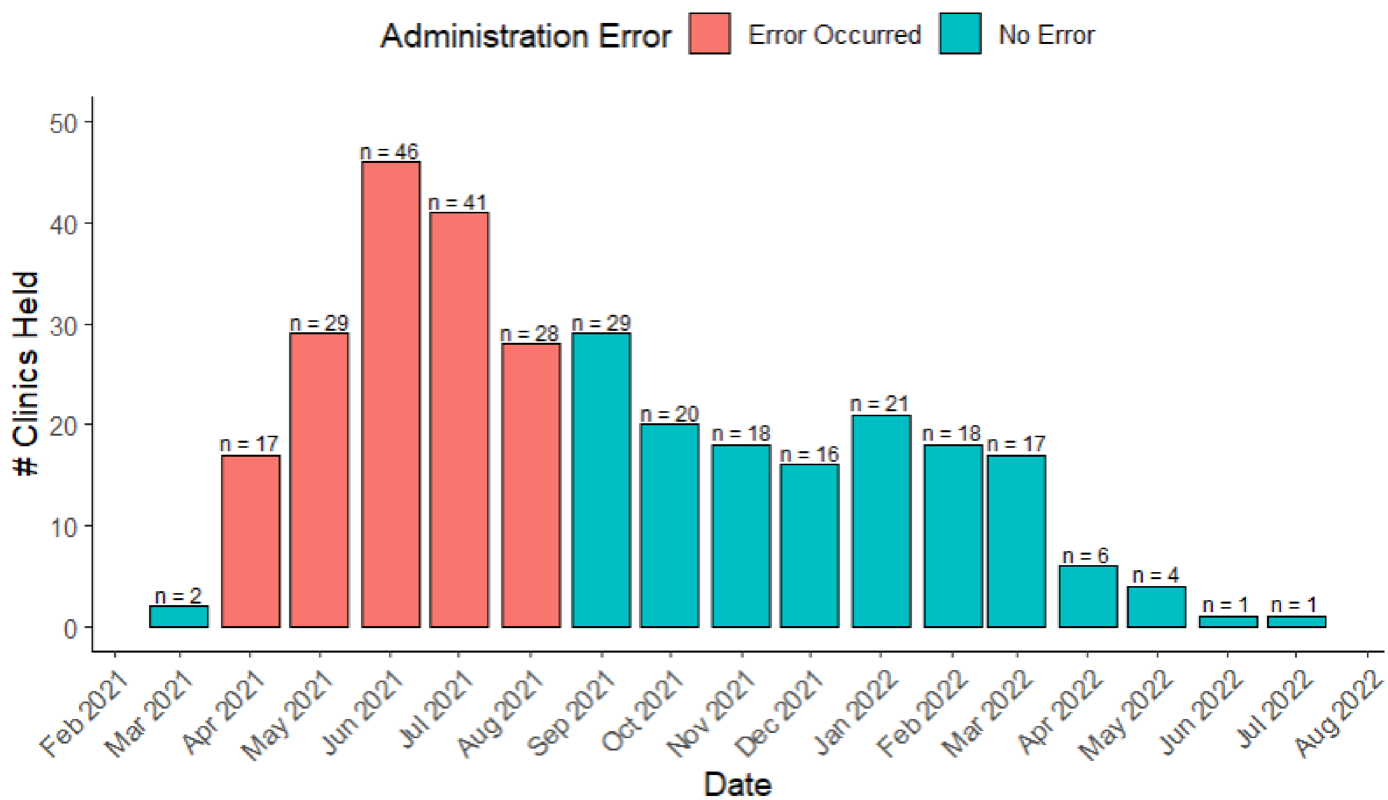
Number and types of vaccination errors

When analyzing KNA records containing vaccine errors the date, types, description, and intervention implemented when vaccination errors were recorded. Vaccination errors occurred during the first 5 months of the mobile clinics. The remaining 11 months yielded no error. Figure 3 revealed that the greatest number of vaccination errors occurred during months when the most vaccination clinics were held. There was a high number of clinics held in June ($n = 46$), but fewer were held in May ($n = 29$) which was the month where the greatest number of vaccines were administered in the community ($n = 1180$) (Figure 3). Overall, the rate of errors was .001 (9/8086).

When looking at actual errors that occurred during mobile vaccination clinics, a total of nine vaccination errors were recorded between May 2021 and June 2022. Error types were classified as incorrect client, medication, time interval, dose, route, medication not given, expired medication administered, or expired consent. See a table summary of recorded errors in Appendix D. Four of the nine errors were classified as procedural errors. A procedural error occurred when the patient’s date of birth was not verified, which led to the incorrect dose being administered. Vaccination errors occurred mainly during the first five months of the mobile vaccination operations (Figure 3). The remaining eleven months yielded no vaccination error occurrences.

Figure 3

Frequency distribution of mobile clinic vaccination errors



Discussion

Summary

The purpose of this project was to evaluate the process effectiveness of the training program as perceived by the team leaders and to assess the number of vaccination errors that occurred during mobile vaccination clinics. Overall, the results indicate a positive perception of the training program among the team leaders, with suggestions provided for further enhancement. The findings shed light on roles and responsibilities as it relates to workload during the vaccination clinic, while emphasized the need for ongoing monitoring and strategies to minimize vaccination errors during peak clinic periods as more errors tend to occur during high frequency clinics (Figure 3). These insights will inform future improvements to the training program and help create a safer and more efficient mobile vaccination initiative.

The CDC's logic model framework for program evaluation in public health served as the foundation for evaluating the effectiveness of the training program in this project. To operationalize the definitions and ensure a comprehensive evaluation, a process evaluation scale was developed based on the CDC's logic model. This scale consisted of 9 items that aligned with the four attributes outlined in the logic model: utility, feasibility, propriety, and accuracy. By aligning the evaluation tool with the logic model standards, this approach ensured that the evaluation process captured the key dimensions and criteria necessary to assess the training program's effectiveness. The use of operationalized definitions and a systematic evaluation scale allowed for a comprehensive analysis of team leaders' perceptions, providing valuable insights into the program's strengths and areas for improvement.

In this project, all 12 team leaders had extensive experience in the field as either an RN or APRN, with 5 out of 12 having 0-5 years of experience in administering vaccines and 7 out of 12 having 10 or more years of vaccine administration experience. This distribution of experience levels may suggest a diverse perspective on the evaluation of the training program. Results of the training program process effectiveness showed that team leaders utilized multiple resources for training with a high average of 4.41 out of a total of 5 resource training materials accessed. This finding indicates that team leaders value access to various materials to support their training and professional development, highlighting the thoroughness of their engagement with available resources.

Overall, participants perceived the training program as effective by demonstrating a strong agreement regarding the necessity of a standardized training process for team leaders as noteworthy and the importance placed on consistency and uniformity in training approaches. It also underscores the desire for clear guidelines and protocols to ensure a standardized and effective vaccination program. The survey results indicated that team leaders recognized the importance of staying up to date on vaccine administration, which reflects their commitment to delivering safe and accurate vaccinations. Their feelings of preparedness and competence to run a vaccination clinic further indicate the value they place on their roles and responsibilities. The suggestions provided by the team leaders for improving the training program, such as focus groups, feedback opportunities, continuing education, and longer training sessions, demonstrate their proactive mindset and desire for continuous improvement. At the item and scale levels, statistical significance was not found regarding the effectiveness of the training program among nurses with different years of experience in vaccine administration. This indicates that the years of experience in vaccine administration among nurses did not have a significant impact on the effectiveness of the training program.

Analyzing the KNA records of vaccination errors revealed that the highest number of errors occurred during months with a greater number of vaccination clinics. This finding suggests a potential relationship between workload and error occurrence, highlighting the importance of adequately managing resources and ensuring sufficient staffing during busy periods. The variation in the number of clinics held in June compared to May, despite the higher number of vaccines administered in May, raises questions about the factors contributing to this discrepancy and warrants further investigation.

There were 9 procedural errors detected during vaccination administrations. The errors occurred when the patient's date of birth was not verified, resulting in incorrect dose being administered. The interventions implemented to reduce future occurrences included a discussion between the team leader and other nursing personnel involved on the need to review the patient encounter form and verify each patient's date of birth and vaccine dose prior to vaccination. The literature supports additional interventions include updating the training manual as part of the training quality improvement process, multiple interventions that can prevent vaccination errors such as establishing ongoing education of staff who dispense, prepare, and administer vaccines (Barboza et al., 2020). This led to the development and implementation of a "cheat sheet" that was made available at registration and at every vaccination and pharmacy station. The cheat sheet contained the age a patient should be to be eligible to receive a certain dose of COVID-19 vaccine on that day. All vaccination errors occurred during the first five months of the mobile clinic. Over the entire 116-month span of mobile vaccination clinics, the training manual had eighteen updates through continuous process improvement. Early detection of errors, process, and procedure updates led to a decline in ongoing errors during the remaining clinic months. Updates included developing resources such as checklists and short training videos that team leaders could utilize as a guide to ensure that they cover important topics with volunteers prior to the start of the clinic. Training resources can be found in the appendix section. Furthermore, the literature supports that implementing more safety checks is needed for vaccines with complex schedules (Reed et al., 2019). According to Hampton, introducing auto-disable syringes into immunization programs will help prevent vaccine handling and administration errors, fortunately, none of the actual errors that occurred during mobile vaccination clinics were device-related (Hampton, 2020).

During the debrief session at the end of each clinic was where many of the barriers or challenges were uncovered. The debrief was an extremely impactful tool during mobile vaccination clinics. They provided an opportunity for each member of the vaccination team to reveal what went well, and what did not go well, and for them to provide any suggestions on how unfavorable events or near misses can be prevented during subsequent clinics. The debriefing process made volunteers feel valued and part of the quality improvement process that ultimately informed and impacted outcomes and safe vaccine administrations.

Limitations

The results presented in this study are subject to certain limitations. All 12 team leaders had extensive experience in the nursing field. This composition of experienced team leaders may not fully represent the potential range of outcomes and perceptions that could be observed with a more diverse sample, including novice healthcare providers who might have different training needs. Specifically, the effectiveness of a training program can vary depending on the experience level of the healthcare provider. A program designed for novice healthcare providers may not be as effective for more experienced individuals who may require more advanced training and education. In this study, most team leaders had over 10 years of experience in both nursing and vaccine administration, which may have influenced their perceptions and responses to the training program. The other limitation includes the nature of questions that asked only about the number of training materials used. In future studies, asking participants to rate the quality of each material will be helpful.

Despite these limitations, evaluating the effectiveness of standardized mobile vaccination clinic training programs is crucial for ensuring the safety and efficacy of vaccination administration. Continued research in this area is warranted to identify best practices and develop effective training programs that can be tailored to different populations, vaccine types, and settings. By addressing these limitations, future studies can provide more comprehensive insights into the impact of training programs on healthcare providers' perceptions and the overall quality of mobile vaccination clinics.

Conclusion

In conclusion, results of the training program process effectiveness have yielded promising results. Regardless of their experience levels in vaccination administration or nursing, the team leaders found the training program to be highly useful and effective. This indicates that the program effectively catered to the diverse needs and backgrounds of the team leaders, ensuring their comprehension and proficiency in vaccination administration and the prevention of vaccination errors.

Furthermore, a meticulous assessment of the vaccination errors that occurred during the mobile vaccination clinics revealed an impressively low overall error rate of .001. This result provides strong evidence that the training program successfully mitigated vaccination administration errors and met the satisfaction level of the team leaders. These findings highlight the program's efficacy in enhancing the overall quality and safety of the vaccination process.

This project has not only fostered a culture of excellence in vaccination administration but has also ensured the utmost satisfaction and confidence among team leaders and members of the Louisville community.

The evaluation affirms that the training program has been a resounding success. Its impact on minimizing errors and meeting the expectations of the team leaders showcases its effectiveness and value. The lessons learned and the achievements made through this project will undoubtedly contribute to the improvement of future vaccination programs and reinforce the importance of continuous comprehensive training in both traditional and none- traditional healthcare settings to ensure the advancement of safe and effective vaccination practices.

Tables

Table 1.

Demographics of Team Leaders

Years of Experience	*How many years of experience do you have in the nursing field?* *n (%)*	*How many years of experience with vaccine administration do you have?* *n (%)*
0-1	0 (0)	0 (0)
1-5	0 (0)	5 (42)
6-9	0 (0)	0 (0)
10 or more	12 (100)	7 (58)

Table 2.

Mean and standard deviation of participant perceptions on training program effectiveness with results of independent t-test by vaccine administration experience (1-5 years vs. ≥10 years)

Survey Question	*All participants Mean (SD) n = 12*	*Participants with 1 – 5 years of vaccine administration experience. Mean (SD) n = 5*	*Participants with ≥10 years of vaccine administration experience. Mean (SD) n = 7*	*P-value*
1. How effective was the training that you received at preparing to prevent vaccine administration errors during mobile vaccine clinics?	3.91 (0.29)	4.00 (0.00)	3.86 (0.38)	.749
2. To what extent do you believe the process of preventing vaccination administration errors through standardized training was successful?	3.91 (0.29)	4.00 (0.00)	3.86 (0.38)	.749
5. After completing the team leader training process, I felt well-prepared to oversee a vaccination clinic independently.	3.63 (0.49)	3.80 (0.45)	3.57 (0.53)	.569
6. After training I felt competent to assign roles and train volunteers during mobile vaccine clinics.	3.63 (0.49)	3.80 (0.45)	3.57 (0.53)	.569
7. A standardized training process is necessary for TL as one strategy to prevent vaccination administration errors during mobile vaccination clinics	4.00 (0.00)	4.00 (0.00)	4.00 (0.00)	.936
8. Staying up to date on vaccine administration updates is important to me in my role as a team leader.	3.81 (0.39)	4.00 (0.00)	3.71 (0.49)	.465
9. How would you rate the overall quality of the team leader training?	4.00 (0.00)	4.00 (0.00)	4.00 (0.00)	.936
Total Score (Summed Scores)	**24.92 (7.65)**	**27.60 (0.89)**	**26.57 (1.99)**	**.465**

Table 3.

Frequency and Percentage of Vaccination Errors

Date of Mobile Vaccination Clinic	*Janssen Vaccine Administered*	*Moderna Vaccine Administered*	*Pfizer Vaccine Administered*	*Total Vaccine Administered per Month*	*Vaccination Error (Frequency)*	*Vaccination Error (%)*
March 2021	95	130	0	225	0	0
April 2021	599	639	0	1238	1	0.08
May 2021	21	1159	0	1180	3	0.25
June 2021	7	988	12	1007	2	0.20
July 2021	45	301	192	538	2	0.37
August 2021	30	226	400	656	1	0.15
September 2021	36	7	524	567	0	0
October 2021	0	0	288	288	0	0
November 2021	0	0	564	564	0	0
December 2021	0	93	670	763	0	0
January 2022	0	0	440	440	0	0
February 2022	0	12	337	349	0	0
March 2022	0	0	164	164	0	0
April 2022	0	2	105	107	0	0
May 2022	0	0	0	0	0	0
June 2022	0	0	0	0	0	0
Total	833	3557	3696	8086	9	.001

Appendices

Appendix A. Demographics Tool
Please answer all the questions below

1. How many years of experience do you have in the nursing field?			
0-1 years	1-5 years	6-9 years	10 years or more
2. How many years of prior experience with vaccination administration do you have?			
0-1 years	1-5	6-9	10 years or more

Appendix B. Evaluation Tool

1. How effective was the training that you received at preparing to prevent vaccine administration errors during mobile vaccine clinics?	Not effective	Somewhat Effective	Effective	Very effective
2. To what extent do you believe the process of preventing vaccination administration errors through standardized training was successful?	Unsuccessful	Somewhat Successful	Successful	Very Successful
3. What strategies can be implemented to improve the team leader training on vaccine administration error prevention process?	Enter Response			
4. Which of the following (if any) resource training material did you use? Select all that apply. a) Standard Operating Procedures (SOP) b) Training manual c) Checklists d) Training videos e) CDC resources f) None of the above				
5. After completing the team leader training process, I felt well prepared to oversee a vaccination clinic independently.	Strongly disagree	Disagree	Agree	Strongly agree
6. After training I felt competent to assign roles and train volunteers during mobile vaccine clinics.	Strongly disagree	Disagree	Agree	Strongly agree
7. A standardized training process is necessary for TL as one strategy to prevent vaccination administration errors during mobile vaccination clinics	Strongly disagree	Disagree	Agree	Strongly Agree
8. Staying up to date on vaccine administration updates is important to me in my role as a team leader.	Strongly disagree	Disagree	Agree	Strongly Agree
9. How would you rate the overall quality of the team leader training?	Poor	Fair	Good	Excellent

Appendix C. Process Evaluation Scale based on CDC Logic Model

Mobile Vaccination Evaluation Tool	CDC Logic Model Standard
1. How effective was the training that you received at preparing you to prevent vaccination administration errors during mobile vaccine clinics?	Utility
2. How successful do you believe the process of preventing vaccination administration errors through standardized training was?	Feasibility
3. What strategies can be implemented to improve the team leader training on vaccine administration error prevention process?	Feasibility
4. Did you use the resource training material provided? (SOP training manual, checklists, training videos, CDC resources)	Utility
5. After completing the team leader training process, I felt well prepared to oversee a vaccination clinic independently.	Propriety
6. After training I felt competent to assign roles and train volunteers during mobile vaccine clinics.	Propriety
7. How would you rate the overall quality of the team leader training?	Accuracy
8. A standardized training process is necessary for TL as one strategy to prevent vaccination administration errors during mobile vaccination clinics	Feasibility
9. Staying up to date on vaccine administration updates is important to me in my role as a team leader.	Utility

Appendix D. Summary of Kentucky Nurses Association (KNA) Data Showing Number and Type of Vaccination Errors that occurred during Mobile Vaccination Clinics (April 1,2021 – May 21, 2022)

Date Error Occurred	Type of Error	Description of Error	Intervention
4/26/2021	Medication Error	Patient birthday was not verified before vaccine administration	Discussion with nurses and other personnel involved on the need to review the patient encounter form and verify date of birth
5/8/2021	Procedural Error	Patient birthday was not verified before vaccine administration	Discussion with nurses and other personnel involved on the need to review the patient encounter form and verify date of birth
5/22/2021	Procedural Error	Patient birthday was not verified before vaccine administration	Discussion with nurses and other personnel involved on the need to review the patient encounter form and verify date of birth
5/24/2021	Procedural Error	Patient birthday was not verified before vaccine administration	Discussion with nurses and other personnel involved on the need to review the patient encounter form and verify date of birth
6/5/2021	Procedural Error	Patient birthday was not verified before vaccine administration	Discussed essential need to review the patient encounter form in its entirety. KNA team leaders instructed to review the requirements for patient encounter form review with all KNA volunteers at EVERY clinic
6/21/2021	Medication Error	Underage administration of Moderna vaccine (<18 y/o)	Discussed essential need to review the patient encounter form in its entirety. KNA team leaders instructed to review the requirements for patient encounter form review with all KNA volunteers at EVERY clinic
7/16/2021	Vaccine Handling Error	Pfizer diluent was not measured accurately.	Patients who received inaccurate dose were emailed. Review of Pfizer reconstitution process
7/22/2021	Administration Error	Underage child received vaccination	Discussed essential need to review the patient encounter form in its entirety. KNA team leaders instructed to review the requirements for patient encounter form review with all KNA volunteers at EVERY clinic
8/8/2021	Medication Error	Incorrect dose administered	Discussed essential need to review the patient encounter form in its entirety. KNA team leaders instructed to review the requirements for patient

			encounter form review with all KNA volunteers at EVERY clinic

Appendix E. Mobile Vaccination Clinic Orientation Training Checklist for Team Leaders

KENTUCKY NURSES ASSOCIATION

Training Checklist

KNA Team leader Responsibilities

- Ensure that the vaccine cooler is plugged in, and that the cooler temperature is within range (36° to 46°F).
- Verify that the vaccine lot number and expiration date on each vaccine vial match the information on the vaccine stickers that are provided by the LMPHW- see new information dated August 21 for Pfizer
- Verify number of vaccine doses on site at the start and at the end of the mission.
- Locate sealed orange emergency tackle box. Verify medication listed and expiration dates listed on sealed box, Benadryl, Epinephrine, Epi-pen, medicine cups and syringes. Ensure pediatric dosing for epinephrine is on site. Contents of the emergency tackle box are included in this manual.
- Review indications for use, doses, and route of administration to manage vaccine emergencies.
- Manage emergency issues and contact EMS and LMPD, if needed
- Verify date stamps at every vaccination station for the correct second dose/ return date:
- Primary series intervals: 4 weeks for Moderna, 3 weeks for Pfizer, one dose only for Janssen. (See chart).
- Booster dose interval after primary series: 5 months for Moderna and Pfizer, 2 months for Janssen. (See chart
- Third doses are administered to immunocompromised individuals for 28 days (about 4 weeks) after completion of the primary dose series.
- Make volunteer assignments based on competency.
- *Orient each volunteer to their role.*
- Remind volunteers that eating and drinking at the vaccine and pharmacy stations are not permitted. If a volunteer may need to eat or use the restroom, the team leader or a different volunteer can be assigned to relieve them.
- Orient volunteers when and how to access “Dr. Strong” – as the code for needing assistance immediately.

Registration

- Verify the vaccine recipient's date of birth**. Must be eighteen years and older to receive Moderna and Janssen vaccine. Must be twelve years and older to receive the adult**

Pfizer vaccine, and between the ages of 5-11 years old for Pfizer pediatric vaccine. A parent or legal guardian will need to sign (or be available for telephone contact to provide consent for children 12-17) and complete the minor consent form before the minor can proceed to the vaccination station. Children 5-11 years old must be accompanied by an adult or guardian.

- Add orange sticker to the top of the PEF and write the age of the pediatric patient that will be receiving pediatric vaccine (children ages 5 through 11 years).
- Ensure that printing is legible and that all names and last names appear on the PEF in the correct order and with the correct spelling.
- Verify first, second, third, or booster dose, vaccine type and duration since last dose was administered (5 months- Pfizer and Moderna, 2 months- Janssen).
- Take the patient's temperature. If the temperature is 100.4 Fahrenheit (38 Celsius) degree or greater notify KNA team leader immediately.
- Review of paper consent form (PEF) to ensure completion of all patient and insurance information.
- Direct patients to pre vaccination waiting area.

Vaccinator

- Verify patient's name, last name, and date of birth prior to vaccinating. Ask the patient their age. **On the day of vaccination**, the vaccine recipients must be eighteen years and older to receive Moderna and Janssen vaccine. Recipients must be twelve years and older to receive the adult Pfizer vaccine and 5-11 years of age to receive pediatric Pfizer vaccine.
- A parent or legal guardian will need to sign the consent form before the minor should be vaccinated. Telephone permission may be obtained if the parent is not present. Children 5-11 must be accompanied by a parent or guardian. Parent or legal guardian should sign and print their name on the consent.
- Ask the patient if they have questions regarding the vaccination or the process for today.
- If the vaccine recipient is to receive their second dose, third dose or booster and does not have their vaccine card, the previous vaccine name and lot number information can be looked up in Sales Force or in the vaccine registry (KYIR) by IT personnel on site. If an individual is a veteran and they received it at a Kentucky VA site call Delanor to contact the VA. If **the date or manufacturer of the first dose cannot be verified, a second or booster dose cannot be provided.**
- Vaccination screening questions reviewed with patient and completed on PEF [handout]
- Sanitize hands prior to touching vaccine equipment or patient.
- Disinfect table and organize supplies.
- Review syringe type and safety device use
- Orient each vaccinator to their station and on which age group they will be providing vaccine to.
- Verify correct dose and check for large bubbles in the syringe prior to vaccination.
- Identify deltoid injection landmarks.
- Identify correct needle length for patient.

- Review injection technique for IM deltoid administration
- Review sharp's safety
- Provide patient education regarding what may be expected post-vaccination and printed materials.
- Ensure injection information is completed on PEF including vaccine lot #, administered by, arm vaccine injected, provider number and signed by injector.

Vaccination Assistant

- Complete CDC vaccination card with name, verify date of birth, vaccine sticker (if available, if not available handwrite the information), write-in site location name and today's date.
- Date to return for 2nd dose, if indicated (verify that return date on stamp is correct).
- Time out card with 15 minutes from vaccination time in black or 30 minutes in red.
- Give time out card and vaccination cards to patient and direct them to post-vaccination waiting area with instructions how to notify personnel if needed.

Pharmacy

- *KNA Team leaders or trained pharmacy personnel are responsible for reconstituting the Pfizer pediatric vaccine. KNA team leaders verify that anyone assigned as the pharmacist has watched the video and reviewed the step-by-step instructions. Team leader must review the Pfizer reconstitution video and steps prior to the vaccine event. Link to the video: https://www.dropbox.com/s/aehyze8rfytjmfv/Pfizer%20Diluent%207%201%202021%20v3.mp4?dl=
- Ensure information on vaccine stickers matches vaccine vials in cooler (e.g., brand, lot #, number of vials)
- Review vaccine dosage
- Vaccine temperature monitoring
- Review needles and syringes
- Handle needles and syringes to maintain sterility.
- Drawing vaccine from the vial
- Quality check of doses, syringe caps and connections (ensure needle and syringe connections are secure to prevent vaccine from leaking).
- Apply appropriate vaccine color-coded sticker to individually prepared vaccine doses.
- Maintain vials for dose count checks.
- Monitor when to open next vaccine vial with consultation with the Team Leader

Post-Vaccination Monitoring

- Monitor patient time out cards.
- Provide instructions to volunteer to monitor.
    - Difficulty breathing
    - Light headedness
    - Tingling of arm or other body parts

- Rash
- Headache
- Nausea
- Diarrhea
- General uneasiness

If any of the above happen notify the KNA team leader immediately

Post Clinic Debrief

- Verify the number of vaccine doses provide during the clinic
- Check Moderna vials to ensure those that have been pierced 20 times are removed from use and remaining doses evaluated for waste report
- Verify waste and rationale for waste
- Verify the number of doses to be returned to the health department
- Ensure syringes and open vials are labeled with date, time of opening and initials of the person who prepared if to be transported to a site later in the day
- Waste vaccine in syringes by emptying the contents into the sharp's container. Place the empty syringe in the sharp's container
- Place empty vials and vials with vaccine to be to be wasted in the sharp's container
- Validate the waste on the vaccine log.
- Sign the vaccine return log to indicate the number of doses to be returned to the LMPHW
- *Call, email, or text Delanor with number of vaccines provided, wasted vaccine, clinic opportunities for improvement and clinic end time*

Appendix F. Booster and Third Dose and Age Cheat Sheet

BOOSTER Cross-product boosters remain allowable	PFIZER (Adult Gray Top- No Dilution)	MODERNA	JANSSEN
WHEN CAN YOU GET A BOOSTER? AFTER COMPLETION OF PRIMARY SERIES (1st, 2nd, 3rd DOSE)	5 MONTHS	5 MONTHS	2 MONTHS Only recommended for individuals 18 and older who cannot safely receive an mRNA vaccine
BOOSTER AGE DOSE	AGE: 12 + DOSE: 0.3 mL	AGE: 18 + DOSE: 0.25 mL	AGE: 18 + DOSE: 0.5 mL
THIRD DOSE Indicated for Moderately to Severely immunocompromised individuals *PART OF PRIMARY DOSE SERIES	PFIZER	MODERNA	JANSSEN
WHEN CAN YOU GET A THIRD DOSE?	28 days after completion of primary series	28 days after completion of primary series	NO GUIDANCE
THIRD DOSE AGE DOSE	PEDIATRICS AGE: 5-11 DOSE: 0.2 mL/ 10mcg (Dilute with 1.3 mL Normal saline) ADULTS AGE: 12+ DOSE: 0.3mL/ 30mcg	AGE: 18 + DOSE: 0.5 mL	NO GUIDANCE

Appendix G. Color-Coded Vaccine Dose and Age Chart

Vaccine	Vial Cap/ Table Color	Diluent	Dosage	Age	DOB Range*
Pfizer (primary series- 1st,2nd,3rd dose) *this vaccine may also be used as booster for prior "Pfizer Purple" doses		DO NOT Dilute	0.3 mL	12 years and above	
Pfizer (pediatric vaccine) *not interchangeable with other Pfizer vaccines)		1.3 mL normal saline diluent added to vial	0.2 mL	5 - 11 years	
Moderna (primary series- 1st,2nd,3rd dose)		DO NOT Dilute	0.5 mL	18 years and above	
Moderna booster 0.25mL [ages 18 and above]		DO NOT Dilute	0.25 mL	18 years and above	
Janssen (primary series- single dose)		DO NOT Dilute	0.5 mL	18 years and above	
Flu vaccine		DO NOT Dilute	0.5 mL	5 years and above**	

Appendix H. Kentucky Nurses Association (KNA) Letter of Support

305 Townepark Circle; Ste 100
Louisville, KY 40243
502-245-2843
www.kentucky-nurses.org

KENTUCKY
NURSES ASSOCIATION

October 30, 2022

To Whom It May Concern:

The purpose of this letter is to inform you that I approve of Valenchia Brown's DNP project which focuses on **Evaluating the Effectiveness of a Standardized Mobile Vaccination Clinic Training Program in Reducing Vaccination Errors.**

This project is an evaluation of our education and training program developed for training team leaders to oversee activities during mobile vaccination clinics. Vaccination administration errors is a patient safety issue and the expansion of knowledge and confidence for our team leaders will help provide the best results for the communities we serve.

Sincerely,

Delanor Manson

Delanor Manson, MA, BSN, RN
Chief Executive Officer
Kentucky Nurses Association

Appendix I. University of Louisville Internal Review Board Project Approval

Human Subjects Protection Program Office
300 E. Market Street, Suite 380
University of Louisville
Louisville, KY 40202

UNIVERSITY OF LOUISVILLE

DATE:	April 06, 2023
TO:	Ratchneewan Ross, Ph.D.
FROM:	The University of Louisville Institutional Review Board
IRB NUMBER:	23.0142
STUDY TITLE:	**Evaluating the Effectiveness of a Standardized Mobile Vaccination Clinic Training Program in Reducing Vaccination Administration Errors.**
REFERENCE #:	762525
DATE OF REVIEW:	04/05/2023
CONTACT FOR QUESTIONS:	Sherry Block 852-2163 slbloc04@louisville.edu

The amendment has been received by the Human Subjects Protection Program Office and approved by the Chair/Vice Chair of the Institutional Review Board (IRB) on 04/05/2023 through the expedited review procedure according to 45 CFR 46.110(B). The following documents have been reviewed and approved:

Title	Version #	Version Date	Outcome
Protocol Revised 4/4/23:Evaluating the Effectiveness of a Standardized Mobile Vaccination Clinic Training Program in Reducing Vaccination Administration Errors	Version 1.2	04/03/2023	

The modifications include:
The sample size of the study changed from 10 to12 team leaders.

IRB policy requires that investigators use the IRB "stamped" approved version of informed consents, assents, and other materials given to research participants. The previous versions are no longer valid. For instructions on locating the IRB stamped documents in iRIS visit: https://louisville.edu/research/humansubjects/iRISSubmissionManual.pdf.

The committee will be advised of this action at a regularly scheduled meeting.

Thank you,
Laura Clark MD
Laura Clark, M.D., Chair,
Biomedical Institutional Review Board

We value your feedback; let us know how we are doing: https://www.surveymonkey.com/r/CCLHXRP

Appendix J. Example of Incident Report Form for Medication Errors

This section for Medication Errors Only

Error Type:

	Incorrect Client		Administered Expired Medication
	Incorrect Medication		Medication Not Given
	Incorrect Time Interval		Consent Expired
X	Incorrect Dose		
	Incorrect Route		

Name of Medication/Vaccine	Amount/Dosage	Route of Administration
Pfizer	1 vial	IM

Was client/parent notified? NA

If no, Why: Not applicabb

[redacted] APRN | [redacted] | 8.2.21

Prepared by (Printed Name and Title) | *Prepared by Signature* | *Date*

Supervisory Incident Review and Response

To be completed after review and verification of the information listed in this report.

List any supplemental facts and/or explanation:

Factors contributing to the incident:

***Retraining and/or protocol review must be initiated by the supervisor for all medication and practice errors.**

Action taken:

Supervisor (Printed Name and Title) | *Supervisor Signature* | *Date*

Copies: Original to Chief of Staff for inclusion in administration file
Scan to relevant program manager and/or division director

Page 2 of 2

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