

IMPROVING PROVIDERS' AND MEDICAL ASSISTANTS' KNOWLEDGE OF
BUZZY®: A QUALITY IMPROVEMENT PROJECT

by

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As members of the DNP Project Committee, we certify that we have read the DNP project prepared by Elizabeth Moe, titled Improving Providers' and Medical Assistants' Knowledge of Buzzy®: A Quality Improvement Project, and recommend that it be accepted as fulfilling the DNP project requirement for the Degree of Doctor of Nursing Practice.

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LAND ACKNOWLEDGEMENT

We respectfully acknowledge the University of Arizona is on the land and territories of Indigenous peoples. Today, Arizona is home to 22 federally recognized tribes, with Tucson being home to the O'odham and the Yaqui. The University strives to build sustainable relationships with sovereign Native Nations and Indigenous communities through education offerings, partnerships, and community service.

DEDICATION

It is an honor and privilege to dedicate this to my loving boyfriend, wild and supportive family, and truest friends. Together they not only guided me but cheered me on when things were tough.

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Abstract

Background: Improvement in vaccine technology and expansion of worldwide resources have been among the most effective strategies in protecting children and adults against disease (Saman et al., 2023). In the last five years, the number of fully vaccinated children in kindergarten programs in the United States (US) has fallen to under 93%, which is below coverage levels of the past decade (Williams & Kates, 2024). This downward trend has significantly increased the risk of preventable deaths from non-vaccine compliance.

Purpose: The purpose of this Doctor of Nursing Practice (DNP) quality improvement (QI) project was to increase providers' and medical assistants' perceived knowledge of the pain mitigation device, Buzzy®, and to measure the staff's intent to change practice and offer Buzzy®.

Methods: This quality improvement (QI) project used a quantitative pre- and post-educational assessment design. Multiple-choice survey questions were given before and after the Prezi educational presentation for pediatric primary care providers and medical support staff at Agave Pediatrics – Deer Valley location. The post-educational assessment examined the impact of education on providers' perceived knowledge and intent to change practice.

Results: Perceived knowledge of pain mitigation and the intent to modify practice by offering Buzzy® demonstrated an increase after the educational presentation.

Conclusions: Providers and medical assistants reported increased perceived knowledge about pain mitigation for vaccinations and expressed an intention to change their practice. This demonstrated a sustainable opportunity to provide further continuing education to staff to increase perceived knowledge and comfort levels with the Buzzy® device.

Background and Significance

Fear of needles, or needle phobia, is a prominent issue for many children, even following some into adulthood. Up to 30% of adults aged 20-40 have formed a fear of needles stemming from immunizations administered at a pediatric clinic during childhood (Sari et al., 2025). Not only can this fear develop into a lifelong phobia, but it can also completely deter children and families from complying with recommended vaccines and any corresponding vaccine schedule (National Institute of Health [NIH], 2021). Polarization surrounding vaccination can involve political, religious, personal, or medical reasons as to why parents either refuse immunizations outright or create their own schedule for immunizations. However, up to 8% of non-compliance with recommended vaccines can be attributed to needle fear (Taddio et al., 2012). Vaccine compliance reaches beyond the individual and into the community, state, region, and even the entire world. Being unvaccinated or delaying vaccinations increases the risk of contracting and spreading a vaccine-preventable disease to at-risk populations, including those unable to receive vaccines due to medical contraindications or socioeconomic reasons, as well as those with only partial immunity. Children are an especially vulnerable population, including those under the age requirement for certain vaccines; children with a medical exemption, such as a child going through immune suppression therapy for cancer treatment; or those who did not receive adequate immune response from their vaccines. Protecting the community from illness introduces the idea of herd immunity. Herd immunity is a way to shield those susceptible to a disease or infection by using immunized people as a defensive wall, effectively blocking a pathogen and its pathway from infecting others and continuing to spread (McDermott, 2021).

Imperative for fighting against infectious diseases, immunizations are responsible for significantly reducing morbidity and mortality rates worldwide (Saman et al., 2023). Over the past 30 years, childhood deaths have declined considerably by over 50%, partly due to the successful use of vaccinations (World Health Organization [WHO], 2025). Though shown to be effective and the most excellent tool available to prevent illnesses and associated complications, compliance is decreasing. Declining vaccination rates have caused an increase in preventable disease outbreaks, resulting in deaths (Seither et al., 2024). Illnesses once thought to be almost eradicated are reemerging. For example, in 2025, measles infections increased more than fivefold, resulting in many hospitalizations and three deaths (Centers for Disease Control and Prevention [CDC], 2025). This is an example of the unfortunate real-life implications that occur with declining vaccination rates. It demonstrates the importance pediatric providers and support staff have to their community and patients, to offer solutions to break barriers holding families back from getting immunizations. Getting immunized is an individual decision when over 18 years old; in pediatrics, the decision is designated and entrusted to the parents and guardians to make on behalf of the child. However, their decision does not just affect their child but also impacts a much larger system.

Research is underway to create non-painful techniques for delivering immunizations, such as oral vaccines, edible vaccines, and nano patches, which are being explored, and some are entering clinical trials (Garg & Aggarwal, 2017). Currently, most of the vaccines available today are based on injectable preparations and can cause pain upon administration, as well as emotional anxiety and worry before, during, and after the procedure for both pediatric patients and their parents. Strategies explored and sometimes used include supportive positioning of the

child, oral sucrose use, premedication with Tylenol or Motrin, and application of anesthetic creams before the injection, as well as cold or vibration therapy. Emphasizing distraction techniques, such as blowing bubbles, using toys with sounds/lights, or even electronic tablet use, can also be introduced during the immunization process (Lee et al., 2018). These strategies are all helpful, but they have some barriers that make them, at times, difficult for pediatric offices to incorporate efficiently and effectively. Oral sucrose, for example, is helpful for infants; however, there is no significant data on its use in older children. Medicating children is best utilized for post-vaccine discomfort rather than before the procedure itself. Numbing creams, such as EMLA cream or lidocaine, are effective in decreasing the initial pain from needle puncture of the skin but take time to work and require timely coordination between providers, support staff, and families, affecting how reliably they can be utilized prior to or during the immunization procedure to obtain the full effect. Distraction techniques are beneficial and can be individualized for each patient, effectively distracting them from the pain source. While all these techniques have shown potential for a positive impact on vaccine procedural pain and distress/fear, the use of combined methods, including cooling and vibration, has demonstrated the most significant impact on pain and distress levels in children (Lee et al., 2018). Limitations exist due to the individuality of each child and their unique preferences, past experiences, coping mechanisms for handling pain, and personality/temperament; these factors should always be considered, as no solution fits each child perfectly.

One method that has been found to reduce the pain and anxiety felt by patients receiving immunizations is the Buzzy®. This device utilizes the gate control theory of pain, incorporating cold and vibration to alter the brain's perception of pain's cognitive and emotional factors

(Trachsel, 2023). The perception of pain is unique to everyone, including children, and emotional and situational components can play a significant role in this. Buzzy® aids in addressing how the brain perceives distress by offering a sense of control, decreasing fear through a non-threatening intervention, and blocking physiologic pain. This child-friendly plastic bee features ice wings and uses an on/off switch to produce a distracting vibrating sensation (Buzzy®Helps, 2025). The nerves are desensitized using a combination of cold (ice wings) and vibrations (from the device itself). The cooling component alone, which has U.S.

Food and Drug Administration (FDA) approval for individuals over 12 months of age, has been proven effective at lowering children's Face, Legs, Activity, Cry, Consolability (FLACC) scores during immunizations (Okafuji et al., 2025). Tactile simulation, which can be represented through the vibration component of the Buzzy®, is proposed to disturb or dampen the signal transmission of pain fibers, thereby lowering the pain sensation around the injection site (Lee et al., 2018). To reduce pain during procedures like injections, Buzzy® should be placed proximally between the brain and the procedure site, on the same nerve pathway or dermatome to help block pain signals. Specifically, Buzzy® should be positioned over the injection site for 30-60 seconds, then moved up a few centimeters to allow for unobstructed access to the correct injection site. It should be kept vibrating throughout the injection for optimal pain relief (Buzzy®Helps, 2025).

While other techniques and nonpharmacological ways to reduce pain have been explored and proven to be beneficial, including the Helfer skin tap technique that also works in conjunction with the gateway pain theory, studies have shown Buzzy® is more effective than many other interventions, as it combines several interventions (Sönmezet al., 2024). In a

systematic review of nine studies with over 1100 participants aged 3-18 years, Buzzy® demonstrated successful pain mitigation during painful medical interventions or treatments such as vaccinations (Ballard et al., 2019). As a product, it approaches the vaccine procedure utilizing combined techniques to reach the most significant effect for pain mitigation. The device also allows for some flexibility in its implementation, as its design function gives the patient and family the ability to participate in its use while engaging in other therapeutic techniques. For example, a toddler can sit in his or her parent's lap during the immunization process, allowing for a therapeutic hold. The Buzzy® can then be held in place by either the parent, another staff member, or a securing device, so the child's hands are free to be controlled or focused on a distraction device, such as a fidget toy or holding a tablet. For older children who could benefit from feeling a sense of control, they have the option to hold the device in place themselves—again, demonstrating its ability to cater and allow for a customized vaccine procedure that is unique to the individual child's needs. It is a product that is easy to implement, offers multiple benefits, is suitable for the pediatric population, and may help decrease needle phobia and pain, thereby aiding parents in deciding to have their children receive immunizations.

Local Problem

Vaccine concerns and noncompliance are issues faced by those who reside in Arizona. In Maricopa County alone, the percentage of under-vaccinated kindergarten students has increased in the last 10 years due to personal exemptions (Arizona Department of Health Services [AZDHS], n.d.). This creates a significant problem and increases the chances of disease-preventable outbreaks in the county and state. Arizona has fallen under 95% vaccine compliance—the minimum compliance recommended to protect and stop the spread of disease in

a community (Figure 1). Without enough of the population adequately vaccinated, Arizona is failing to protect the vulnerable population and those who rely on herd immunity.

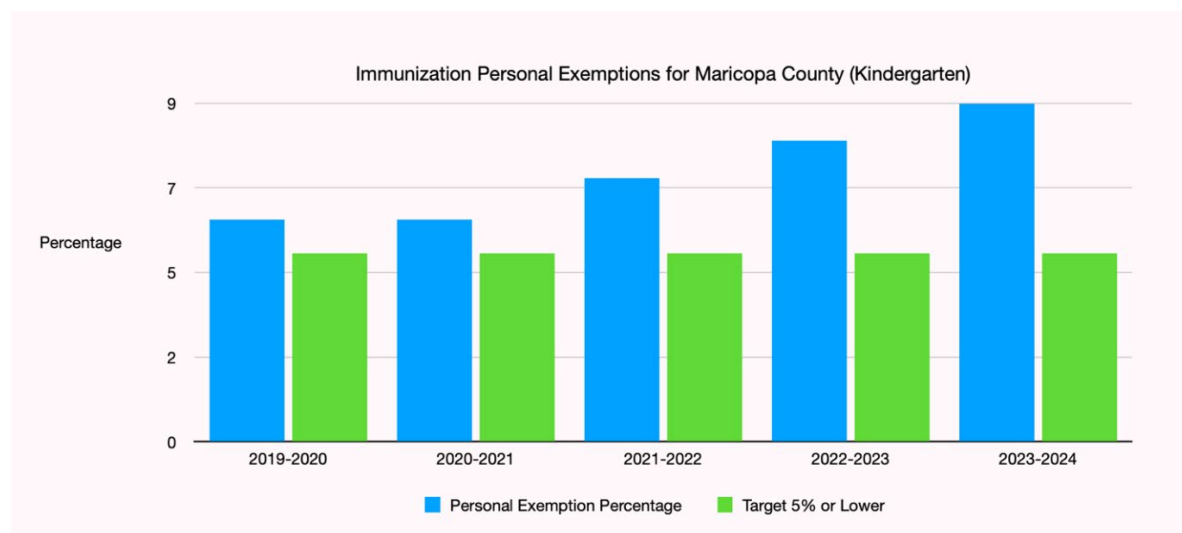
At Agave Pediatrics – Deer Valley, a pediatric clinic in Glendale, Arizona, any pain mitigation techniques, or preparations are solely the responsibility of the patient and family. There is currently no service or product being offered to them inside the clinic to aid in pain mitigation during the immunization process. Standard practice at this specific clinic location involves securely positioning the child, depending on their age, and administering the intramuscular or subcutaneous immunization, then promptly leaving the exam room. If parents choose to bring items for distraction, pre-medicate, or utilize other interventions, it is their responsibility for their implementation. This pediatric clinic has not implemented pain mitigation techniques due to a lack of education on various strategies, inadequate training for providers and support staff on proper implementation, and concerns about time constraints due to the limited time per appointment slot.

With education and patient or parent participation, the Buzzy® offers potential for pain and anxiety/distress relief at Agave Pediatrics – Deer Valley without compromising appointment times, as preparation only takes 30-60 seconds and can be done by parents while vaccines are prepared by the medical assistant. It is easy to use and educate staff on, inexpensive, reliable, and time-efficient (U.S. Department of Health and Human Services [USDHHS], 2021). Agave Pediatrics – Deer Valley uses either the arm/deltoid or the thigh/vastus lateralis for immunization injection sites, and the Buzzy® device can be easily placed and utilized in these areas. When considering the implementation of the Buzzy® device specifically at Agave Pediatrics – Deer Valley, the Buzzy® can be offered for all vaccine administrations for children over the age of 12

months but would likely be most beneficial for children aged 4-18 years (Buzzy®Helps, 2025). Children under four years of age find it more challenging to gather self-reported pain levels, fear, and distress, so most studies have focused on utilizing the device in healthy school-aged children over 4 years old (Lee et al., 2018).

Figure 1

Grouped Histogram of Arizona Immunization Coverage Levels from 2019 – 2024



Note: Personal exemption percentage has increased year-over-year without reaching Target 5% or lower.

Purpose

The purpose of this quality improvement (QI) project is to present an evidence-based presentation to pediatric primary care providers and medical assistants on the benefits of using the Buzzy® distraction device during the administration of pediatric vaccinations.

Project Question

Among pediatric primary care providers and medical assistants at Agave Pediatrics – Deer Valley, does education on the Buzzy® distraction device, when compared to standard

practice, increase their perceived knowledge and intent to change practice by offering this pain mitigation service during the administration of pediatric vaccinations?

Project Objectives

Objective 1

Develop and present evidence-based information to providers and medical assistants at Agave Pediatrics – Deer Valley on a pain mitigation strategy to help aid in vaccine administration to pediatric patients.

Objective 2

Evaluate increased perceived knowledge on the Buzzy® and providers' and medical assistants' intent to change their practice through comparison of pre-test and posttest questionnaires.

Key Concept Definitions

Major Key Words/Concepts Used in the QI Project

Injectable Vaccine (Immunization/Vaccination)

A shot with an inactive portion or weakened organism that will initiate the immune system to respond. This will then help the body produce an antigen and recognize that organism so it can fight it more effectively and in a timely manner if exposed again (WHO, 2024).

Under Immunized

The status given to an individual whose immunization status is suboptimal (NIH, n.d.).

Non-Immunized

A person or individual who is not protected or have immunity to specific diseases, usually due to them not receiving the necessary vaccinations and therefore they remain susceptible to the specific disease (NIH, n.d.).

Herd Immunity

When a significant proportion of the community has achieved immunity to a pathogen, it reduces the risk for that pathogen to continue to thrive and spread the disease. It gives a broader coverage for the individuals who are not immune, as the pathogen has a more challenging time infiltrating the community as a group (WHO, 2024).

Pain

“An unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage” (IASP, 2021, p. 2).

Primary Care Providers (PCP)

In context with this project, primary care providers include Doctor of Medicine (MD), Osteopathic Medicine (DO), Physician Assistant (PA), and Nurse Practitioner (NP) who work in a pediatric primary care setting.

Medical Assistant (MA)

In the context of this project, Medical Assistants (MA) assist primary care providers with patient care, such as measuring height, weight, and vitals, performing tests, and preparing and administering vaccines.

Intent to Change Practice

In context with this project, intent to change practice will refer to the participants' willingness to alter their standard practice, which is no pain mitigation technique, and consider offering Buzzy® for pain mitigation.

Parent

An adult or person over the age of 18 years old who can be classified as the biological parent to the child or an adult who has been granted or retained legal guardianship over a child.

Implementation Model

This QI project used the Model for Improvement, which is a strong framework for aiding in improvement and simplistic application. This model was developed by Associates in Process Improvement, is frequently used by the Institute for Healthcare Improvement (IHI) and focuses on two essential components: (1) three fundamental questions and (2) The Plan-Do-Study-Act (PDSA) cycle (IHI, n.d.). Using this model helps not only to make a change or improvement, but also to provide continued thinking by having the ability to move back and forth between the steps.

Fundamental Questions

There are three fundamental questions to address when implementing this model. They include: (1) What are we trying to accomplish? (2) How will we know that a change is an improvement, and (3) What changes can we make that will result in improvement? Due to the model's fluid nature, these questions can be answered and then adapted as the project progresses or there is a change in thinking.

Plan-Do-Study-Act (PDSA) Cycle

This quality improvement (QI) project was initiated and carried out using the well-established Plan-Do-Study-Act (PDSA) cycle. Its focus is on taking an organized stepwise approach (Table 1 & Figure 2). The Buzzy® education began with sharing information and gaining insight into participants' willingness to alter or change their practice. Since this model is cyclical, it is beneficial to start small and upcycle for various trials and adaptations if the project were to expand (Hill, 2023). The adaptability allows the QI project to continue growing and expanding. PDSA is not new to aiding in healthcare quality improvement and has been utilized for its unique goal-oriented focus and for aiding in refining the scientific process (Barr, 2024). Addressing and meeting each of the steps in this model positions the quality improvement project to not only answer the original project question, but to also provide a foundation for continued projects and improvement. This project aimed to complete one cycle of the PDSA with education geared towards pediatric primary care providers and medical assistants, with the hope that they will be receptive to further improvement projects. After completion of the initial PDSA cycle, including the provision of provider education and evaluation of their intent to change practice, an adjusted PDSA cycle can be initiated, focusing on the implementation of the Buzzy® device. By embracing the cyclic nature of this model and its potential to steer continued practice improvement, there is an opportunity for continued growth and improvement.

Plan

The planning phase is a fundamental starting point for the project. It requires creating a team, identifying an issue or area of improvement, clearly defining goals and objectives, and understanding how these goals and objectives can create change (IHI, n.d.). The area for

improvement was identified as the standard vaccine administration practice at Agave Pediatrics – Deer Valley, which does not currently offer any pain mitigation techniques beyond family comfort. The project leader consulted with the owner/MD of the Agave Pediatric Clinics, another physician at the clinic, a nurse practitioner, and the clinic manager. Through the consultation, the project leader gained insight into the provider and staff perspectives on administering pain mitigation devices for immunization and identifying educational needs. The clinic expressed interest in learning a non-pharmacological technique to alleviate pain during immunizations. The Buzzy® is a device that is FDA-approved, has a low cost, a shallow learning curve, and combines multiple pain mitigation techniques, making it a good choice for this clinic.

Do

The next step in the cycle involved implementing the change plan, which included evidence-based education for pediatric primary care providers and medical assistants at the Agave Pediatrics – Deer Valley clinic. As the project was executed, data was captured and documented, and the beginning of analysis commenced (IHI, n.d.). The pre-recorded educational presentation was delivered to staff for asynchronous access, and assessment was completed by the end dates specified in the recruitment and follow-up emails. Prior to viewing the material, participants were asked to answer a 5-item pre-education questionnaire. Upon conclusion of the presentation, participants were asked to complete a 7-item post-education questionnaire. The pre-education and post-education questionnaires were delivered and completed via SurveyMonkey.

Study

The study phase serves to examine, compare, and review the collected data (IHI, n.d.). For purposes of this project, the study phase involved completing the data analysis from the

assessments, comparing the data with the project leader’s projections, and reflecting on and summarizing the findings (IHI, n.d.). The project leader analyzed the assessment survey responses and evaluated them for changes in perceived knowledge level and intent to change practice, using descriptive statistics to assess the success of the intervention.

Act

The final step in the PDSA cycle involved applying what was learned, refining or adjusting as needed, remaining open to making modifications, and planning for the next step or cycle (IHI, n.d.). Proper education was provided, and providers and medical assistants demonstrated an intent to change or modify their practices. Agave Pediatrics – Deer Valley clinic has the option to formally implement the use of Buzzy® in the clinic. Expansion to the other Agave Pediatrics clinic locations may also occur, either with or without another PDSA cycle, depending on the need to refine the process for other clinic sites. To adjust for unanticipated results, the project leader has reviewed the process and made recommendations to the Agave Pediatrics – Deer Valley administrators for modifications to the PDSA cycle, which can be repeated later. Due to time constraints, only one PDSA cycle was conducted as part of this quality improvement project.

Table 1

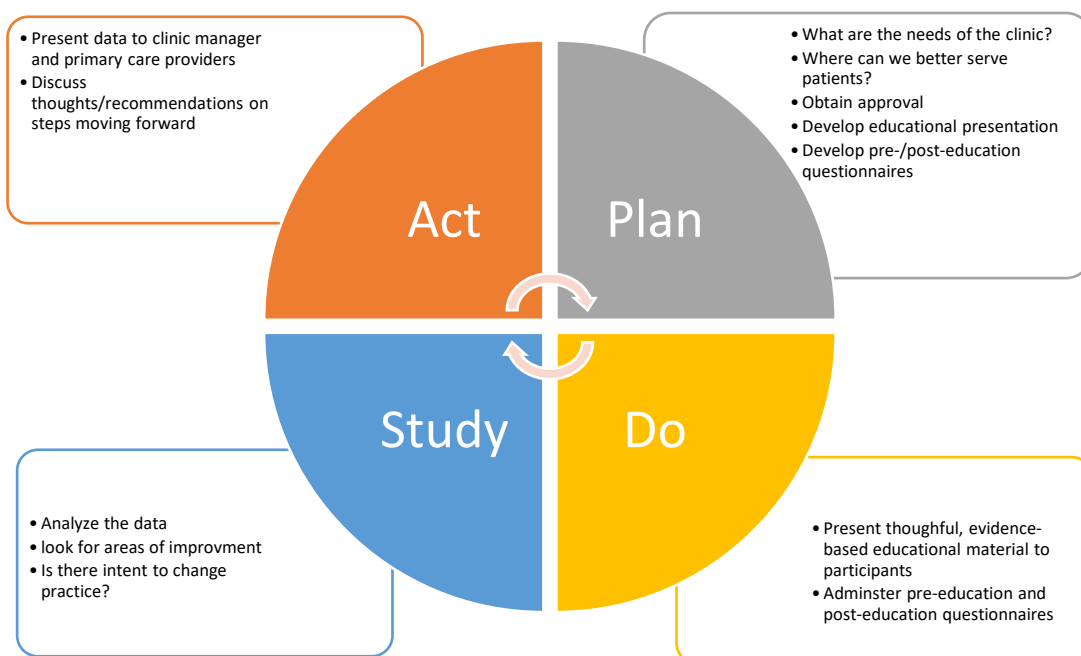
Plan-Do-Study-Act (PDSA) Cycle Questions and Answers

What are we trying to accomplish? Improve providers’ and medical assistants’ knowledge of the benefits Buzzy® can provide when used for vaccinations and increase their intent to offer Buzzy® for pain mitigation.

How will we know that a change is an improvement? Participants will complete a 5-item pre-education survey and a 7-item post-education survey to determine if there was a change in perceived knowledge and intent to change practice after viewing the educational presentation on Buzzy®.

What changes can we make that will result in improvement? Providing education on pain mitigation benefits from implementing Buzzy® may make vaccine pain less of an issue for noncompliance and improve vaccination rates at Agave Pediatrics – Deer Valley.

Note: Modeled after the Institute for Healthcare Improvement Questions.

Figure 2*Plan-Do-Study-Act (PDSA) Cycle Flow Diagram*

Note: The flow diagram is modeled after the Institute for Health Care Improvement and illustrates testing a change on a small scale.

Methods

This QI project aimed to educate providers and medical assistants at Agave Pediatrics – Deer Valley on Buzzy® and measured the intent to change practice using Buzzy® during vaccine administration. To assess learners’ perceived knowledge and intent to change practice, this quality improvement project used a standard pretest/posttest design. After engaging in an educational Prezi presentation, a post-test was administered to assess educational level and intent to change practice using Buzzy®. The data for this project was obtained from completed surveys following the educational Prezi presentation.

Site and Stakeholders

The project was conducted at Agave Pediatrics, the Deer Valley location. Agave Pediatrics aims to be Arizona's leading pediatric care provider, with five locations in the greater Phoenix area, since its opening in 2005. Agave Pediatrics prides itself on facilitating open and respectful conversations about vaccines and clinic policy, while also honoring providers' responsibility to public health (Agave Pediatrics, 2022). They allow for alternative vaccine schedules and encourage frequent communication between the provider, patient, and parent at all well visits. Additionally, they provide vaccine-only appointment options. The Deer Valley location has two medical doctors (MD), three pediatric nurse practitioners (PNP), three physician assistants (PA), and six medical assistants (MA) who were eligible to participate in the quality improvement project. The practice respects the wishes of families who do not wish to receive any vaccinations. However, due to Agave Pediatrics' current policy, they encourage those who choose this path to find a clinic that can best cater to their needs and immunization preferences.

Authorization was obtained from Agave Pediatrics prior to project implementation to ensure compliance with clinic policies and procedures. The key stakeholders of Agave Pediatrics – Deer Valley included pediatric primary care providers (MD, NP, & PA), medical assistants who administer prescribed vaccinations, and patients and parents who may benefit from a potential practice change resulting from education on Buzzy®. Although children and parents were not directly involved in the quality improvement project, they may benefit from the increased perceived knowledge that providers and support staff gain about Buzzy®. This method of pain mitigation has the potential to be applied more effectively and frequently by pediatric providers and medical assistants when administering vaccinations. Ideally, this will improve the

quality of care for patients and expand the options available to providers and medical assistants, thereby easing patient discomfort and improving vaccination rates.

Participants and Recruitment

Recruitment was conducted voluntarily; neither primary care providers nor medical assistants were required to view educational material or participate in the pre- and post-assessments. To recruit project participants, an email was sent to eligible staff at the clinic location with details on the quality improvement project, including the consent/disclosure form, presentation, supplemental information, and essential links. A reminder email was sent to potential participants three business days before the survey deadline, and all materials were sent in the original recruitment email. The consent/disclosure link was included at the end of the presentation. The inclusion criteria for participants were employment by Agave Pediatrics – Deer Valley location, proficiency in speaking and reading English, direct provision of patient care as a primary care provider or medical assistant, and involvement in the vaccination process (e.g., prescriber or administrator). The providers and medical assistants were selected to receive this education as they play a crucial role in vaccine compliance. The providers order the vaccine(s), provide most of the vaccine education, and answer parental questions. The medical assistants at this practice administer immunizations and spend time with patients and their families, addressing questions and concerns about vaccines. Participation in the project's educational session and data collection process was voluntary and did not involve any direct or indirect compensation. Participation was not a requirement of employment, and participants could withdraw from the project at any time without any repercussions. All participants were able to

view the disclosure form, and each participant agreed to its terms and conditions by completing the respective surveys. Privacy was ensured as no names were linked to participant responses.

Intervention

The intervention for this quality improvement project focused on provider and medical assistant education, delivered through a presentation via Prezi. The presentation focused on how pain and anxiety from vaccines can impact vaccination compliance, and how pain mitigation techniques such as Buzzy® can decrease pain and emotional discomfort. It consisted of a scripted, evidence-based, pre-recorded 15-minute audio and visual presentation delivered via Prezi. Two learning objectives were addressed during the presentation. The first objective was to improve providers' and medical support staff's perceived knowledge of pain mitigation strategies, specifically the use of the Buzzy®, as measured by improvements in post-education assessment scores. The second objective was to increase the intent of providers and medical support staff to incorporate the Buzzy® device into vaccination practices, as measured by changes in survey responses following the educational intervention.

Prior to and following the presentation, survey links from SurveyMonkey were available, which included several multiple-choice questions and some free-response questions that could be completed in under 10 minutes. Included in the post-presentation were two demographic questions, such as specific occupation and the number of years in that occupation. To establish content validity, a questionnaire was developed by the project leader to ensure that the questions were formulated to determine if the educational intervention was successful. Two independent and uniquely qualified reviewers reviewed the presentation content and pre- and post-assessment questions. The first reviewer was a staff scientist from the University of Colorado Department

with a background in research methodology and experimental design. The first reviewer had recommendations to adjust some of the question scales' wording due to the risk of embellishment and ambiguity. The other reviewer was a child life specialist who works for one of the largest pediatric health care systems in Arizona and advocates for pain management strategies daily, who gave some recommendations on how to explain the holding positions for Buzzy® for individuals who are new to the device. Both independent reviewers agreed that the pre- and post-assessment questions accurately measured the project's aims based on the information presented (Appendix F).

Evaluation Measures

This quality improvement project aimed to educate providers and medical assistants at Agave Pediatrics – Deer Valley about Buzzy® and measure their intent to change from their standard practice to administering vaccines using Buzzy®. To assess learners' self-reported intent to change practice and perceived knowledge regarding the pain mitigation device, this project utilized a pre-assessment and post-assessment survey. The pre-assessment was given before the presentation to determine a baseline of perceived knowledge. Following the educational presentation, a post-assessment was administered to evaluate the participants' perceived knowledge of mitigating vaccine injection pain, specifically with the use of Buzzy®, and to assess their intention to change practice by offering this device to patients and their families. Participants were asked to answer questions based on what they had learned from the presentation. The data for this project was obtained by the project leader from the completed pre- and post-surveys and is presented in the analysis portion of the quality improvement project.

Analysis

The pre- and post-survey questions were created and aligned with the goals of this QI project: to measure improvement in perceived knowledge levels and intent to modify practice surrounding the Buzzy® pain mitigation device. Statistical analysis methods were selected based on the ordinal nature of individual Likert-like items and the study's small sample size. Descriptive statistics, including the mean, median, and mode, were calculated from the gathered data. This enabled the project leader to compare pre- and post-assessment scores. Qualitative insights for the QI project were gained through open-ended responses. There were two responses from the post assessment that were Missing Completely at Random (MCAR). MCAR occurs when subjects do not respond or forget to complete the evaluation; it is not systematically related to the outcome (Mack, 2018). The Mann-Whitney U-test was used for unpaired group comparison, as this test is appropriate for ordinal and non-parametric data without assuming a normal distribution (Jameison, 2004). A one-sample Wilcoxon signed-rank test was used to analyze question four of the post-test, comparing it against the scale midpoint, indicating the intent to change practice, which was recommended for assessing directional tendency in Likert responses (Sullivan & Artino, 2013). Thematic analysis of open response questions was used to identify common themes, including barriers and supports. All analyses were conducted in R version 4.5.1 (R Core Team, 2025) using the packages *effsize* or effect size calculations (Torchiano, 2020), *ggplot2* for data visualization (Wickham, 2016), and *dplyr* for data wrangling (Wickham et al., 2023).

Ethical Considerations

The Belmont Report was utilized to ensure that ethical principles and guidelines were adhered to throughout this project. The Belmont Report, which was signed into law in 1974 to protect human subjects in research, served as a foundation to guarantee that ethical principles were applied, including adherence to routine accepted medical practices, careful consideration of risk and benefits, appropriateness for human subjects, selection guidelines, and ensuring proper informed consent for participants. The core of this report focuses on three fundamental ethical principles that must be addressed: respect for persons, beneficence, and justice (HHS, 2022). All individuals involved were treated as autonomous agents, and those who may have diminished autonomy were protected and excluded from participating in the project. All participants in the educational presentation and survey were autonomous individuals over 18 years old, capable of self-determination. They were provided with adequate information and completed the education and survey voluntarily, without any repercussions or incentives. No vulnerable populations were included in this quality improvement project. Beneficence, a core ethical principle in medicine and research, was upheld as an ethical duty to perform actions in the best interest of the patient (Olejarczyk, 2024). This principle can be broken down into two main aspects: to do no harm and to optimize potential benefits while minimizing possible harms (Olejarczyk, 2024). The project educated providers to expand their knowledge on pain mitigation for vaccines and potentially alter their practices by using distraction tools for necessary but uncomfortable vaccinations. Justice ensures fairness and equal treatment for all individuals (RHOP, 2022). Each qualified employee was allowed to participate in the presentation on Buzzy® and complete the subsequent surveys, regardless of their race, age, or gender. The presentation was available to all primary

care providers and clinical staff for their own educational purposes, irrespective of whether they wished to participate in the surveys. This QI project practiced and followed these three ethical principles for all participants.

IRB Review and Approval

This project was reviewed by the University of Arizona's Institutional Review Board (IRB). On September 8, 2025, it was determined that the QI project was not human research, and the project leader was able to proceed with its implementation.

Results

Characteristics of the Sample Population

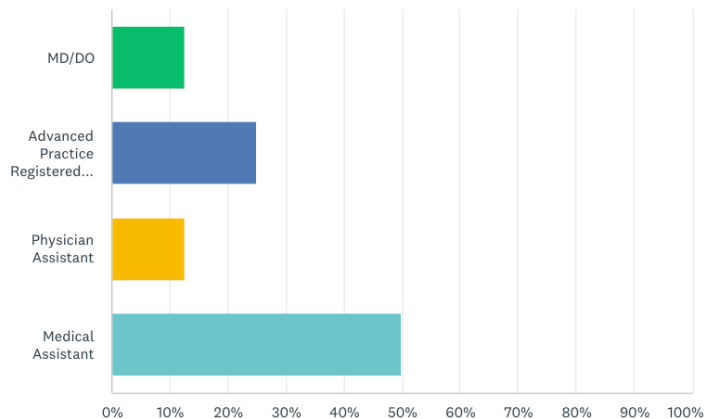
Agave Pediatrics-Deer Valley staff members participated in the Buzzy educational presentation, and 10 staff members completed the pre-assessment, while eight completed the post-assessment. Of those who participated, the majority 50% (n=4) were medical assistants, 25% (n=2) were advanced practice registered nurses, 12.5% (n=1) were physician assistants, and 12.5% (n=1) were physicians. The years of experience the participants had in their current role were as follows: 12.5% (n=1) had less than one year, 37.5% (n=3) had one to five years, 12.5% (n=1) had six to nine years, and 37.5% (n=3) had 10 years or more. For participant demographics (Figures 3 & 4).

Figure 3

Participant Demographics: Job Title

What is your current title?

Answered: 8 Skipped: 0



ANSWER CHOICES	RESPONSES	
▼ MD/DO	12.50%	1
▼ Advanced Practice Registered Nurse	25.00%	2
▼ Physician Assistant	12.50%	1
▼ Medical Assistant	50.00%	4
TOTAL		8

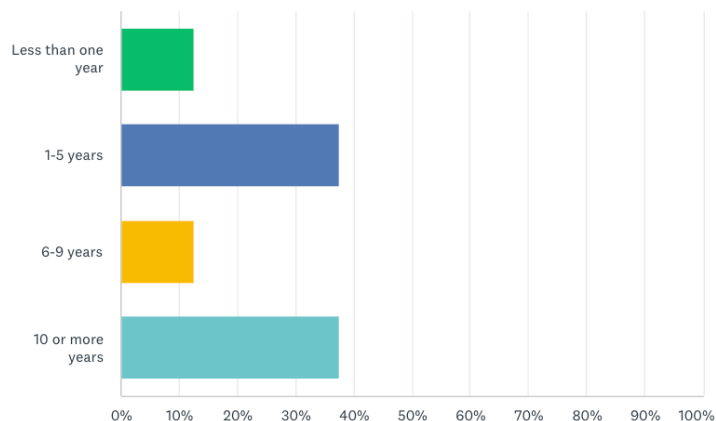
Note: Graph created through SurveyMonkey Ink. using assessment data.

Figure 4

Participant Demographics: Years of Experience in Current Role

How many years of experience do you have in your current healthcare role?

Answered: 8 Skipped: 0



ANSWER CHOICES	RESPONSES	
▼ Less than one year	12.50%	1
▼ 1-5 years	37.50%	3
▼ 6-9 years	12.50%	1
▼ 10 or more years	37.50%	3
TOTAL		8

Note: Graph created through SurveyMonkey Ink. Using assessment data.

Dates of Implementation

The Buzzy® educational presentation and surveys were emailed to staff on September 22, 2025. Surveys were open to eligible participants until October 6, 2025. A reminder email was sent out on October 1, 2025. The staff members were able to access the presentation through a Prezi link or an MP4 video, both of which were attached to the recruitment email and reminder email. The pre- and post-assessments were accessible through links via SurveyMonkey. The data that was gathered through the surveys was anonymous, and there were no participant

identification numbers connecting participants to their individual answers. The data was analyzed on October 9, 2025, using R version 4.5.1.

Statistical Analysis

The results from the pre- and post-assessments were variable; see Table 2 for the descriptive and inferential statistics for questions 1-3 of the pre- and post-assessments. Figures 5 and 6 graphically depict the change in pre- and post-assessment responses after the educational intervention. The educational intervention comparison was analyzed using a 5-point Likert-type scale on the pre- and post-assessment; question one scale was 1.0 ('Not significant') to 5.0 ('Very significant'), while question two and three scales were 1.0 ('Not knowledgeable') to 5.0 ('Completely knowledgeable'). Questions one and three were not found to be statistically significant, indicating that they were not affected by the intervention. Question one, which focused on perceived knowledge of pain significance as a deterring factor for vaccines, demonstrated no change in median knowledge from 4.0 ('Significant'). This was not statistically significant enough to conclude that the educational intervention had an effect on perceived knowledge of pain significance. Question two, inquiring about knowledge levels on pain mitigation strategies, demonstrated a statistically significant improvement in median knowledge levels from 3.0 ('Moderately knowledgeable') to 4.0 ('Highly knowledgeable'). This demonstrates that the educational intervention had a positive impact on perceived knowledge levels related to pain mitigation. Question three aimed to assess the knowledge level of Buzzy®; there was an increase in median from 3.0 ('Moderately knowledgeable') to 4.0 ('Highly knowledgeable'). Although there was a demonstrated increase in perceived knowledge of Buzzy®, it was not statistically significant enough to demonstrate that the increase was due to

educational intervention. It is worth noting that, in the pre-assessment, three participants rated their knowledge of Buzzy as ‘completely knowledgeable,’ whereas, in the post-assessment, with eight responses, only two participants rated their knowledge of Buzzy as completely knowledgeable.

Question four aimed to determine whether the educational intervention affected participants' intent to modify their practice and offer Buzzy to patients. This was analyzed using a 5-point Likert-type scale on the post-assessment from 1.0 (‘Very unlikely’) to 5.0 (‘Very likely’). The median response was 4.0 (‘Likely’), with 75% of participants indicating they were likely or very likely to implement the device in their practice (Figure 7). A one-sample Wilcoxon signed-rank test demonstrated that intent scores were significantly above the neutral point ($p = 0.031 < 0.05$), indicating that the educational intervention was statistically significant and successfully motivated behavioral intent.

Table 2

Descriptive and Inferential Statistics for Pre and Post-Assessment Questions 1-3

Variable	N	Mean	Median	Mode	P-value	Statistically Significant
PREQ01	10	3.5	4	4	0.361	No
PSTQ01	8	3.875	4	4	$P > 0.05$	
PREQ02	10	2.8	3	3	0.0185	Yes
PSTQ02	8	3.875	4	4	$P < 0.05$	
PREQ03	10	3	3	3, 5	0.0895	No
PSTQ03	8	4.25	4	4	$P > 0.05$	

Figure 5

Perception of Pain as a Vaccination Deterrent

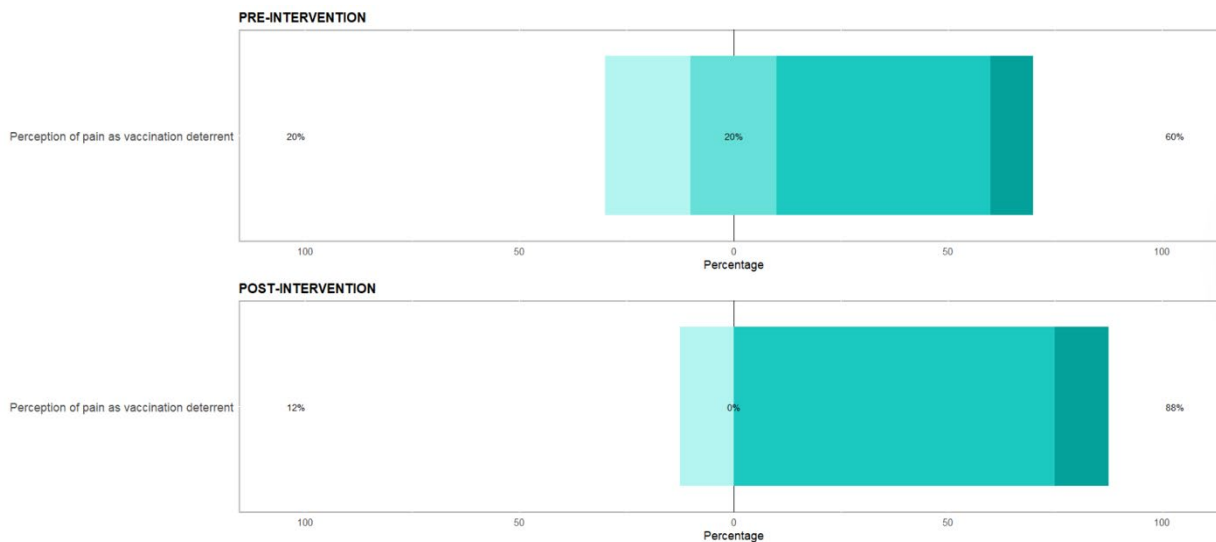


Figure 6

Questions 2 and 3: Knowledge Assessment

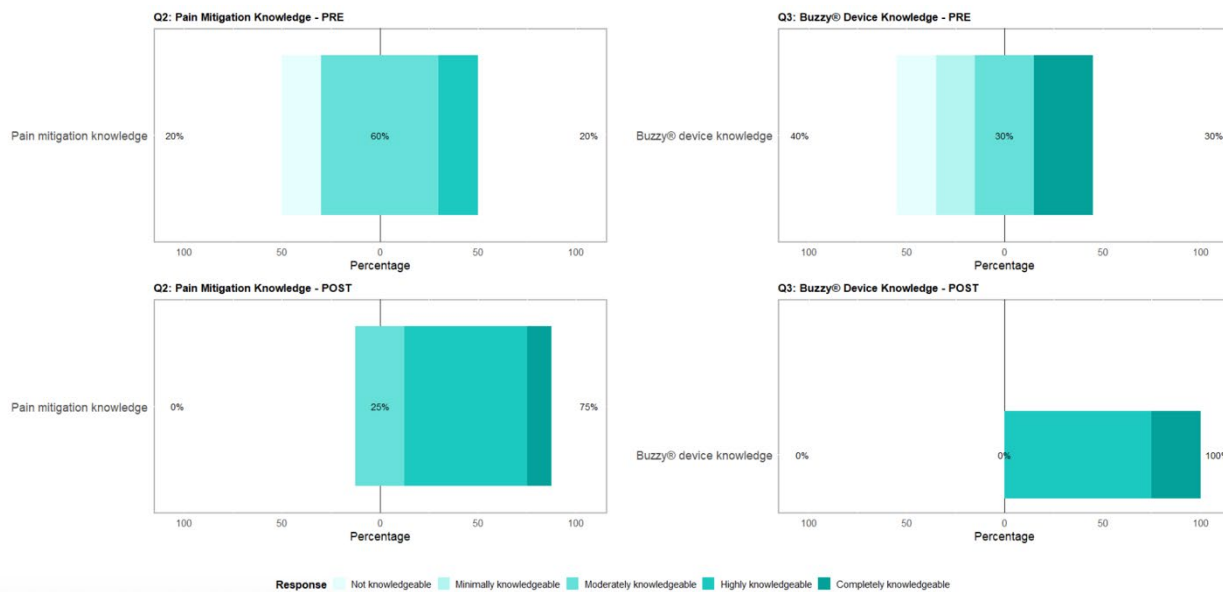
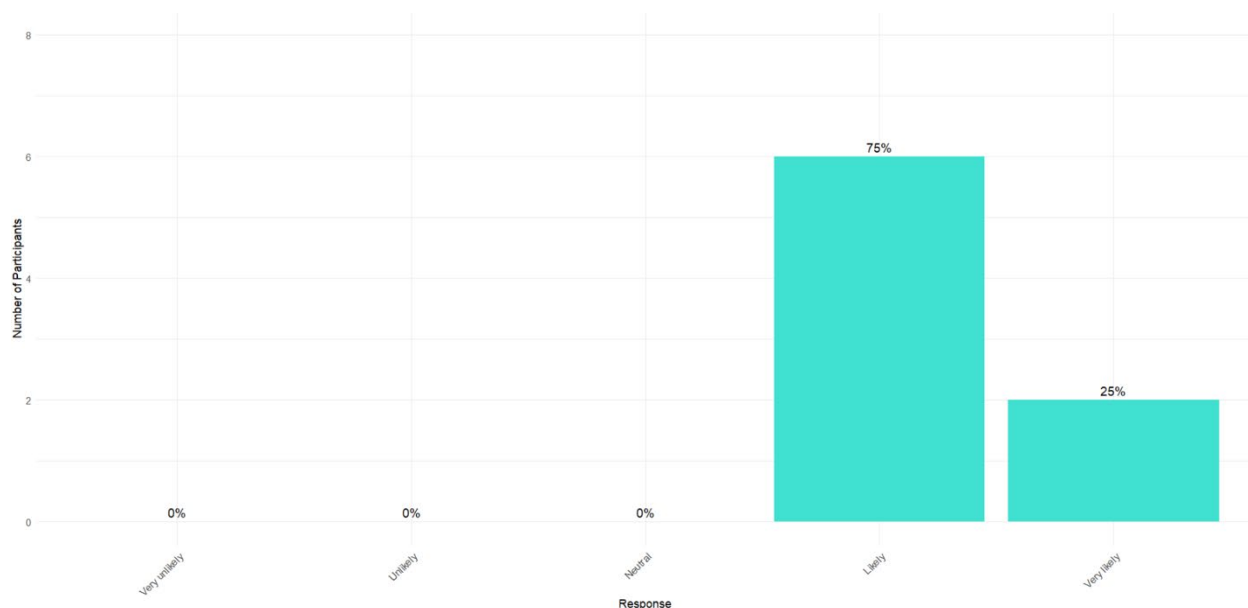


Figure 7*Intent to Modify Practice***Pre-Educational Assessment Free Responses**

To gather views and knowledge levels before the educational presentation, a pre-assessment survey was utilized. There were three Likert-type scale questions and two free-response questions. A breakdown of the specific questions and responses, including percentages, is available in Table 3.

Current Pain Mitigation Practices

Before the educational presentation, participants were asked to describe the methods they currently use to mitigate pain during vaccinations. The question was administered in an open-ended format to facilitate a collection of diverse responses. Qualitative analysis of the data revealed three common themes: offering an incentive after immunization, explaining the process, and the lack of current use of pain mitigation strategies. Four participants (40%) indicated that

they provided an incentive to the children after they received the immunization, typically a popsicle or a sticker. Two participants (20%) focused on explaining the process to the patient and family. A subset of participants (n=3; 30%) indicated that they did not currently employ any pain mitigation strategies. A final participant (n=1; 10%) provided a free-text response that pertained to Tylenol. However, the response requires further clarification to be interpreted; specifically, whether the use was prescribed and administered in the clinic setting or if it was a recommendation for caregivers, and whether the administration occurred before or after immunization.

Challenges to Implementing Pain Mitigation Techniques

The final question of the pre-assessment was another open-ended question, aiming to facilitate open dialogue and diverse responses. It asked the participants to describe any challenges they face in implementing pain mitigation techniques during vaccinations. After qualitative analysis of the responses, a common barrier that emerged was managing children who were crying and kicking during the vaccination process (40%; n=4). A subset of participants indicated no perceived challenges (30%; n=3). In contrast, some participants did not respond to this question (30%| n=3).

Table 3*Pre-Assessment Questions and Responses*

Question	Answer	N	%
How significant do you think pain from receiving a vaccination is as a deterring factor for patients and families when declining vaccinations?	Very Significant	1	10%
	Significant	5	50%
	Moderately Significant	2	20%
	Minimally Significant	2	20%
	Not Significant	0	0%
Rate your current knowledge of pain mitigation methods that can be implemented during vaccinations.	Completely Knowledgeable	0	0%
	Highly Knowledgeable	2	20%
	Moderately Knowledgeable	6	60%
	Minimally Knowledgeable	1	10%
	Not Knowledgeable	1	10%
Rate your knowledge level on Buzzy®.	Completely Knowledgeable	3	30%
	Highly Knowledgeable	0	0%
	Moderately Knowledgeable	3	30%
	Minimally Knowledgeable	2	20%
	Not Knowledgeable	2	20%
What methods do you currently use to mitigate pain during vaccinations?	Offering an incentive after immunization	4	40%
	Explaining the process	2	20%
	No current pain mitigation process	3	30%
	Tylenol	1	10%
Please describe any challenges you face in implementing pain mitigation techniques during vaccinations.	Managing children who were crying and kicking	4	40%
	No perceived barriers	3	30%
	Did not respond to question	3	30%

Post-Educational Assessment Free Responses

After the educational presentation, a post-assessment survey was given to participants. This assessment echoed the three main questions from the pre-assessment plus an additional question inquiring about their intent to change or modify their practice based on what was learned from the educational presentation. These four questions were presented on a Likert-type scale, followed by a single free-response question. A more in-depth breakdown of the individual questions and responses is provided in Table 2. The demographic questions for the QI project are included in the post-assessment section.

Possible Barriers to Implementing Buzzy®

The final question of the post-educational assessment used an open-ended question to gather participants' perspectives on any barriers to implementing Buzzy® at the clinic. Qualitative analysis revealed potential perceived barriers such as the cost of Buzzy® and adjusting to changes in practice. The price of Buzzy® was identified as a barrier by one participant (12.5%), while another participant (n=1; 12.5%) identified the challenge of adapting to any practice change as a barrier. Six participants (75%) reported no perceived barriers to implementing Buzzy®.

Table 4

Post-Assessment Questions and Responses

Question	Answer	N	%
How significant do you think pain from receiving a vaccination is as a deterring factor for patients and families when declining vaccinations?	Very Significant	1	12.5%
	Significant	6	75%
	Moderately Significant	0	0%
	Minimally Significant	1	12.5%
	Not Significant	0	0%
Rate your current knowledge of pain mitigation methods that can be implemented during vaccinations.	Completely Knowledgeable	1	12.5%
	Highly Knowledgeable	5	62.5%
	Moderately Knowledgeable	2	25%
	Minimally Knowledgeable	0	0%
	Not Knowledgeable	0	0%
Rate your knowledge level on Buzzy®.	Completely Knowledgeable	2	25%
	Highly Knowledgeable	6	75%
	Moderately Knowledgeable	0	0%
	Minimally Knowledgeable	0	0%
	Not Knowledgeable	0	0%
Rate your intent to modify your practice and offer Buzzy® to your patients for vaccinations	Very Likely	2	25%
	Likely	6	75%
	Neither likely nor unlikely	0	0%
	Unlikely	0	0%
	Very unlikely	0	0%
Do you see any barriers to implementation of the Buzzy® at the clinic?	Cost of Buzzy®	1	12.5%
	Adjusting to change in practice	1	12.5%
	None	6	75%

Discussion

The concluding findings for this QI project yielded mixed results, with some post-assessment questions demonstrating both statistical and clinical improvement in education. This QI project was shown to increase staff knowledge of pain mitigation strategies and intent to use Buzzy®. In contrast, other questions showed only clinical improvement (improved scoring without statistical significance), and some indicated no improvement. Increasing perceived knowledge of pain mitigation methods during vaccination, along with the intent to modify practice and offer Buzzy, resulted in clinically and statistically successful outcomes of the educational intervention. While the statistical significance of pain as a deterring factor for vaccine hesitancy was not improved, clinically, the mean score increased, demonstrating an improvement in perceived clinical knowledge. Additionally, after completing the educational intervention, a higher percentage of participants indicated that pain was either a significant or a very significant factor in vaccine hesitancy.

Methodological limitations that may have affected the interpretation of the findings include the potential for a ceiling effect and the inability to match individual pre- and post-assessment responses. In the pre-assessment, 30% (n=3) of participants had already rated themselves as completely knowledgeable on Buzzy®, leaving no room for measurable improvement in this area. In the post-assessment, two of eight participants (25%) rated themselves as completely knowledgeable. However, without unique participant identifiers, it was not possible to determine whether the previously knowledgeable participants were among those lost to follow-up, or whether the standards for a completely knowledgeable rating were adjusted after the presentation, or if participants recalibrated their self-assessment standards after

becoming more aware of knowledge gaps they had not previously recognized. Matching pre- and post-assessment responses was not possible due to the lack of unique participant identifiers, limiting the ability to assess individual perceived growth in knowledge. Future projects should incorporate unique identifiers for participants to enable paired analysis and control for baseline knowledge variability when measuring the impact of education and changes in practice.

Despite the limitations and mixed statistical outcomes, this project achieved meaningful clinical success in increasing staff intent to use Buzzy® for vaccine pain mitigation, one of the main purposes of the QI project. This behavioral change represents a crucial step toward enhancing the vaccination experience for pediatric patients and their families. The staff's intention to modify their practice suggests that the intervention may be effective in addressing critical knowledge gaps in current pain management approaches during vaccinations and expanding the use of this clinically validated device, the other goal of the QI project. Continued emphasis on the connection between pain management and vaccine hesitancy may strengthen staff motivation to consistently offer these interventions, creating a more family-centered vaccination experience. Future directions should focus on sustaining this practice change through ongoing education and evaluation, ideally making the vaccination process less daunting for everyone involved and, hopefully, encouraging vaccine compliance.

Outcomes

The outcomes of this QI project demonstrated the effectiveness of educating and providing evidence-based information to improve perceived knowledge of pain mitigation strategies that can be used during vaccine administration in a primary care clinic setting. It demonstrated an intent to modify practice and offer Buzzy® to patients for vaccinations. It,

however, did not definitively increase perceived knowledge about whether pain from vaccinations is a deterring factor for vaccines (contributing to vaccine hesitancy), nor did it demonstrate strong evidence of an increase in knowledge of Buzzy.

Alignment with DNP Essentials

The Doctor of Nursing Practice (DNP) essentials are the foundational structure that guides doctorally-prepared nurses in translating evidence into practice (AACN, 2006). This QI project specifically drew on DNP Essentials II and III.

Essential II: Organizational and Systems Leadership for Quality Improvement and Systems Thinking

The doctorally-prepared nurse will utilize their unique knowledge and skills to improve patient and healthcare outcomes through direct care, targeted patient populations, and the community for excellence in practice (AACN, 2006). This QI project achieved its essential goal by identifying a gap in therapeutic immunization procedures and education and subsequently implementing an educational intervention for medical providers and medical assistants. By introducing and educating on the Buzzy®, a device designed to mitigate vaccine pain, the project aims to introduce a potential system-level improvement in the immunization experience for patients and their families.

Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice

The doctorally-prepared nurse will integrate knowledge from diverse areas of research and various disciplines to aid in solving practical problems and promoting health outcomes (AACN, 2006). The project leader conducted a comprehensive literature review, synthesizing findings and current evidence. This process informed the creation of an educational presentation

on the Buzzy® as an intervention for medical providers and medical assistants to consider adopting in their future practice.

Sustainability

The presentation and supplemental materials developed for this QI project were distributed to all medical providers and medical assistants at Agave Pediatrics–Deer Valley. Items can be archived for future reference or continuing education. To support sustainability, an additional PDSA cycle can be implemented to assess for opportunities for refinement, including updates to the educational presentation, additional supplemental handouts, or the addition of demonstration videos. The presentation is an educational audiovisual presentation created through the Prezi platform. It also has demonstration images to enhance usability and act as quick reference guides. The Buzzy® information insert can also be printed and stored with the device for quick reference. This framework supports ongoing integration, adaptation, and potential expansion of the QI initiative into practice within the Deer Valley location, with the option to extend to additional Agave Pediatrics practice locations.

Limitations

The QI project had several limitations including a limited sample size, inconsistent responses to both the pre- and post-assessments, and the lack of continued follow-up. The project was implemented at just one of the five Agave Pediatrics locations, and the sample sizes were $n = 10$ (pre-assessment) and $n=8$ (post-assessment). These constraints were primarily due to the project's short implementation timeline. There were also two participants who completed the pre-assessment but did not complete the post-assessment, causing participant attrition (Fincham, 2008). A follow-up and reminder email was sent to try to prevent this issue. Another significant

limitation was the inability to conduct longitudinal follow-up. The project focused on education and the intent to change practice, which was evaluated following education. It would be valuable to assess whether practice change occurred after the education; specifically, whether the Buzzy® was being offered to patients and families during vaccinations. Due to the strict timeline of the QI project, only the first PDSA cycle was completed. For future studies; larger, multisite samples; and follow-up periods would be valuable for assessing implementation in practice.

Conclusion

Implications for Future Practice

The ability to alleviate the iatrogenic pain caused by immunizations can go a long way in not only relieving pain but also building a stronger rapport with patients and their caregivers, fostering a therapeutic relationship. Pain associated with vaccines is of concern for caregivers and children, and 85% of parents believe healthcare providers have a responsibility to minimize procedural pain (Pottie et al., 2016). Despite this, in a primary care clinic setting, resources for immunization pain mitigation are often limited due to several factors, including time constraints from a high volume of patients, set appointment blocks, inadequate physical space, insufficient knowledge, and inadequate staff support (Cwynar et al., 2021). The Buzzy® is a device that offers drug-free pain relief and addresses many of these barriers. Buzzy® can have minimal effect on procedure time once training and staff familiarity with the device is established, as it only requires being on the skin for 30-60 seconds before the injection. Post-use, the only additional time requirement is to clean the device by wiping it down, which can be done when wiping down other medical equipment, like the thermometer, and then placing the ice wings back in the freezer. Unlike bulkier distraction tools or devices that need specialized storage or

regular calibration, Buzzy® is compact; easily stored with frequently used medical equipment, such as thermometers, pulse oximeters, and blood pressure cuffs; and does not require ongoing maintenance. The optional ice wings components only need a basic freezer, which many offices already have available. The device is cost-effective and offers various purchase options, ranging from a personal device for approximately 40 USD to the Buzzy® Mini Healthcare pack for approximately 130 USD, with other packages in between (Buzzy®Helps, 2025). Although the device requires some basic training, it does not involve medication administration, and there are limited contraindications that can be easily taught to staff. Proper device positioning allows for optimal pain relief; however, incorrect positioning does not pose a risk to the patient. Buzzy can be adapted to various situations, allowing for shared involvement in the immunization process. Additionally, the patient and caregiver may be actively involved by holding Buzzy® in place, which reduces the reliance on additional aid from staff for its use. These features make it a promising device for future implementation in practice.

The findings of this project demonstrated an increase in perceived knowledge of pain mitigation strategies. They showed strong evidence of intent to modify personal practice to offer the Buzzy® to patients and their families during the immunization process. Across various clinical roles and titles, participants reported a high likelihood of intent to change their practice and incorporate Buzzy® as a pain mitigation option. The post-education assessment suggested that additional education was needed to improve understanding of pain as a deterrent factor for vaccine administration (vaccine hesitancy) and to statistically enhance knowledge levels on the Buzzy® device. Additional education would also be beneficial in addressing some barriers and areas that can be further developed. The addition of an in-person educational or demonstration

service would allow participants to engage with the device. They could experience the vibration effect, the ice wings, and the playful design that makes the Buzzy® a unique device. This would be incredibly beneficial in developing confidence in the device. While the educational presentation was an initial step, it has created an opportunity for Agave Pediatrics-Deer Valley to further explore pain mitigation strategies to improve pain mitigation during vaccine administration.

This QI project was grounded in analysis from its conceptualization through to its implementation. This project was conducted at one of the several Agave Pediatric clinics located in the Phoenix area. To gain a broader dataset, expanding to other Agave Pediatric locations would be beneficial, enhancing overall impact and sustainability in practice. The expansion of the project and implementation of Buzzy could support changes in future practice. Allowing for the evaluation of staff assessment of its perceived benefits, assessment on patients' and/or caregivers' feedback if they found it helpful, or even longitudinal vaccine rates, comparing rates before offering the device to after. These are topics that can be expanded upon from this initial education and built on, making vaccine administration a better experience for the patients, caregivers, and providers.

Appendix A

Site Authorization / The University of Arizona Institutional Review Board Authorization

Letter

Agave Pediatrics
3575 W Deer Valley Rd,
Glendale, AZ 85308

Date: 04/17/2025

Human Subjects Protection Program
The University of Arizona
845 N Park Ave., Suite 537A
Tucson, AZ 85719

Please note that Ms. Elizabeth Moe, University of Arizona Doctor of Nursing Practice student, has permission of the Agave Pediatrics Clinic to conduct a quality improvement project at our facility for her project, "Educating Pediatric Providers and Medical Assistants on The Buzzy® Distraction Device for Immunizations: A Quality Improvement Project."

Ms. Moe will conduct an education presentation, then a post-survey of health care providers and medical assistants at Agave Pediatrics. She will recruit providers through email. The email will provide a description of the project, what they will be asked to do, and the time involved. Ms. Moe's activities will be completed by *November 2025*.

Ms. Moe has agreed to provide to my office a copy of the University of Arizona Determination before she recruits participants. She will also present aggregate results to the providers at their monthly staff meeting.

If there are any questions, please contact my office.

Signed,

SIGNATURE

A handwritten signature in black ink, appearing to read "Elizabeth Moe", written over the word "SIGNATURE".



University of Arizona IRB
 845 N Park Ave., Suite 537A
 Tucson, AZ 85719
 Fax: 520-621-9810
VPR-IRB@arizona.edu

NOT HUMAN RESEARCH

September 8, 2025

Elizabeth Moe

Dear Elizabeth Moe:

On 9/8/2025, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title:	Improving Providers' and Medical Assistants' Knowledge of Buzzy®: A Quality Improvement Project
Investigator:	Elizabeth Moe
IRB Submission ID:	STUDY00006980
Sponsor:	None
Prime Sponsor:	None
IND, IDE, or HDE:	None
Documents Reviewed:	<ul style="list-style-type: none"> • Advisor Attestation, Category: Other; • Agave Site Authorization, Category: Institutional Approval; • Buzzy® Insert, Category: Participant Material; • Buzzy® Presentation, Category: Participant Material; • Consent/Disclosure Form, Category: Consent Form; • expert evaluation, Category: Other; • IRB Protocol, Category: IRB Protocol; • Post-Assessment, Category: Data Collection Tool; • Pre-Assessment, Category: Data Collection Tool; • Recruitment email and reminder, Category: Recruitment Materials; • Survey Validation, Category: Other;

The IRB determined that the proposed activity is not research involving human subjects as defined by DHHS and FDA regulations.





University of Arizona IRB
845 N Park Ave., Suite 537A
Tucson, AZ 85719
Fax: 520-621-9810
VPR-IRB@arizona.edu

IRB review and approval by this organization is not required. This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these activities are research involving humans in which the organization is engaged, please submit a new request to the IRB for a determination.

All Covered Individuals must disclose all sponsored and non-sponsored Research Projects to the Office for Responsible Outside Interests (OROI) prior to Conducting Research if the individual is an Investigator. Please visit the [OROI](#) website for more information.

We value your feedback and would appreciate you taking the time to complete our survey about your experience with the IRB staff:

https://uarizona.co1.qualtrics.com/jfe/form/SV_chQ04WxNA06b42i.

If questions arise at any time during your study, please email the general IRB inbox at VPR-IRB@arizona.edu.



Appendix B
Participant Consent / Disclosure

Improving Providers' and Medical Assistants' Knowledge of Buzzy®: A Quality Improvement Project

Elizabeth Moe

This quality improvement (QI) project aims to educate pediatric providers and medical assistants about the benefits the Buzzy® distraction device can offer patients receiving vaccinations. Education will be provided through a presentation.

If you choose to take part in this project, you will be asked to review educational materials and/or a verbal presentation and complete a brief pre- and post-education assessment. Participation will take approximately 15 minutes. There are no foreseeable risks associated with this project. Although there are no direct benefits to you, your participation may help improve patient care in the future. Your responses will remain anonymous, and your name will not be collected or linked to your answers.

Participation in this project is voluntary. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may withdraw from the project at any time, and you may skip any question you prefer not to answer. By participating, you do not give up any personal legal rights you may have as a participant.

For any questions, concerns, or complaints about the project, you may contact Elizabeth Moe, BSN, RN, at (253) 820-2686 or via email at moej271@arizona.edu.

By proceeding, you agree to have your responses used for this project.

Appendix C

Recruitment Email / Email Reminder

Initial Recruitment Email

Subject: Request for Participation in Buzzy® Quality Improvement Project

Hello Agave Pediatrics team,

I'm Elizabeth Moe, a Pediatric Nurse Practitioner student at the University of Arizona, currently completing my clinical rotations at your Deer Valley clinic. As part of my final semester, I am implementing a Quality Improvement project focused on educating providers and staff about the Buzzy® distraction device.

I have prepared a short presentation for you to view at your convenience, along with pre- and post-educational assessments. Links to the presentation, surveys, and additional information about the Buzzy® device are attached.

Your participation is voluntary but greatly appreciated. Completing the survey indicates your consent to participate, and a detailed consent form will also be provided. Please submit your responses by [DATE].

If you have any questions, feel free to contact me at moej271@arizona.edu or speak with me in person at the clinic.

Thank you for your support,

Elizabeth Moe, BSN, RN
Pediatric Nurse Practitioner Student
University of Arizona

Reminder Email

Subject: Buzzy® Quality Improvement Project Reminder

Hello Agave Pediatrics team,

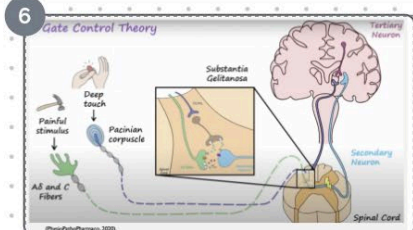
As the date approaches, I want to send a reminder about the current Quality Improvement project on Buzzy® education that I am offering. Attached, you will find links to the presentation, surveys, and additional information on Buzzy®. Your participation is voluntary but greatly appreciated, and completing the survey will indicate your consent to participate. A detailed consent form is also included. The deadline to complete the surveys is [DATE]. If you have any questions, please feel free to contact me at moej271@arizona.edu or in person at the clinic.

I appreciate your support,

Elizabeth Moe, BSN, RN
Pediatric Nurse Practitioner Student
University of Arizona

Appendix D

Presentation Overview / Presentation Script / Presentation Supplemental Material



7 HOW TO USE BUZZY®

Step One: Gather Supplies

- Remove ice wings from freezer*
- Get the Buzzy device
- Gather necessary vaccine supplies

* Ice wings can be stored out of the freezer for *10-15 minutes.

14 Please complete this Post-Educational Assessment Survey

By completing the survey you are agreeing to the following terms and conditions:
- Consent form

Supplemental information on @buzzy®
- Buzzy@msst

15 REFERENCES

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11 HOW TO USE BUZZY®

Step 4: Administer Vaccine

- Hold Buzzy securely to site.
- Slow injection using proper sanitization and positioning per policy
- Works best when Buzzy is between the injection site and brain

12 Real Life Impact

10 HOW TO USE BUZZY®

Step 3: Turn On and Get Ready

- Press ON switch located on top of Buzzy
- Hold the device over Injection Site for 30-60 seconds

ON

9 HOW TO USE BUZZY®

Step Two: Attach Ice Wings

Place hole in ice wings over hook on the back of Buzzy.

1

BUZZY® EDUCATION

ELIZABETH MOE, RN, BSN

2

Pre-Educational Assessment Survey

3

Learning Objectives

Objective 1: Improve providers' and medical support staff's perceived knowledge of pain mitigation strategies, specifically the use of the Buzzy®, as measured by improvements in post-education assessment scores.

Objective 2: Assess the intent of providers and medical support staff to incorporate the Buzzy® device into vaccination practices, as measured by changes in survey responses following the educational intervention.

5 WHAT IS BUZZY®

- Friendly, fun vibration device with optional ice wings
- Takes the STING out of shots
- Developed by experts
- Pain Care Labs, a leader in drug free pain relief
- Based on Gate Control Theory
- Reduces perception of pain

(Photo: MSJ)

Eye openers

- Undervaccinated kindergarten students¹ has doubled in last 15 years (Arizona Department of Health Services, 2024)
- 30% of adults have needle fear stemming from immunizations from childhood (Sari et al., 2020)
- Fear of the pain and discomfort has been identified as a factor for vaccine hesitancy (Gowdx & Dempsey, 2023)

Buzzy® Presentation Script

Slide 1: Intro

-Hello, my name is Elizabeth Moe, and I am a Pediatric Nurse Practitioner student at the University of Arizona. Today, I will be presenting on the Buzzy® device and discussing how an understanding of its benefits could inform potential implementation within your clinic in the future.

Slide 2: Pre-Educational Assessment

-Please take this quick survey; it only takes 1-2 minutes before watching the presentation. Thank you!

Slide 3: Eye Openers

-The number of Maricopa County kindergarten students who are under-vaccinated has doubled in the last 11 years due to personal exemptions (Arizona Department of Health Services, 2024)

-30% of adults aged 20-40 formed a fear of needles stemming from immunizations administered at a pediatrician's clinic during childhood. (Sari et al., 2025)

-Fear of the pain and discomfort has been identified as a factor for vaccine hesitancy in parents and adolescents (Gowda & Dempsey, 2013)

-Big takeaway from these facts is that the vaccines you give every day, multiple times per day, matter and can make a difference in a variety of ways

Slide 4: Learning Objectives

-Objective 1:

Improve providers' and medical support staff's perceived knowledge of pain mitigation strategies, specifically the use of the Buzzy®, as measured by improvements in post-education assessment scores.

-Objective 2:

Assess the intent of providers and medical support staff to incorporate the Buzzy® device into vaccination practices, as measured by changes in survey responses following the educational intervention.

Slide 5: What is Buzzy®

-This child-friendly, playful vibration device features optional ice wing attachments. It transforms immunizations and venipuncture procedures into less stressful experiences for patients, caregivers, and providers.

-Developed by a team of experts led by Dr. Amy Baxter, a Pediatric Emergency Medicine Physician and Pain Researcher, this innovative tool reflects the push for drug-free pain management.

-Brought to you by Pain Care Labs, it represents just one of their many products dedicated to non-pharmacological comfort solutions. The company remains committed to ongoing research and development in this critical field.

-The device's effectiveness is grounded in the scientifically supported Gate Control Theory of pain, which will be explored further in the following slide.

Slide 6: Gate Control Theory of Pain

-The spinal cord contains a "gate" mechanism that mediates pain signals: non-painful inputs can close the gate to painful signals, reducing pain perception. Pain signals carried by small nerve fibers can be blocked by simultaneous activation of large fibers, such as touch, pressure, or vibration, and psychological factors that influence how much pain is ultimately felt. For example, if you hit your finger with a hammer, the pain gate is open. However, if you also grab and apply pressure to the finger, it competes with the pain, and the gate closes a bit, reducing the pain you feel.

-The ice wings of Buzzy® work in a similar way, but not just right where the pain is happening, through descending noxious inhibitory control or DNIC. It causes the brain to focus more on the sensation of the cold and reduce sensations felt elsewhere in the body, thereby raising the overall pain threshold.

Slide 7: How to use Buzzy

Step One: Gather Supplies

-Remove the ice wings from the freezer and retrieve the Buzzy device. Verify the vaccine orders and assemble all essential vaccine supplies. Please note that the ice wings can remain outside the freezer for 10 to 15 minutes without compromising their effectiveness.

Slide 8: How to use Buzzy

Step Two: Attach Ice Wings

-Position the hole in the ice wings over the hook located on the back of the Buzzy device or thread the wings through the elastic band to attach them to the back.

-The device can be utilized with or without the ice wings, allowing for patient preference. For example, if the child finds the cold sensation uncomfortable or if the wings are not available during vaccination.

Slide 9: How to use Buzzy

Step 3: Turn On and Get Ready

-Activate Buzzy by pressing the ON switch on the device's top. Hold the device gently over the injection site for 30 to 60 seconds. Both parents and patients are welcome to engage in this step if they want to be involved.

Slide 10: How to use Buzzy

Step 4: Administer the Vaccine

-Gently reposition the Buzzy® device slightly upward, ensuring it remains securely in place while the injection site remains unobstructed by the device or its wings. Thoroughly cleanse and sanitize the area in accordance with clinic policy.

-Administer the vaccine as per standard clinical procedures.

-Following administration, promptly remove the needle and dispose of it in a sharps container. Cover the injection site with a bandage or appropriate dressing.

-Clean the Buzzy® device with clinic-approved disinfecting wipes between each patient. Ensure all hazardous materials are disposed of properly, in accordance with clinic protocols.

Slide 11: BETWEEN THE PAIN AND THE BRAIN

-Buzzy® should always be positioned between the vaccine injection site and the brain for it to be most effective. As depicted in the presentation images, there are various ways for patients and their families to assist in holding the device. Clinical testing has shown that Buzzy® is most effective in children aged 3 to 18 years. Older children may hold the device themselves, which gives them a sense of control and a task to focus on, as opposed to only focusing on the vaccine. While parents or another helper may also assist by holding the device in place, this allows parents the opportunity to be more involved in the process. For added convenience—especially on busy days without extra help—a strap that is provided can be used to secure Buzzy® comfortably in place.

Slide 12: Real Life Impact

- At one time, measles was believed to be effectively eradicated. Today, however, we are witnessing a resurgence within our communities, with more cases than we have seen in many years. So far this year, there have been over 1,000 reported cases—representing a staggering 450% increase since 2010. Notably, 96% of those who contracted measles were unvaccinated; 12% required hospitalization, and tragically, there were three deaths.

-These numbers underscore the vital importance of vaccines and their impact on community health. While Buzzy® alone will not sway everyone's views on vaccination, it offers parents and patients an effective strategy to minimize pain and discomfort during immunizations. By making the experience less intimidating, Buzzy® may help prevent the development of needle phobias and demonstrate a clear commitment to the well-being of patients and their families during a procedure that, let's face it, is rarely enjoyable

Slide 12: Thank you

-Please take the post-educational assessment, which should take less than 5 minutes. Thank you so much for your participation. If you would like to view the consent/disclosure form, it is linked here, and there is the Buzzy® insert linked as well that offers great supplemental information.

Slide 13: References

Indications For Use 1
 Warnings, Contraindications, Cautions 1
 Buzzy® Personal Includes 2
 Directions For Use 3
 Ice Packs 3, 4
 For Injections 5
 Buzzy® Placement 5
 Finger Sticks, Splinters 7
 Stomach Injections 7
 Burning, Itching 7
 IVs & Phlebotomy, For children 8
 Maintenance, Ordering, Guarantee 9
 Troubleshooting, Warranty 10



Environmental conditions:
 Transport and storage between uses: $25\text{ to }70\text{ }^\circ\text{C}$, 0-95% RH, 700-1060 hPa
Operating conditions:
 5-40 °C, 15-95% RH, 700-1060 hPa, 2000m altitude

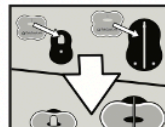
Directions For Use:



Fold & place Ice Packs in freezer.
 Gel inside ice may deteriorate if not stored properly and will dehydrate over time or in dry climates. Ice Packs will refreeze solid in approximately 30-60 minutes. Ice Packs do not contain Ethylene Glycol ("anti-freeze"). (For optimal battery life, do not freeze vibration unit.)

Ice Packs will stay frozen for approximately 15 minutes at room temperature and 5 minutes against skin. Buzzy® Ice Packs are reversible. Face the blue or smooth side of the Ice Pack toward the skin for more numbing power. If sensitive to cold, face the soft side of the Ice Pack against the skin.
 Tip: For icing larger areas, prepare additional Ice Packs (sold separately). Ice Packs fit with the hole placed horizontally on the hook, or horizontally under the silicone band. Do not orient hole/wings vertically as the hole will rip/band may snap.

3



Attach Ice Packs to back of Buzzy®.

Why Frozen?
 For best effect, the Ice Packs must be frozen solid to transmit vibration at the effective frequency and strength. For injections, ice provides up to 60% of the numbing, because intense cold causes the brain to inhibit pain everywhere.

1



Activate vibration switch or press button firmly. Leave in place 30-120 seconds.

4

Buzzy® Personal Includes:

All Buzzy® kits include a vibration unit with 2 AAA batteries (installed) and instructions. All accessories are latex free and reusable.

Buzzy® Personal includes a vibration unit with toggle switch, two reusable Ice Packs, and a hands free strap.

Buzzy® Mini Personal includes a vibration unit with button switch and energy saving automatic 3-minute shut-off, two reusable Ice Packs, and a hands free strap. Press and hold button firmly until vibration activates.

- The device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) the device may not cause harmful interference, and (2) the device must accept any interference received, including interference that may cause undesired operation.
- "Please note that changes or modifications to this product are not expressly approved by the party responsible for compliance with these rules and authority to operate the equipment."
- NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: - Reorient or relocate the receiving antenna. - Increase the separation between the equipment and receiver. - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. - Consult the dealer or an experienced radio/TV technician for help.
- PainCareLabs, 195 Arizona Ave., • 19800E Atlanta GA 30307 • 877-805-2899 PainCareLabs.com ©2022 PainCareLabs, Inc. (USA)

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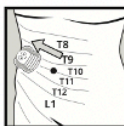
Buzzy® Placement:



Buzzy® controls pain on contact.
 Place directly on injury or "between the brain and the pain" for procedures. **Dot**

For Injections:
 Place Buzzy® with ice directly on the injection site. Activate vibration. Leave in place at least 30 seconds. Larger volumes or more painful injections may require up to 120 seconds. During injection, move Buzzy® proximally so the dot is 2-3 cm proximal (closer to the head) to the injection site in the same dermatome as the injection.

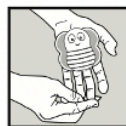
5



Place the dot (located at the bigger rounded end) as close as possible to the site of the procedure, with Buzzy®'s end farthest away. During the injection, move Buzzy® 2-3 cm toward the spine along nerve pathways/zones (dermatomes) as shown. Tip: To transport, place in a Cold2Go bag, or between 2 commercial cold packs (sold separately). An insulated environment will help maintain frozen temperature.

Why Does Placement Matter?
 Vibration and cold are transmitted together to the same place in the spine as pain. To block pain, Buzzy® needs to be on the same nerve paths as the source of the pain.

6



For finger sticks or splinter removal:
 Press Buzzy® onto the palm with the bottom and toward the finger. Activate vibration. Leave in place throughout cleaning and during the procedure.
For burning or itching:
 Place Buzzy® directly on the site. Activate vibration. Rub or press in place until the area feels better.
For stomach injections:
 Place the Buzzy® on the surface of the abdomen on a horizontal line from the belly button to the side of the body. Activate vibration. Place the injection (proximal to the Buzzy®) on a horizontal line between the belly button.



For IVs or phlebotomy:
 Do not put directly on the site of access.
 Activate, then hold or tuck Buzzy® under the tourniquet 3-5 cm above (proximal to) the access site. Clean the site and access without delay.
 Optional: Pass tourniquet through the slot of Buzzy® Personal to secure Buzzy® to arm. For instances where pain is anticipated to be ongoing (e.g., infusion of painful medication), Buzzy® may be left in place to block the pain. In most cases, when the IV access is completed, the clinician will remove the tourniquet and device. Hold the vibration unit to prevent the unit from falling.

For Children:
 Let children hold Buzzy® in advance for familiarity, and let them choose whether or not to use the ice pack. For vaccinating children sitting up, a parent can put an arm around the child's shoulders and hold Buzzy® for them.

8

Maintenance:

Buzzy® is a personal consumer product intended to be used by a single user. Check the entire device for any visible evidence of damage such as cracks. Ensure that the switch moves freely. Make sure external screws are secure. To replace AAA batteries, unscrew using a Phillips-head screwdriver and open back panel, placing batteries in the orientation shown inside the device. Gently wipe clean all exposed surfaces with a soft cloth dampened with a mild soap solution. To disinfect, wipe all exposed surfaces with alcohol or chlorhexidine, or a hospital-grade sanitizing wipe. Do not autoclave or immerse. This device does not require sterilization for use.

How To Order/Additional Information:

Please visit our website PainCareLabs.com for a complete list of FAQs, other pain management tips, how-to videos, accessories, and replacement parts.

Guarantee:

If not completely satisfied, return within 30 days to place of purchase for a full refund, or contact us at the address listed.

DO NOT SERVICE WHILE IN USE

US Patented British Patent No. 2455695
 RM-1910, 1248-064-5002-00, 1248-064-5001-00

9

Troubleshooting:

With proper care, your Buzzy® motor unit will last for at least 6 months. With heavy use or extreme temperature fluctuations, batteries may need to be replaced more frequently. If device stops working or has weak mechanical stimulation, replace batteries.

Warranty:

The Company covers every type of malfunction or defect that may appear or arise from normal use in the motor unit of the product for 6 months. The warranty for soft goods and ice packs lasts 6 months from date of purchase. The company will replace your product or refund your purchase and reserves the right to upgrade or replace parts with the latest product versions. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. Warranty is void if used by clinicians in a healthcare setting.

MMJ Labs, LLC dba Pain Care Labs
 195 Arizona Ave NE L1W8 • Atlanta, GA 30307, U.S.A.
 PainCareLabs.com • info@PainCareLabs.com
 877.805.2899

CS Lifesciences Europe Limited
 The Black Church, St. Mary's Place
 Dublin 7, D07 P4AX, Ireland

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Buzzy® is a personal consumer product intended to be used by a single user or in home healthcare environments by a lay operator. Buzzy® is applied for up to 2 minutes proximal to the procedure to reduce pain or distress from procedures for:

- Acute pain from needles, injections, or dialysis cannulation
- Cosmetic injections or local procedures expected to be painful
- Dental injections or procedures
- Orthopedic injections or local procedures
- Temporary relief of itching, splinter and bee sting removal

PainCareLabs.com

For Buzzy® Mini Personal (Striped, Black, and LadyBuzzy) and Buzzy® Personal (Striped, Black, and LadyBuzzy)
 BKM1, BKM2, BKM3, BKT1, BKT2, BKT3
 IFU-002 Rev 01 Buzzy® Personal Instructions for Use
 07.07.2022



Appendix E

Evaluation Instruments (Pre-Education and Post-Education Assessments)

Pre-Educational Assessment on Vaccination Pain Mitigation

📄 Page title

1. How significant do you think pain from receiving a vaccination is as a deterring factor for patients and families when declining vaccinations?

- Very significant
- Significant
- Moderately significant
- Minimally significant
- Not significant

2. Rate your current knowledge of pain mitigation methods that can be implemented during vaccinations.

- Completely knowledgeable
- Highly knowledgeable
- Moderately knowledgeable
- Minimally knowledgeable
- Not knowledgeable

3. Rate your knowledge level on Buzzy®.

- Completely knowledgeable
- Highly knowledgeable
- Moderately knowledgeable
- Minimally knowledgeable
- Not knowledgeable

4. What methods do you currently use to mitigate pain during vaccinations?

5. Please describe any challenges you face in implementing pain mitigation techniques during vaccinations.

📄 Add content ▼

Post Educational Assessment on Buzzy® Education

1. How significant do you think pain from receiving a vaccination is as a deterring factor for patients and families when declining vaccinations?

- Very significant
- Significant
- Moderately significant
- Minimally significant
- Not significant

2. Rate your current knowledge of pain mitigation methods that can be implemented during vaccinations.

- Completely knowledgeable
- Highly knowledgeable
- Moderately knowledgeable
- Minimally knowledgeable
- Not knowledgeable

3. Rate your knowledge level on Buzzy®.

- Completely knowledgeable
- Highly knowledgeable
- Moderately knowledgeable
- Minimally knowledgeable
- Not knowledgeable

4. Rate your intent to modify your practice and offer Buzzy® to your patients for vaccinations.

- Very likely
- Likely
- Neither likely nor unlikely
- Unlikely
- Very unlikely

5. What is your current title?

- MD/DO
- Advanced Practice Registered Nurse
- Physician Assistant
- Medical Assistant

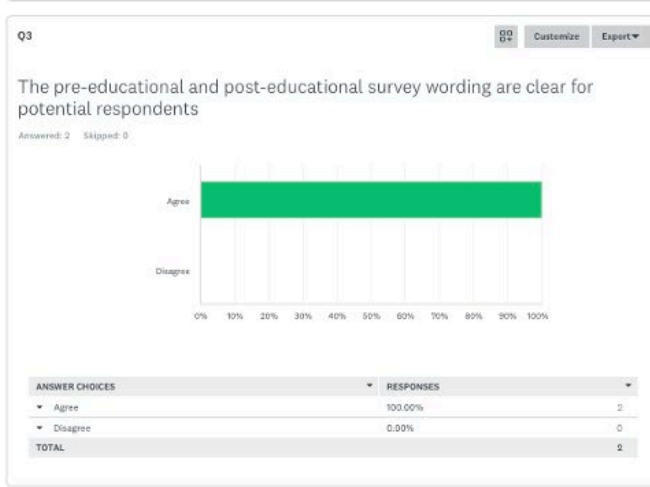
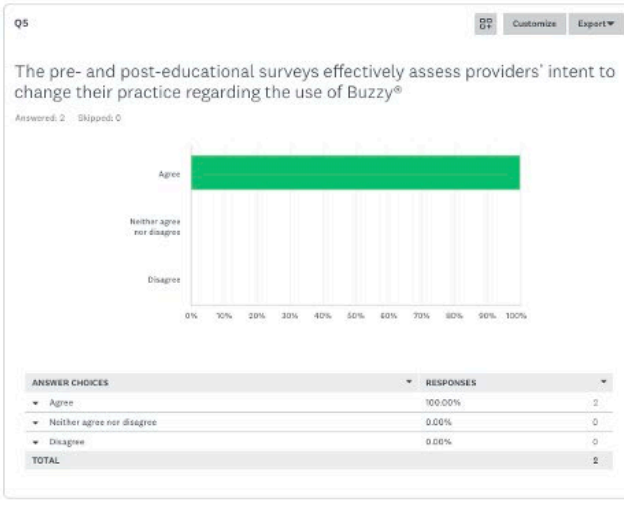
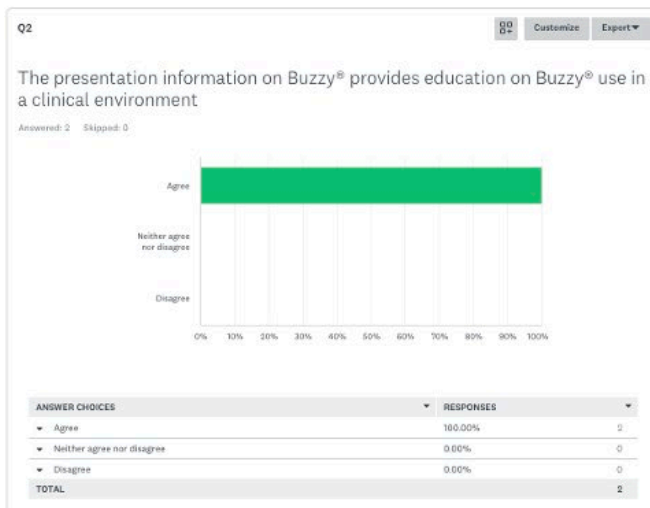
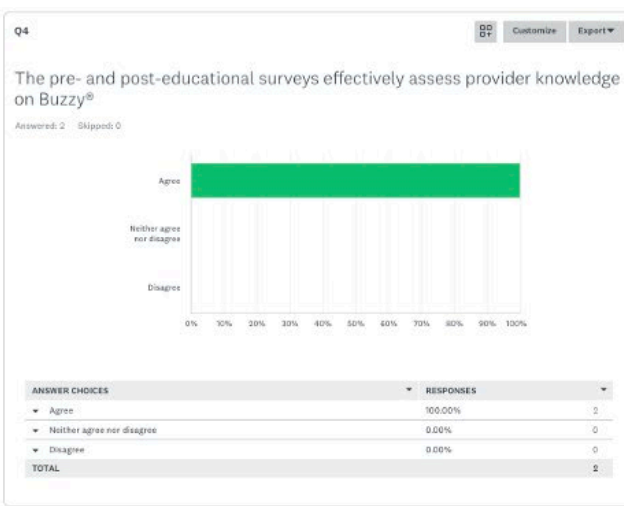
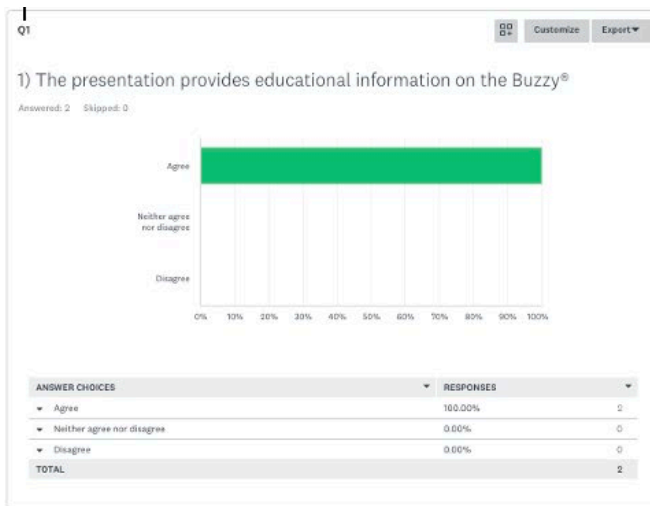
6. How many years of experience do you have in your current healthcare role?

- Less than one year
- 1-5 years
- 6-9 years
- 10 or more years

7. Do you see any barriers to implementation of the Buzzy at the clinic?

Appendix F

**Other Documents as Applicable to the Project (Content Expert Review Results / Photo
Release)**



Q6 Export

Please state your role and qualifications relevant to validating the project surveys?

Answered: 2 Skipped: 0

RESPONSES (2) WORD CLOUD TAGS (0)

Sentiment Analysis
 Detect the sentiment behind written responses to understand how people feel. Watch a demo Upgrade

Search Responses Filter by tag

Showing 2 responses

- Child Life Specialist who advocates for pain management strategies every day in a pediatric setting.
 9/18/2025 11:33 AM View respondent's answers Add Tag
- Staff Research Scientist at University of Colorado Anschutz Medical Campus. Background in clinical and basic science research, research methodology and experimental design.
 8/25/2025 03:22 PM View respondent's answers Add Tag

PHOTO RELEASE FORM

I, Megan Hightower, the parent of children modeling for Buzzy® placement demonstration (Hereinafter known as the "QI Project"), agree to the following:

I understand that my child(ren) whose name(s) are listed below may be photographed for demonstration activities. I understand that these photographs may be used in demonstration of Buzzy® for a QI Project, either in print or on the Internet.

The child(ren) are known as: Delaney Hightower and Richard Hightower.

With my signature below I grant permission for my child(ren) to be photographed, or their images recorded for print or electronic use in demonstration of Buzzy® for Ms. Moe's QI Project. I understand that it is my responsibility to update this form in the event that I no longer wish to authorize the above uses. I understand that there will be no payment for me or my child's participation in this release.

Parent/Guardian Signature

eSigned by:
Megan Hightower
05/25/2025 @ 22:52 UTC

Date: May 08, 2025

Relationship To Child: Mother



Appendix G
Literature Review Grid

Author, Year	Title of Publication	Type of Study	Findings and Main Outcomes	Link to Project
Ballard et al, 2019	Efficacy of the Buzzy® Device for Pain Management During Needle-related Procedures: A Systematic Review and Meta-Analysis	Systematic Review and Meta-Analysis, quantitative and qualitative analyses were conducted	Buzzy® is a promising intervention for procedural pain management in children, but due to heterogeneity and low-quality evidence needs further research	Buzzy® while proven to be effective in managing procedural pain there is still more studies needed to strengthen the research
Clemmons et al., 2017	Incidence of Measles in the United States, 2001–2015	Retrospective Cohort Studies	A relative increase in measles rates have been occurring since 2000. High number of unvaccinated cases suggest failure to vaccinate can be the main driver for measles transmission.	This study demonstrates how important vaccines are in establishing herd immunity, and without majority of the population being adequately vaccinated, illness transmission can lead to outbreaks.
McDermott, 2021	Core Concept: Herd immunity is an important—and often misunderstood—public health phenomenon	Qualitative with Phenomenology	Looks at the concept of herd immunity and how the idea originated. Also applies it disease outbreaks.	Herd immunity has been a proven and successful way to protect the group and has been utilized since 1900s.
Okafuji et al, 2025	Use of a cooling pack to reduce subcutaneous vaccine injection pain in children aged 3-6 years: A single-blind, randomized, parallel-group multicenter study	Single blind, randomized, parallel-group study	Cooled group had significantly lower FLACC scores compared to non-cooled group	Aids in validating the cooling component of the Buzzy® device.
Sari, D et al, January 2025	Effects of Buzzy® and ShotBlocker® on Pain and Anxiety During Immunization in Children: A Randomized Controlled Trial	Experimental randomized controlled trial	ShotBlocker and Buzzy® demonstrated lower pain and anxiety levels than control group	Demonstrates the Buzzy® not only lowers pain levels but anxiety as well. It also is compared to another pain mitigation technique.
Seither et al., 2024	Coverage with Selected Vaccines and Exemption Rates Among Children in Kindergarten — United States, 2023–24 School Year	Secondary Analysis of Quantitative Data	State required vaccines are declining from 95% compliance to under 93%. Creating greater risk for	Provides content to why vaccination compliance is so important.

Author, Year	Title of Publication	Type of Study	Findings and Main Outcomes	Link to Project
			vaccine preventable disease outbreaks.	
Sonmez, D, et al, November 2024	Effects of the Helfer skin tap technique and Buzzy® application on the levels of pain and fear experienced by children during vaccination: A randomized controlled trial	Randomized controlled experimental design	Both Helfer skin tap and Buzzy® were effective in reducing pain, Buzzy® was most effective	Study demonstrates the effectiveness of the Buzzy® device for pain relief. It also demonstrates it was more effective when compared to the Helfer skin tap.
Taddio et al., 2012	Survey of the prevalence of immunization non-compliance due to needle fears in children and adults	Cross Sectional Survey	Showed that needle fear for both children and adults was a factor in vaccine compliance.	Since fear is a component of vaccine hesitancy, it demonstrates the Buzzy® can have an impact possibly increasing compliance.

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