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Proper Technique when Administering Intramuscular Injections

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by

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Abstract

The intent of the evidence-based practice project was to implement a policy change requiring licensed nurses employed by a local rural healthcare organization to complete an educational module on correct intramuscular (IM) administration technique. During the 2014 influenza season, injuries were noted to employees who received influenza vaccinations within the healthcare organization. The injuries occurred after licensed nurses employed by the healthcare organization administered the influenza injection incorrectly to other employees. Injuries were noted after the influenza injection was administered too high in the deltoid causing injury to the shoulder joint. A corrective action plan was developed by a doctoral student within the organization which included an educational module and teach-back to validate competency of proper placement for an IM injection. In September 2015, licensed nurses who volunteered to administer influenza vaccinations to employees within the organization completed the educational class and teach-back, with the intent no injuries would be reported to employees during the influenza season. At the conclusion of the project, it was noted the educational session was effective in evaluation and validation of correct technique when administering the influenza vaccination. No injuries were noted to employees within the healthcare organization during the 2015 influenza season from improperly administered influenza vaccinations.

Keywords: vaccine administration, shoulder injuries from vaccine administration, vaccine, injections, deltoid

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The trend of medication administration has shifted with medications given more via intravenous route instead of intramuscular route. Thus when nurses are providing intramuscular injections it could be once a year during the influenza season, potentially causing more error to the receiver due to a lack in skill level. The Joint Commission for Accreditation of Healthcare Organization requires assessment of clinical competence of all nursing staff (National Institute of Health (NIH), 2015). Competency is defined as "the knowledge, skills, ability, and behaviors a person possesses in order to perform tasks correctly and skillfully" (O'Shea, 2002, p. 175). Healthcare organizations are held accountable for the competency of all staff. Competence assessment is an ongoing process of assessing, maintaining, demonstrating, and continually improving educational material, skills check off, and exams to meet the every changing healthcare needs.

Problem Recognition

Shoulder injuries related to vaccination administration (SIRVA) is a complication noted with improper administration technique of vaccines. Several cases of SIRVA occurred at a local rural healthcare organization in 2014 after improper intramuscular administration of the influenza vaccine. When a vaccine is administered improperly, the content of the vaccine enters the bursa (a fluid filled area) of the shoulder joint instead of the deltoid muscle causing an inflammatory response. The inflammatory response includes bursitis, tendonitis, and/or adhesive capsulitis (frozen shoulder) leading to prolonged restrictions in the function of the affected shoulder (Bodor & Montalvo, 2006).

The administration of vaccines is key in the nation's efforts to protect people of all ages from a host of infectious diseases. The Centers for Disease Control and Prevention

(CDC) and Food and Drug Administration test for safety and effectiveness of vaccines before utilization of these vaccines can begin, while continuously monitoring for adverse events (Institute of Medicine, 2011). Even with these regulations in place, adverse events can occur with any vaccine due to side effects from the vaccine and if a vaccine is given improperly.

Scope of Problem

In October and November 2014 several verbal complaints were made from individuals experiencing prolonged soreness and pain at the injection site from the influenza vaccination. In October 2014, four cases were entered in the healthcare organizations adverse event reporting system with two additional cases entered in November 2014. These individuals reported shoulder discomfort and limitation of movement within the shoulder in which the injection was received. The Employee Health Department initiated treatment, however, in November 2014 two cases required referral to an orthopedic office and an additional case was referred in December 2014. These cases required additional treatment including diagnostic testing, magnetic resonance imaging (MRI), steroid injections, and physical therapy. The total for workers' compensation claims for the three cases with severe complaints was $10,960. The true scope of this problem is not well known due to many adverse events not being reported.

Problem Statement

Mild problems following vaccine administration include soreness, redness, or swelling at the injection site; however, in some cases prolonged shoulder pain and dysfunction can occur. To reduce the problem, complications, and sequel effects of SIRVA, careful consideration should be given to appropriate injection technique when

administering IM injection vaccinations. The intent of the evidence-based practice project was to implement a policy change requiring licensed nurses employed by a local rural healthcare organization to complete an educational module on correct IM injection administration technique. The CDC recommends all personnel administering vaccinations should receive education on vaccine administration and competency-based training (Center for Disease Control and Prevention (CDC), 2013c). The World Health Organization (WHO) defines a safe injection as not harmful to the recipient, health care worker, and community (CDC, 2015b).

PICOT Statement

Within a local rural healthcare organization, licensed nurses who volunteer to administer influenza vaccinations to staff within the organization completed a 10 minute educational class on proper IM injection technique, with the intent no injuries would be reported in the 2015 influenza season from an improperly administrated vaccine. An educational class was developed and implemented to include appropriate needle size/length, proper placement of an IM injection in the deltoid, proper positioning of the administrator and receiver during the injection, in addition to a "teach-back" to demonstrate proper placement of an IM injection. After the material was taught, confirmation of an individual's understanding was completed with asking the individual to explain the concept and demonstrate the task back to the instructor in a "teach-back" session. Teach-back is an educational strategy used to confirm an individual understands the information relayed to them (Ping, 2012). A policy change was implemented requiring employees to complete an annual educational module on proper IM injection technique with a "teach-back" prior to administration of influenza vaccinations. Once the

educational module was implemented, data was compared between the numbers of adverse events in 2014 to adverse events in 2015 from improper administration of an influenza vaccine.

Sponsor and Stakeholder

The project was implemented at a local rural healthcare organization located in the western foothills of the state. The facility is a nationally recognized organization promoting health and providing high quality and expert healthcare to the residents within the county and surrounding areas since 1946. It includes 43 primary and specialty offices and a 435-bed, non-profit hospital. This organization employs over 3,800 individuals and is a major employer in the local community with a population of 207,039 individuals (Gaston County Department of Health & Human Services, 2013). The mission of this facility is to provide exceptional healthcare, while showing compassion, accountability, respect, and safety for patients and the communities it serves. Stakeholders include investors and employees, in addition to the individuals and community served by the healthcare organization.

The strength of this project was the implementation of a new policy benefiting all stakeholders. The healthcare organization for which this evidence based practice improvement project was implemented is an organization allowing staff nurses' involvement in decision-making related to practice improvement ideas. The organization is an outcome driven organization with Magnet recognition for its continual efforts in nursing improvement. The educational class provided the necessary competencies as recommended by the CDC and a standardized process of IM injections, in addition to cost saving benefits from elimination of adverse events with improper given IM

vaccinations. A potential weakness was the lack of reporting of adverse events from vaccine administration to know the true extent of the problem. The opportunity exists to increase knowledge of all stakeholders. The development and implementation of an educational class was beneficial to nursing staff by increasing knowledge and skills needed to move toward a standard of practice for IM injections. A potential delay in the Institutional Review Board (IRB) approval due to multiple steps required to get approval within the healthcare organization was not noted. Another potential delay was push back from managers and staff, as some nurses think they know how to properly administer an IM injection even if he or she has not given an injection in years was not noted. The lack of access to supporting data/information to identify a clinical practice issue due to lack of reporting did not delay the project. (Figure 1)

Strengths	**Weaknesses**
-Standardized processing of IM injection -Outcome driven organization -Magnet Recognition -Staff nurses involved in decision-making -Community support and involvement -Diverse learning styles and backgrounds of team members -Cost saving in workers' compensation claims	-Productivity versus quality and resources needed -Lack of reporting -Custom and practice of IM injection technique instead of evidence based practice
Opportunities	**Threats**
-To improve standard practice -Increase knowledge and skill -Involve stakeholders in project idea -Continuing education -Good collaboration	-Support for developing educational module -Communication between team members -IRB approval -Stakeholders do not approve project -Personnel not at bedside -New computer system training during implementation of project

Figure 1. SWOT Analysis

Theoretical Underpinning

Expert nurses develop skills and understanding of patient care over time through a sound educational base in addition to experience. Patricia Benner developed a theoretical framework to distinguish five levels of nursing practice from novice to expert. Benner noted three characteristics of change across these skill competency levels. Movement is noted from the novice nurse's dependence on abstract principles, viewing all pieces of a situation as equally important, and as a disconnected observer to the expert nurse with a multitude of experiences to guide practice, viewing the whole situation with different degrees of important pieces, and as an engaged performer. Benner's model is situational and interpretive; whereas, other models are linear with task being completed in sequential order. As nurses progress through the five levels, their ability to anticipate needs based on past experiences heightens, in addition to utilizing logical thinking and problem solving skills (Stewart, 2015).

Nurses within their nursing career will move throughout Benner's stages of clinical competence depending on new job experiences or new skills required within a new position. All licensed nurses were taught proper intramuscular injection technique in nursing school, however when skills are not utilized often, these learned skills can be lost. The once proficient or expert performer of intramuscular injections is now a competent professional with the knowledge base, but lacked continued experience to administer these injections.

Literature Review

The literature search was completed using Medline, CINAHL, and Bulldog One databases. The research and articles in regards to the significance of improperly given

injections, injuries noted from these improper techniques, and proper technique for administering intramuscular injections were reviewed. Key terms utilized within the search included shoulder injuries related to vaccination administration (SIRVA), IM injections, vaccine administration, and injections.

Problem Significance

Shoulder injuries related to vaccination administration (SIRVA) have been noted to occur after various vaccinations including but not limited to influenza and pneumococcal. Atanasoff, Ryan, Lightfoot, and Johann-Liang (2010) reviewed claims submitted to the Vaccine Injury Compensation Program (VICP) related to shoulder pain after vaccine administration from 2006-2010. Thirteen cases of shoulder pain and dysfunction after administration were noted. Eight of the 13 who had shoulder pain received the influenza vaccination. Forty-six percent of participants in this study reported the vaccine was administered too high in the deltoid.

The Centers for Disease Control and Prevention monitors the safety and effectiveness of vaccines licensed in the United States. To ensure the safety of vaccines, CDC utilizes three surveillance systems, Vaccine Adverse Event Reporting System (VAERS), The Vaccine Safety Datalink (VSD), and The Clinical Immunization Safety Assessment (CISA) Network to identify potential risk factors and adverse events associated with a vaccine.

VAERS is a public health system established in 1990 allowing individuals, healthcare professionals, and manufacturers to report adverse events associated with vaccines approved in the United States. The Food and Administration (FDA) and CDC used data from VAERS to monitor safety of vaccines and conduct research studies.

Health care providers are required by law to report any adverse event listed on the manufacturer's package insert, unexpected, or clinically significant event, to VAERS (CDC, 2013a).

With the collaboration of CDC Immunization Safety Officers (ISO) and nine healthcare organizations, the VSD was started in 1990. The VSD used data including type of injection and date of vaccination to conduct vaccine safety studies. These studies are based on questions and concerns in the medical literature and reports from VAERS. Several studies have been published by the VAS to address vaccine safety concerns and provide information for vaccine recommendations for the nation (CDC, 2014).

In 2001, the CDC established the CISA Network to address and evaluate unmet vaccine safety clinical needs. CISA is a national network of vaccine safety experts from the CDC Immunization Safety Office (ISO) and seven medical research centers within the United States. This network studies the pathophysiology of adverse events, identifies risk factors, and develops guidelines to help healthcare providers (CDC, 2013b).

The National Vaccine Injury Compensation Program (VICP) was created as a no-fault alternative in 1988 by The National Childhood Vaccine Injury Act of 1986 as a result of the harsh lawsuits against vaccine manufacture and healthcare providers. VICP was established to maintain an accessible and efficient forum for those injured by vaccinations approved for compensation, in addition to ensuring adequate supplies of vaccinations are available and monitoring vaccination costs. Seasonal influenza, pneumococcal, Hepatitis A and B, meningococcal, and human papillomavirus vaccines are some of the vaccines covered by VICP (United States Department of Health and Human Services, 2012).

The VICP is managed by three Federal government offices: the US Department of Justice (DOJ), the US Court of Federal Claims (the Court), and US Department of Health and Human Services (HHS). An individual, legal guardian of a child or legal representation of an estate can file a claim for compensation for a vaccine-related injury or death with the Court. The petition is then reviewed by a HHS physician to determine if it meets medical criteria for compensation. If medical criteria are met then a decision is made under the VICP for compensation (The Vaccine Injury Compensation Program, 2011). Reporting systems and vaccine safety activities will continue to be utilized to monitor and study adverse events with the development and use of new and existing vaccines.

Injuries

The most common finding on examination of each participant after an improperly administered injection was limited and painful range of motion (ROM). Findings noted on the magnetic resonance imaging (MRI) exam completed included bursitis, fluid collection in the muscle and bursa, tendonitis, rotator cuff tears, and atrophy of the rotator cuff tendon (Atanasoff et al., 2010). All participants in this study experienced pain for at least six months. Treatment options included corticosteroid injections, physical therapy, and surgery for severe cases. Atanasoff et al. (2010) made several recommendations to help decrease the chance of an injection being given into the bursa including: avoid the top third of the deltoid, have both the administrator and the receiver in a seated position to help minimize the chance of the injection being given high, and have the receiver of the vaccine to abduct his or her arm a few degrees laterally to decrease the exposure of the bursa in individuals with smaller shoulder mass.

Bodor and Montalvo (2006) reported two cases of shoulder pain with decreased range of motion (ROM) following vaccination; one of which was the influenza vaccination, while the other was a pneumococcal vaccine. From 2010-2012, 167 cases were reported to the Vaccine Event Reporting System (VAERS) for SIRVA after administration of the influenza vaccination (US Department of Health and Human Services, 2015). Barnes, Ledford, and Hogan (2012) reported on a young woman who developed acute left shoulder pain and limited ROM within two days after receiving a seasonal influenza vaccine.

Magnetic resonance imaging (MRI) exams were conducted in both studies with similar findings in all reports including joint effusion (increase fluid within the joint) and a partial tear of the tendon and contusion (bruising of the bone). Treatment options as noted in other studies included a referral to sports medicine, physical therapy, and several corticosteroid injections. Bodor and Montalvo (2006) further evaluated the depth and location of the sub deltoid bursa via ultrasound on the individuals within their case study. It was noted needle length of one-inch or greater could go beyond the deltoid muscle into the bursa or other tissues of the shoulder in some patients, especially adults with a lower body mass index (BMI). Bodor and Montalvo (2006) concluded the "upper third of the deltoid muscle should not be used for vaccine injections" (p. 587).

Proper Technique

Lippert and Wall (2008) expounded on the needle size used to give vaccines suggesting a weight based vaccination technique in pediatric patients. Cook, Williamson, and Pond (2006) and Koster, Stellato, Kohn, and Rubin (2009) further evaluated BMI, gender, and weight with ultrasound to determine appropriate needle lengths in

intramuscular injections in elderly adults and adolescents. The authors stated these recommendations could decrease or possibly prevent SIRVA. The literature reinforced the likelihood a vaccine could be unintentionally injected into structures underlying the deltoid muscle due to inappropriate injection techniques and needle length.

The CDC recommended any personnel administering vaccinations to receive education on proper techniques. Guidelines on vaccine administration have been developed by the CDC including proper preparation of a vaccine or medication, appropriate needle length, proper placement of injections, and techniques to help prevent administration errors (CDC, 2015a).

According to the CDC, all inactivated vaccines are administered via the intramuscular route. Two routinely recommended IM sites include the deltoid and the vastus lateral is muscles. Injections within these sites depend on the age of the individual and muscle development. Decisions on needle length should be made for each person based on the size of the muscle, adipose tissue present, volume of medication to be administered, and injection technique. Recommendations on needle length based on weight include using a 5/8-1 inch needle for women and men weighing less than 130 lbs., 1 inch needle for women and men weighing 130-152 lbs., a 1 to 1 ½ inch needle for men weighing 152-260 lbs., and a 1 ½ inch needle for women over 200 lbs. and men over 260 lbs.(CDC, 2015a).

Davidson and Rourke (2013) reported two techniques to find the correct placement of an IM injection within the deltoid. These include finding the acromion process (top of shoulder) and going three finger breadths beneath to inject a medication or vaccine or visualizing an upside down triangle on the shoulder and administering the

injection in the middle of this triangle. The technique of finding the acromion process is the most widely used technique. To avoid administration of the injection into the underlying structures, the skin should be held taut between the thumb and forefinger-isolating the muscle before inserting the needle into the muscle at a 90 degree angle (CDC, 2015a).

Project Design

Project Proposal

This project issue was completed in two steps. For the year 2015, a 10 minute educational session was developed by the doctoral student. The class consisted of a six slide power point presentation (Appendix A). The presentation included equipment needed to perform an IM injection, appropriate needle size/length, proper placement of an IM injection in the deltoid, and proper positioning of the administrator and receiver during the injection. At the end of the power point presentation, each member of the class completed a teach-back by verbal communication and demonstration on the instructor's arm the proper landmark to use and proper placement of an IM injection in the deltoid (Appendix B). Initially the doctoral student trained employee health staff (one nurse practitioner, one medical doctor, three registered nurses), occupational medicine staff (one licensed practical nurse, three nurse practitioners), and three clinical nurse specialist/nurse educators in the first week of September 2015. These individuals were designated as “trainers” and helped check off individuals during the scheduled class times taught by the doctoral student. The educational classes were offered at various times including nights, weekends, at the end and the beginning of shifts for those wishing to be “flu champions.” The targeted population to become “flu champions” included clinical

managers, shift managers, assistant managers, clinical nursing staff volunteers, and career ladder nurses. Managers and directors were encouraged to identify "flu champions" on different shifts so an adequate number of individuals were trained as flu vaccine administrators. These individuals were given access to pull the employee vaccines out of the automated medication dispensing system utilized within the organization to administer to other employees who are unable to attend a flu clinic. One hundred forty five individuals within the healthcare organization were trained and designated as "flu champions" during the 2015 influenza season.

A policy was developed requiring the completion of an educational class on proper administration of an IM injection and a teach-back prior to administering influenza vaccinations to employees within the healthcare organization (Appendix C). A computer based learning (CBL) module was developed by the doctoral student containing educational material and video on proper placement of an IM injection in the deltoid. In 2016, the educational module will be made available to those administering the influenza injection within the organization (Appendix D). At the completion of the educational module, a certificate of completion will need to be printed off and taken to the Employee Health Department to complete a teach-back.

Team Selection

The doctoral student lead the team with development and implementation of the evidence-based practice improvement project. A Master's prepared nurse working as a clinical nurse specialist was an essential part of the project serving as the practicum partner and a member of the team. She was part of the research committee, in addition to the Magnet council and very knowledgeable about project implementation and policy

development. Other team members include a nurse practitioner involved with the management and scheduling of the influenza clinics, a nurse educator specialist with a focus in critical care, and a clinical nurse director over the procedural floors of the healthcare organization. Each member of the team played an integral part in the development and implementation of this project.

Outcomes

The outcome of this project was to show a reduction in the number of adverse events causing shoulder injuries. Staff within the healthcare organization demonstrated competency on IM injection administration after completing an educational class. To sustain the intervention, a policy was developed. This policy requires licensed nurses to complete an educational module on proper IM technique with a teach-back to validate comprehension of the material before volunteering to administer influenza vaccinations to other healthcare employees within the organization.

Goals

The primary goal of this project was to decrease the amount of adverse events, such as shoulder injuries related to vaccine administration, occurring after improperly administered influenza vaccination. Healthcare professionals need to remain knowledgeable about the shoulder and muscular anatomy, in addition to remaining competent and skillful related to proper IM injection technique, in order to avoid injecting vaccinations too high (Foster & Davis, 2013). Reviewing current recommendations for IM injections through yearly educational classes can help ensure proper technique is used by individuals through standardization of knowledge and competencies on proper administration.

Objectives

Registered nurses and licensed practical nurses who administered the influenza vaccine within the local rural healthcare organization demonstrated 100% competency on proper administration of IM injections technique after completing a 10 minute educational session with a teach-back. A 100% decrease in the number of severe adverse events leading to shoulder injuries was noted after the implementation of the educational class in the 2015 influenza season. Also within the 2015 influenza season, elimination of verbal complaints from improperly given influenza vaccinations was noted.

Mission Statement

The mission of this project was to prevent injuries sustained from improperly given intramuscular injections. An educational module was developed and implemented, then change was sustained through a policy implementation. The addition of these safety measures was intended to meet the standard of care and eliminate adverse events from vaccine administration, in addition reduce the cost incurred by the local rural healthcare organization through workers compensation claims.

Project Management Tools

IM injection-Educational Module and Policy Change	Jan-May 2015	June 2015	July 2015	Aug 2015	Sept 2015	Oct 2015	Nov-Dec 2015	Jan 2015	Feb 2015
Planning									
Research									
Design									
IRB Application									
Initial Implementation of Project									
Implementation									
Follow-up Evaluation									

Figure 2. GANTT Chart

Timeline

After administration of the influenza vaccines from October to December 2014, several verbal cases of prolonged side effects and extended problems such as shoulder injuries due to the injection given too high in the deltoid were noted. Three cases needed to be referred to orthopedics for further evaluation and treatment leading to cost incurred by the healthcare organization in worker's compensation claims. The problem was noted and interventions were developed to prevent further complications in the upcoming years from improperly given vaccinations. A literature review began in January 2015 to evaluate the significance of the problem and what interventions had been noted to help with this issue. The literature lacked the true number of cases due to the incomplete reporting from individuals not associating shoulder pain from an improperly administered vaccination. Once the project was approved through the educational institute of the doctoral student, the planning for the project began in April 2015. In May 2015, the healthcare organization required the doctoral student to present the project idea and material before two councils, including the council for Research and Evidence Based Practice and Nursing Administrative Council. The proposed project idea was also reviewed by the Employee Health Department. In June of 2015, the approval to move forward with the project was given from each council and Employee Health. In July 2015 the healthcare organization's IRB committee expedited the project since it was an evidence-based practice improvement project. The next step was to receive IRB approval from the educational institute the doctoral student attended by the end of August 2015. Within the month of September, classes were provided at various times to train individuals as "flu champions." In October 2015, "flu champions" began administration

of influenza vaccinations to all healthcare members within the healthcare organization. Follow-up data on the number of verbal complaints and severe complications were reviewed in December 2015. This data was used to evaluate the effectiveness of the educational module and to implement policy changes regulating criteria for individuals "flu champions" administering influenza vaccinations. In January 2016, a computer based learning module was up-loaded to the healthcare organizations intranet. It included the educational slides and a short video was attached to the computer based learning module in order to provide a visual on the proper placement for administration of an IM injection using the landmarks of the shoulder. The closure of the project was proposed in January 2016. (Figure 2)

Evaluation Plan

The evaluation for this project was completed in two parts. At the completion of the educational class, each participant in the class completed a teach-back on the proper placement of an IM injection into the deltoid. Each person was asked to explain the landmarks and identify the correct position for an IM injection on the instructor's arm. The method of teach-back was used to evaluate an individual's comprehension and important points covered within the material covered during the educational class. This method allows instructors to reinforce what is already known and teach participants what they do not know or understand (Ping, 2012). The outcome of this project was evaluated at the end of December 2015. This evaluation assessed the number of verbal complaints and adverse events requiring workers compensation claims which occurred during the 2015 influenza season. These numbers were compared to the number of cases in the 2014 influenza season. If a decrease in cases is noted, the educational class would be continued

and sustained with a policy change for upcoming influenza seasons. The increased awareness of the complications which can arise from improper administration may increase the number of reported complaints, which might be a limitation to the project. (Figure 3)

Inputs	Constraints	Activities	Outputs	Short Term	Long Term	Impact
Personal-trainers Staff and volunteer time	Timeframe	Development of educational module Policy development Development of video for organizations intranet Training and education	Trained staff and volunteers Number of participants	Knowledge improvement Skill improvement	Change in administration technique	Decreased verbal complaints of improperly given injection No adverse events requiring outsourcing after injection administration

Figure 3. Logic Magic Development

Quality Improvement Methods

The quality improvement method used for this project was the Plan-Do-Study-Act (PDSA) model. The PDSA Cycle is a series of steps utilized in learning and gaining knowledge for the continual improvement within a project. The initial cycle "Plan" encompasses identifying a goal, need, purpose, or opportunity for change and putting an action plan together of how it will be put into action and measured. This step is followed by the "Do" step where components of the plan is implemented. The third step "Study" monitors the outcomes and validity of the plan, in addition to evaluating the progression and success of the plan and areas of improvement. Integrating what is learned in step

three leads to the final step “Act.” Information obtained within this cycle can be used to help makes change needed within an organization. If the project met the intended goals, a change can be applied on a larger scale; however, if the goal is not met, the cycle is intended to be a continual process allowing tweaking of the current plan and restarting the process in order to meet the intended goals and expectations. The PDSA cycle can be applied in any setting and is a guide for continual quality improvement (National Health Service Institute for Innovation and Improvement, 2008).

Licensed nurses within a local rural healthcare organization demonstrated 100% competency after the completion of an educational class, in addition to a 100% decrease in cases with severe injuries to the shoulder requiring referrals to orthopedic offices during the 2015 influenza season. The project implementation occurred before the beginning of the influenza season and data was collected after completion of the flu clinics scheduled within the healthcare organization. The number of adverse events during the 2014 influenza season was compared to the cases in 2015. When the education was found to be effective with a reduction in the number of adverse events causing shoulder injuries, then continuation of the class was sustained through a policy and practice change. The project will expand to all nurses administering IM medications and vaccinations through annual competencies.

Cost/Benefit Analysis

This project was cost neutral. Classes for the educational module were provided during working hours at various times during the week and weekend, in addition to scheduled management meetings. No cost was incurred for the utilization of classrooms to conduct the educational class within the healthcare organization. These classes lasted

10 minutes requiring little time away for nurses working directly with patient care. This class provided competency based training for nurses on IM injection technique, while enhancing the knowledge and skill needed to safely administer the influenza vaccination. No additional cost will be incurred by the healthcare organization in the way of overtime for individuals completing the educational module. Individuals administering the influenza vaccine to other employees are not paid for this service, it is completed voluntarily.

Project Implementation Process

Institutional Review Board (IRB) approval was obtained through the University's School of Nursing but was not required from the local healthcare organization. A letter of exemption from the healthcare organization's IRB was provided and no informed consent was needed for this evidence-based project. Licensed nurses (RNs and LPNs) employed by the local rural healthcare organization completed an education class and demonstrated competency on the proper intramuscular injection technique. This was completed prior to administering influenza vaccines to other employees in order to decrease injuries from improperly administered vaccinations during the 2015 influenza season. The beginning of September 2015, an initial class was taught by the doctoral student to the employee health staff (one nurse practitioner, one medical doctor, three registered nurses), occupational medicine staff (one licensed practical nurse, three nurse practitioners), and three clinical nurse specialist/nurse educators. These individuals were designated as "trainers" and helped check off individuals on correct placement of an IM injection in the deltoid during the scheduled class times and managers meetings. The educational classes were offered at various times including nights, weekends, and at the end and the

beginning of shifts for those wishing to be “flu champions.” The targeted population to become “flu champions” included clinical managers, shift managers, assistant managers, clinical nursing staff volunteers, and career ladder nurses. Managers and directors identified “flu champions” from each shift so an adequate number of individuals were trained as flu vaccine administrators within each department of the healthcare organization. These individuals administered influenza vaccinations to other employees at flu clinics offered within the organization. Additionally, these individuals were given access to pull the employee vaccines out of the automated medication dispensing system utilized within the organization to administer to other employees who are unable to attend a flu clinic.

During the month of September, seven classes were offered to employees wanting to volunteer to be a “flu champion” to administer influenza vaccinations to employees within the healthcare organization. Three additional classes were offered during the manager, shift manager, and assistant manager meetings in September. A total of 116 licensed nurses within the healthcare organization completed one of the 11 classes taught by the doctoral student. Individuals not able to attend a class were able to schedule a time to receive the class on an individual basis. A total of 29 individuals were provided the class and teach-back outside of the 11 scheduled class times. A total of 145 individuals within the healthcare organization were trained and designated as “flu champions” during the 2015 influenza season.

Project Evaluation

Outcome

The evaluation for this project was completed in two parts. At the completion of the educational class, each participant in the class completed a teach-back on the proper placement of an IM injection into the deltoid on the instructor's arm. This technique as shown in the literature is an educational strategy used to assess an individual's understanding of the important points and reinforces what is already known, in addition to teaching participants what they do not understand or know (Ping, 2012).

The second part of the evaluation process was completed by pulling data from the healthcare organization's adverse event reporting system in December 2015. In December, data was evaluated on the number of employees reporting injuries from improperly administered influenza vaccinations between September 26 and November 30. All employees of the healthcare organization were required to receive a flu vaccination during this time period unless medical documentation was provided as to why the employee could not take the vaccination based on an allergy or religious beliefs.

The data on employee injuries from 2014 and 2015 were compared. During the 2014 influenza season, 3,575 employees within the healthcare organization received the influenza vaccination by a licensed nurse within the healthcare organization. In 2014, several verbal complaints were noted and six employees reported injury with three of these cases being severe injuries requiring an outside referral. During the 2015 influenza season, 3,652 employees received the influenza vaccination by a licensed nurse "flu champion" during the 2015 influenza season. In 2015, no injuries or verbal complaints were reported from improperly administered influenza vaccinations. The findings

suggested competency-based training is an effective measure to reduce and eliminate injuries to employees from improperly administered vaccinations as noted in Table 1.

Table 1.

Influenza Vaccinations Administered and Injuries Sustained by Employees

Year	Influenza Vaccinations Given	Injuries
2014	3,575 employees	6 injuries
2015	3,652 employees	0 injuries-100% improvement

The CDC recommends all personal administering vaccinations should receive education on vaccine administration and competency-based training prior to vaccine administration (CDC, 2013). Without demonstrated competency, the once proficient or expert nurse on IM injection technique may have the knowledge but may lack the skill to perform the task. Benner's theoretical framework provided a guide in regards to clinical competencies. Nurses throughout their career will move throughout the stages of clinical competencies. If a skill, such as administering IM injections is not a routine part of a nurses job requirements, then the knowledge is present, but the skill is not proficient, which reinforces the need for competency-based training.

Sustainability of Project

Subsequent to the educational project implementation, the doctoral student met with team members to develop a policy on the new requirements for licensed nurses providing influenza vaccinations to employees within the healthcare organization. In addition to developing the policy, a computer based learning module was developed

containing the educational material provided in the educational sessions. A short video was created by the doctoral student which demonstrated two ways (acromion process and upside down triangle) to find the appropriate area to administer an IM injection in the deltoid. The video was added to the educational module. Beginning in 2016, the educational module will be made available to nurses wishing to volunteer to administer the influenza vaccinations via the healthcare organization intranet. These individuals will need to contact The Employee Health Department and the educational module will be released to the nurses personnel computer based learning account. At the completion of the educational module, a certificate of completion will be printed and the individual will need to complete a teach-back on proper IM injection placement with one of the trainers in the Employee Health Department. Although this project was focused on vaccine administration, IM injections may be given for numerous medications and the educational module will be expanded to include all licensed nurses providing injections through annual nursing competencies.

Conclusion

Injuries can occur from improperly administered vaccinations. Several cases of SIRVA occurred at a local rural healthcare organization in 2014 after improper intramuscular administration of the influenza vaccine. An evidence-based project was developed to decrease the amount of adverse events occurring after improperly administered influenza vaccination. An educational module was developed and implemented, then the change was sustained through a policy implementation. The addition of these safety measures was intended to meet the standard of care and eliminate adverse events from vaccine administration, in addition reduce the cost incurred by the

local rural healthcare organization through workers' compensation claims. Safety measures such as annual training is needed for the safety of staff and patients. Knowledge about the anatomy of the shoulder, needle size, and proper placement of an IM injection is imperative to prevent injuries. Expanding and refreshing the skill of proper IM injection technique is critical to prevent shoulder injuries from occurring with injections being administered improperly. Reviewing current recommendations for IM injections through yearly educational classes can help ensure proper technique is used by individuals through standardization of knowledge and competencies on proper administration.

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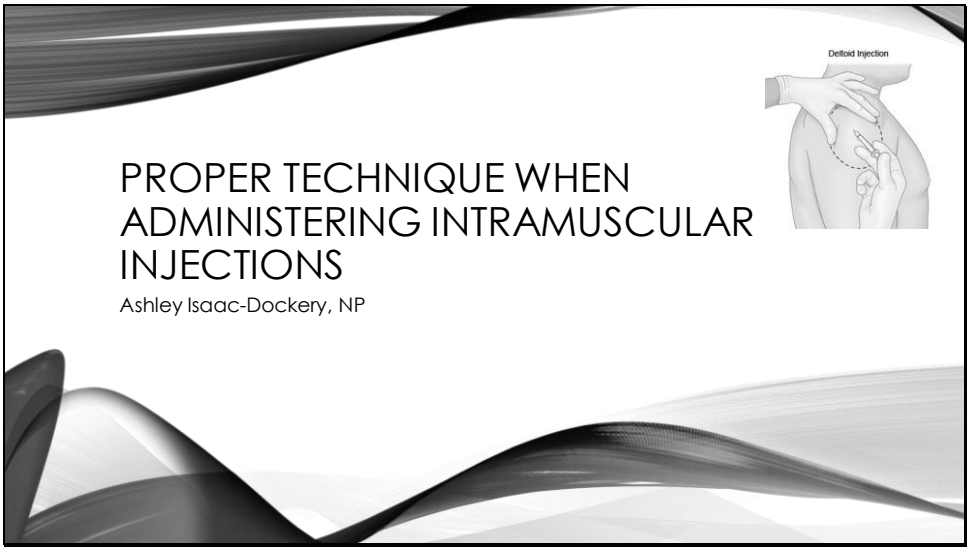
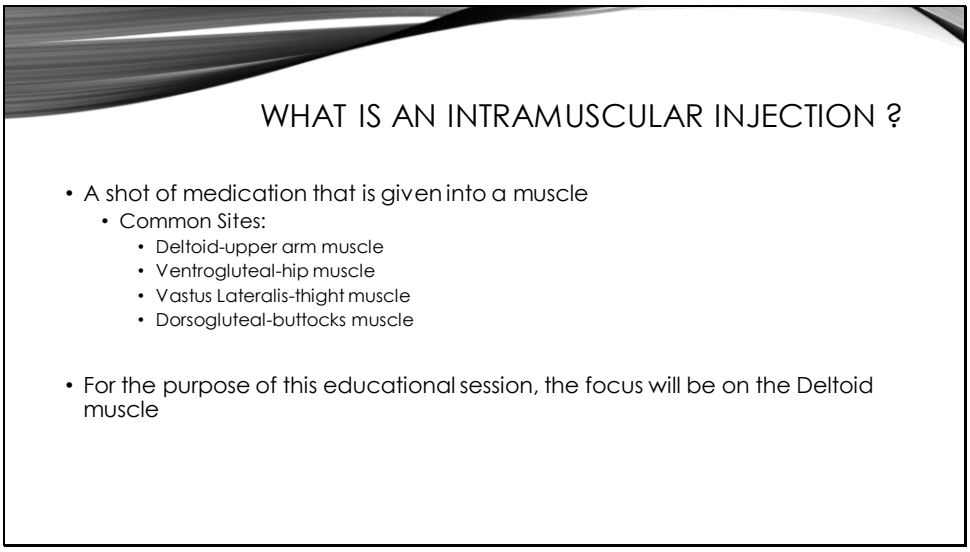
Appendix A

Educational Material for "Flu Champion" Training



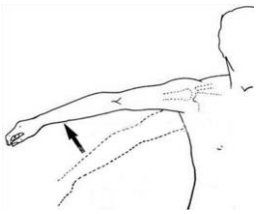


RECOMMENDATIONS FOR NEEDLE LENGTH

- Needle length
  - Based on size of the muscle, thickness of adipose tissue at injection site
- Adults (19 years and older)
  - Men & Women (less than 130 lbs.)
    - 5/8 – 1 inch needle
  - Men & Women (130-150 lbs.)
    - 1 inch needle
  - Men (152-260 lbs.) & Women (152-200 lbs.)
    - 1- 1½ inch needle
  - Men (over 260 lbs.) & Women (over 200 lbs.)
    - 1½ inch needle

RECOMMENDATIONS FOR POSITIONING

- Administrator and receiver of the vaccine should be seated
  - Parallel to each other
- Abduct arm a few degree laterally to decrease exposure of bursa with smaller individuals



HOW TO GIVE AN IM INJECTION IN THE DELTOID

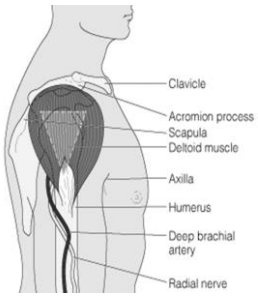
Preparation

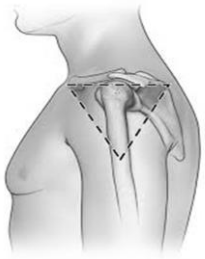
- Wash hands thoroughly
- Assemble the necessary equipment needed to perform the injection

Administration of Vaccine

- Completely expose the upper arm
- Apply gloves
- Clean the skin and site with rubbing alcohol
- Acromion process method:
  - bone going across the top of the upper arm
  - Move 3 finger lengths below the acromion process just above the axillary
- Axillary triangle method:
  - Visualize an upside down triangle on the deltoid--injection will be administered in the middle of the triangle

PROPER PLACEMENT OF AN INTRAMUSCULAR INJECTION





HOW TO GIVE AN INJECTION IN THE DELTOID

Administration of Vaccine

- Muscle held taut between the thumb and forefingers with non-injecting hand
- Insert the needle into the skin at a 90 degree angle
- Aspirate (pull back on needle) prior to injecting the vaccine-If blood appears do not give the injection
- Inject the vaccine into the deltoid muscle
- Remove the needle
- Apply gentle pressure and place bandage to site

REFERENCES

- Atanasoff, S., Ryan, T., Lightfoot, R., & Johann-Liang, R. (2010). Shoulder injury related to vaccine administration (SIRVA). *Vaccine, 28,* 8049-8052. doi: 10.1016/j.vaccine.2010.10.005
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Appendix B

Proper Technique when Administering Intramuscular Injection--Checklist

Verbally communicate the proper steps
Demonstrate on the instructor's arms the two methods for proper placement of an intramuscular injection

Employee's Name_____
Date_____

Task	Yes	No
Wash Hands		
Completely expose the upper arm		
Clean the skin and site with rubbing alcohol		
Verbalize proper level to administer the vaccine (both receiver and recipient sitting)		
Two Methods **Acromion Process**-Move 3 finger lengths below the acromion process just above the armpit **Axillary Triangle**-visualize an upside down triangle on the deltoid-administer injection in the middle of triangle		
Muscle held taut between the thumb and forefingers with non-injecting hand		
Insert needle in the skin at a 90 degree angle		
Aspirate (pull back on needle) prior to injecting If blood appears do not give the injection		
Inject the vaccine into the deltoid muscle		
Remove the needle		
Apply gently pressure and place bandage to site		

Signature of Approved Trainer_____

Appendix C

Policy

ADMINISTRATION OF INFLUENZA (FLU) VACCINE / MIST

POLICY

Influenza vaccine/mist will be offered annually to current facility employees, facility retirees, contract employees, credentialed medical staff, volunteers, adjunct chaplains, Board Members and their spouses.

Flu vaccine/mist may be administered to college/university health professional students in an approved long-term clinical placement rotation with the facility.

Influenza vaccines/mist may be provided for volunteers under age 18 with parent/ guardian consent as long as the volunteer has been pre-screened, approved, and trained/supervised as part of an established ongoing facility volunteer program (e.g., Facility Volunteer Services and/or local Hospice).

PURPOSE

Employee Health will offer Flu vaccine/mist annually.

RESPONSIBILITY/SCOPE

Employee Health Services and staff members designated as flu champions will administer flu vaccines.

Employee Health Services will administer flu mist.

Employee Health will maintain the consent forms in the Employee Health Department.

Standard of practice includes all staff administering the flu vaccine will be required to complete education annually to include: needed equipment, appropriate needle size/length, proper placement of an IM injection in the deltoid, and proper positioning of the administrator and receiver during the injection. Each staff member will be required to complete a demonstration of proper placement in the deltoid in the Employee Health Department.

PROCEDURE/GUIDELINES

Educational handouts will be provided prior to vaccination informing individuals regarding the current influenza vaccine/mist: risks and possible side effects of the vaccine, eligible individuals to receive the vaccine/mist, and what to do in case of a severe reaction.

All vaccine/mist recipients will be required to read the vaccine/mist information sheet and sign an informed consent form prior to administration of the vaccine/mist.

DEFINITIONS

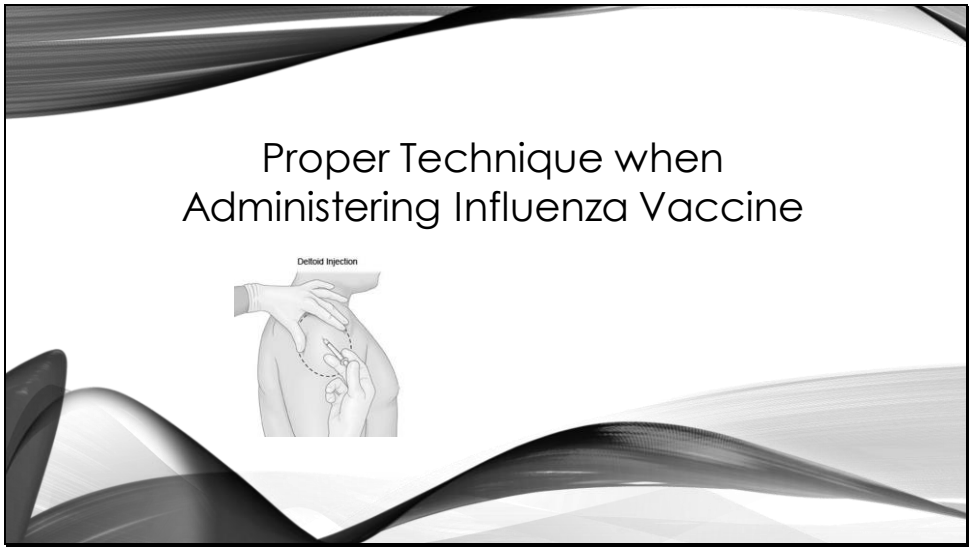
N/A

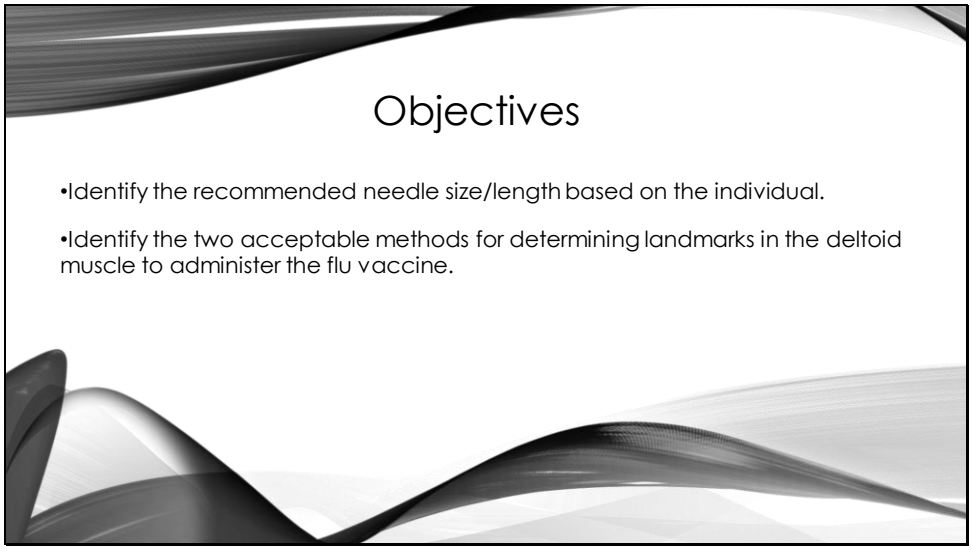
REFERENCES

- ACIP
- CDC Vaccine Recommendations
- TJCA Recommendations
- Revised May 2013
- Revised November 2009
- Reviewed February 2009
- Revised February 2008

Appendix D

Educational Material for Computer Based Learning Module





WHY A CBL ON HOW TO ADMINISTER A FLU VACCINE?

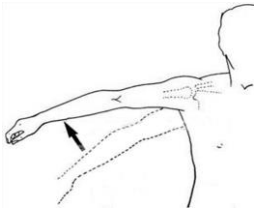
- Improperly administered flu vaccines can cause injuries into the shoulder including limiting individual's ability to maintain normal movement of that arm.
- Every flu champion is expected to complete this CBL, print the skills checklist after completion, and go to Employee Health to be clinically "checked off" prior to administering the vaccine.

Recommendations for needle length
(Per CDC recommendations)

- Needle length
  - Based on size of the muscle, thickness of adipose tissue at injection site
- Adults (19 years and older)
  - Men & Women (less than 130 lbs.)
    - 5/8 – 1 inch needle
  - Men & Women (130-150 lbs.)
    - 1 inch needle
  - Men (152-260 lbs.) & Women (152-200 lbs.)
    - 1- 1½ inch needle
  - Men (over 260 lbs.) & Women (over 200 lbs.)
    - 1½ inch needle

Recommendations for positioning

- Administrator and receiver of the vaccine should be seated
  - Parallel to each other
- Abduct arm a few degree laterally to decrease exposure of bursa with smaller individuals

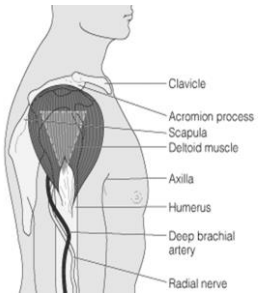


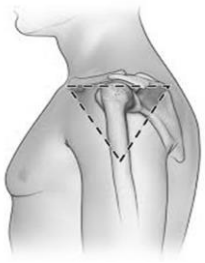
How to give an IM injection in the deltoid

Preparation
- Wash hands thoroughly
- Assemble the necessary equipment needed to perform the injection

Administration of Vaccine
- Completely expose the upper arm
- Apply gloves
- Clean the skin and site with rubbing alcohol
- Acromion process method:
  - bone going across the top of the upper arm
  - Move 3 finger lengths below the acromion process just above the axillary
- Axillary triangle method:
  - Visualize an upside down triangle on the deltoid--injection will be administered in the middle of the triangle (should be directly across from the armpit)

Proper placement of an Intramuscular injection





Place video

How to give an injection in the Deltoid

Administration of Vaccine

- Muscle held taut between the thumb and forefingers with non-injecting hand
- Insert the needle into the skin at a 90 degree angle
- Aspirate (pull back on needle) prior to injecting the vaccine-If blood appears do not give the injection
- Inject the vaccine into the Deltoid muscle
- Remove the needle
- Apply gentle pressure and place bandage to site

- Print the certificate of completion and take to Employee Health for clinical check-off on proper placement of the flu vaccine in the deltoid muscle.