

8-2013

Influenza and Asthma: An Evidenced-Based Approach to Increasing Influenza Vaccinations Among Asthmatic Children

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INFLUENZA AND ASTHMA:
AN EVIDENCED-BASED APPROACH TO
INCREASING INFLUENZA VACCINATIONS
AMONG ASTHMATIC CHILDREN

A project submitted in partial fulfillment
of the requirements for the degree of
Master of Science in Nursing

By

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2013
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Abstract

Asthma is a complex inflammatory process affecting over 6 million American children. Influenza is a seasonal viral respiratory illness that rapidly spreads via droplet contact. The most effective means of preventing influenza is with an annual influenza vaccination. Pediatric experts agree that asthmatic children should be vaccinated against influenza. Despite this consensus, vaccination remains low. A local pediatric practice is participating in a quality improvement project. One program component focuses on engaging primary care practices in an initiative to increase influenza vaccines among asthmatic children. Although improved vaccination is a goal, the program has not provided any clear strategies for increasing vaccination rates. To facilitate the goal, a retrospective chart review was conducted, gathering recent practice data on influenza. Descriptive and correlational statistics were analyzed. A significant correlation was found between insurance type and vaccination status. After data collection, a literature review was conducted with the purpose of developing an evidenced-based approach to increasing vaccination rates among asthmatic children. Based upon results from the literature, fourteen recommendations were made and categorized according to level of evidence into strong, moderate, and weak recommendations. The information was compiled and presented in educational sessions to physicians and staff of the local practice.

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Acknowledgement

I would like to acknowledge my committee chair Randall Johnson PhD, RN, ARNP for the patience, guidance, and encouragement he offered during the course of this research project. I would also like to acknowledge my advisor and committee member Marsha Swinehart MSN, RN, CNE for her involvement in the project. Finally, this research would have been impossible without help from the physicians, nurses, and staff of Star Pediatrics who willingly offered their site and services to facilitate this process.

Chapter 1: Introduction

Pediatric experts agree that asthmatic children should be vaccinated against influenza (AAP updates recommendations for flu vaccine, 2012; Fiore, Shay, Broder, Iskander, Uyeki, Mootrey, . . . Cox, 2008; National Heart Lung and Blood Institute [NHLBI], 2007). Despite this consensus, the rate of pediatric influenza vaccination remains low (Deis, Spiro, Jenkins, Buckles, & Arnold, 2010; Dombkowski, Leung, & Clark, 2008; Gnanasekaran, Finkelstein, Hohman, O'Brien, Kruskal, & Lieu, 2006; Moseley and Hudson, 2009).

Prediction of influenza and its spread is challenging, since the type and severity of annual influenza changes from one season to the next (Flu symptoms and severity, 2011). During the 2012-2013 influenza season 10,721 individuals were hospitalized due to influenza (Key facts about influenza (Flu) and flu vaccine, 2013). From 1976-2007, population-wide annual influenza related deaths ranged from 3,000 to 49,000 (Flu symptoms and severity, 2011). In 2009-2010, influenza-related pediatric deaths tolled 282 compared to 34 influenza-related deaths in 2011-2012 and 87 deaths in 2012-2013 (2011-2012 influenza season, 2012). Percentages of pediatric pulmonary co-morbidity and influenza death were 32.9% in 2009-2010, 15% in 2010-2011, and 23.7% in 2011-2012, and 32.9% in 2012-2013 (Fluview: 2012-2013 influenza season week 9 ending March 2, 2013, 2013). Pulmonary disease was the second most frequently associated

condition in pediatric death from influenza (Fluview: 2012-2013 influenza season week 9 ending March 2, 2013, 2013).

Multiple factors influence vaccination rates including the media, primary care providers, and parental beliefs (Gnanasekaran, Finkelstein, Hohman, O'Brien, Kruskal, & Lieu, 2006; Gnanasekaran, Finkelstein, Lozano, Farber, Chi, Lieu, 2006; Burke, 2006; Moseley & Hudson, 2009).

Media has the potential to impact vaccination status. In 2003, a shortage of vaccinations combined with influenza related deaths created a story for media attention. The news articles highlighting influenza related deaths were associated with an increase in influenza vaccinations for that season. In years that the media has not stressed vaccination, rates remain low (Gnanasekaran, Finkelstein, Hohman, O'Brien, Kruskal, & Lieu, 2006). Typically, less than 50% of asthmatic children are vaccinated each year (Deis, et al., 2010; Dombrowski, Cabana, Cohn, Gebremariam, & Clark, 2005; Gnanasekaran, Finkelstein, Hohman, O'Brien, Kruskal, & Lieu, 2006).

Primary care providers remain front line liaisons for vaccinations. However, physicians admit that lack of a strategic plan provides for missed vaccination opportunities (Burke, 2006; Moseley & Hudson, 2009). Physicians report that children with persistent asthma are more likely to be recommended and receive an influenza vaccination than children with mild or intermittent asthma. Despite vaccine availability and the fact that asthmatic children are often seen in the office during influenza season, many children continue to fall through the cracks and remain unvaccinated. In a study of several thousand children, Dombkowski, Davis, Cohn, & Clark, (2006) report that nearly

75% of unvaccinated children had an office appointment during the influenza season. This omission clearly demonstrates the need for a strategic vaccination plan as an essential component of excellent primary care.

Parental factors contribute to vaccination rates. Studies have shown that parents with lower education are less likely to have their child vaccinated (Gnanasekaran, Finkelstein, Hohman, O'Brien, Kruskal, & Lieu, 2006; Gnanasekaran, Finkelstein, Lozano, Farber, Chi, Lieu, 2006). Parental worry of vaccine dangers presents another potential barrier (Moseley & Hudson, 2009). Vaccination is less likely if parents suggest that an influenza vaccination is unnecessary, may not prevent influenza, or may cause asthma exacerbations (Gnanasekaran, Finkelstein, Hohman, O'Brien, Kruskal, & Lieu, 2006). Positive predictors for vaccination include parent's perception of their child as unhealthy and a verbal recommendation of vaccination by physician (Gnanasekaran, Finkelstein, Hohman, O'Brien, Kruskal, & Lieu, 2006; Jiménez-García, Hernández-Barrera, Carrasco-Garrido, Lopez de Andrés, de Miguel Diez, & Gil de Miguel, 2010). Primary care providers need to be aware of these indicators and address potential concerns in an effort to increase parental acceptability of influenza vaccination for their child with asthma.

Several studies have demonstrated a mixed view of influenza vaccination value in asthmatic children (Anderson & Carrol, 2009; Bueving, 2006; Cates, Jefferson, & Rowe, 2008; Goldstein, 2003; Miller, Griffin, Edwards, Weinberg, Szilagyi, Staat, Iwane, Zhu, Hall, Fairbrother, Seither, Erdman, Lu, & Poehling, 2008; Ong, Forester, and Fallot, 2009). Due to the risks associated with influenza, current policy advocates vaccination.

Additional research in this area is warranted before a policy change can be safely recommended.

Possible contrary results are found in a randomized, controlled study conducted in the Netherlands. Buchanan & Williams (2005), sought to determine the effects of influenza vaccination on asthmatic children. Specifically, their goal was to determine whether influenza vaccination decreased asthma exacerbations. The results of the study indicated there was no statistically significant difference between the vaccinated group and control group (Buchanan & Williams, 2005). Several limitations of this study must be addressed. The power of the study was limited by a low influenza rate of 6% during this particular season. Secondly, the study was conducted only over one influenza season. A repeated study conducted in multiple locations, with a greater population, and over a number of influenza seasons could potentially increase the generalizability of the findings.

Other research has indicated that children with asthma are more susceptible to asthma exacerbations or complications due to influenza (Mahut, Refabert, Marchac, Iniguez, Aubertin, Tamalet, Lebras, Troadec, Chatellier, & Delclaux, 2011; Moseley & Hudson, 2009). Children at risk are more likely to require hospitalization from influenza when compared to those without risk (Goldstein, 2003; Jiménez-García, et al., 2010; Miller, et al., 2008; Moseley & Hudson, 2009). Additionally, anti-viral drugs are expensive and may not be recommended in all pediatric populations (Bueving, 2006).

Other research indicates that influenza vaccination protects lung function, increases quality of life (Cates, et al., 2008), prevents asthma exacerbations, and is

associated with decreased use of oral steroids in the vaccinated population (Ong, et al., 2009).

Barring an allergy to eggs, the influenza vaccine is considered non-maleficent. No harm is done with the inactivated form of administration (Anderson & Carrol, 2009; Bueving, 2006; Cates, et al., 2008; Jiménez-García, et al., 2010). One questionable exception to safety has been suggested with the use of a live vaccine. Infants given live intranasal vaccine demonstrated increased wheezing and hospitalization rates (Cates, et al., 2008; Friedman & Goldman, 2010). Therefore, the live vaccine is not recommended in young children. Some experts argue that the influenza vaccination is of limited value in asthmatic patients, due to a supposition that influenza is an uncommon contributor to asthma exacerbation (Anderson & Carrol, 2009; Bueving, 2006; Cates, et al., 2008). However, the association between influenza and asthma exacerbations remains to be thoroughly investigated (Bueving, 2006, Cates, et al., 2008).

The potential benefits of the influenza vaccine are strong enough to garner continued support from national leaders and experts in the field. Therefore, development of strategies that primary care providers can employ in their practice, are necessary to increase the percentage of asthmatic children who receive the vaccine (Chen, Wang, Tsai, Jiang, Hung, & Lin, 2011).

Chapter 2: Concept Analysis

Asthma is a complex inflammatory process characterized by airway hypersensitivity, bronchial constriction and mucus production (Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma, 2007). According to the National Heart, Lung, and Blood Institute, asthma is one of the most common childhood conditions, affecting over 6 million American children (Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma, 2007). Although the precise cause of asthma is not fully understood, a number of factors have been implicated as triggers of asthma exacerbations. Identified triggers include environmental allergens, tobacco smoke, physical activity, and respiratory illness. Asthma exacerbations are associated with decreased quality of life, increased healthcare costs, missed school or activity, and parental stress. Children, especially males, minorities, and children living in lower socioeconomic conditions are disproportionately affected by asthma (Akinbami, Moorman, & Liu., 2011; Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma, 2007).

The CDC (2013) describe influenza as a respiratory illness characterized by fever, cough, muscle aches, and nasal congestion or rhinorrhea (Key facts about influenza (Flu) and flu vaccine, 2013). Influenza is contagious and rapidly spreads via droplet contact. The most effective means of preventing influenza is with an annual influenza vaccination (Key facts about influenza (Flu) and flu vaccine, 2013). The AAP (2012) and the NHLBI

(2007) have recommended an annual influenza vaccination for all children with priority for vaccination being given to at-risk groups (AAP updates recommendations for flu vaccine, 2012; Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma, 2007). Children with asthma are considered at risk for the development of complications related to influenza and therefore strategies of increasing influenza vaccination in asthmatic children should be a focus of research attention (Gnanasekaran, Finkelstein, Lozano, Farber, Chi, Lieu, 2006; Goldstein, 2003).

The AAP recognizes the need for improved asthma care and has sponsored a quality improvement project titled “Accelerating Improved Care for Children with Asthma Program” (2013). One component of this program focuses on engaging primary care practices in an initiative to increase influenza vaccines among asthmatic children. Although improved vaccination is a goal, the program has not provided any clear strategies for increasing vaccination rates.

Model Case

Joe is a six year old boy, diagnosed with mild persistent asthma. His symptoms are controlled with daily use of an inhaled corticosteroid. Joe has an albuterol inhaler on hand to use for symptom exacerbations. Joe’s asthma is very well controlled, causing symptoms only during season changes, respiratory illness, or intense physical activity. Joe lives at home with his mother, Sandy, who helps Joe manage his asthma. Sandy understands triggers of asthma and therefore does not keep indoor pets or permit indoor smoking. Joe visits his pediatrician periodically for asthma follow-up. During this last visit, Sandy noted the office staff had posted flyers regarding influenza. After Joe and

Sandy were escorted to a room, the nurse provided a handout on influenza vaccination. The pediatrician explained the risks associated with influenza and recommended the influenza shot for Joe, particularly due to his asthma. Sandy perceived that Joe was susceptible to influenza, that the effects of influenza could be harmful to Joe's health and that the benefits of vaccination outweighed the risks. Sandy chose to have Joe vaccinated for influenza during that visit. Joe did not contract influenza during that season.

Joe, Sandy, the office staff, nurse, and the pediatrician are the key players in the above scenario. Joe's mother, Sandy works diligently to help Joe manage his asthma. Since Joe is an asthmatic child, he would benefit from an influenza vaccination. When Sandy and Joe present to the practice for routine follow-up, it is obvious to Sandy that the practice is promoting vaccination. The nurse and pediatrician take time to provide education on the influenza vaccination and make a verbal recommendation. This positive interaction impacts Sandy's decision making for her son, results in an influenza vaccination and therefore, an avoidance of the illness. The attention to influenza and the education provided are not by chance. Rather, this is a purposeful strategy aimed at increasing influenza vaccination. This deliberate team approach demonstrates the purpose of this project.

Project Plan

This study is part of a larger project being conducted at a local pediatric practice. The project is sponsored by the AAP, and is titled "Accelerating Improved Care for Children with Asthma Program" (2013). This is a 14-month project that allows pediatric providers to critically evaluate their current method of asthma care and develop specific

aims for process improvement. One specific aim of the project is to increase the percentage of flu vaccinations in children with asthma to greater than or equal to 90%.

The purpose of this study is to provide an evidenced-based strategy that seeks to increase the number of vaccinations in the asthmatic pediatric population. The pediatricians and staff of the local office have expressed interest in this study and have consented to the proposed method.

Chapter 3: Methodology

The framework for this study will be based on the health belief model developed by Rosenstock (1966) in response to x-ray use for tuberculosis screening. The tenets of this model suggest that individuals, influenced by demographic, social, and psychological factors, participate in disease prevention strategies if they identify themselves as susceptible to disease, perceive the effects of the disease to be severe, believe the benefits of the action outweigh the barriers, and have a call to take action (Chen, et al., 2011; Janz & Becker, 1984). Janz and Becker (1984) have developed a conceptual map to visually describe the variables.

Figure 1

Health Belief Model

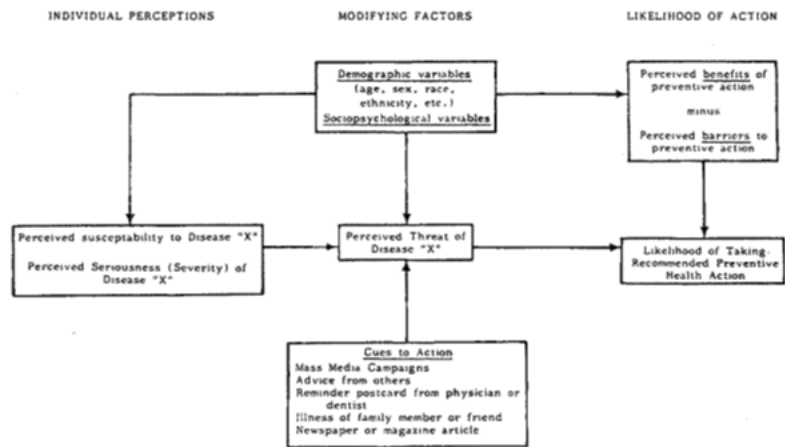


Figure 1. Basic Elements of the Health Belief Model. (Reproduced with permission of *Medical Care*.³¹)

This study will seek to identify the aforementioned specific influences of influenza disease prevention in an effort to develop a strategy for increasing vaccination among asthmatic children.

The ethical considerations of this project have been approved by Cedarville University's Institutional Review Board on April 8, 2013. The data for this project was obtained from a local pediatric practice. The practice is the only pediatric practice located in a medically underserved city of approximately 25,000 residents. The practice also serves individuals of neighboring rural communities. The estimated size of the practice is roughly 5,000 patients. Approximately 60% of the patients served at this practice have private insurance or are self-pay. The remaining 40% are insured through Medicare and/or Medicaid. Two pediatricians and their supportive nursing and administrative staff care for patients at this site.

The first objective of this study was to ascertain from the pediatric practice, a list of asthmatic children age 6 months and older who were seen in the office during the 2012-2013 influenza season. This convenience sample was drawn by the office manager at the pediatric practice using their billing system as a method for retrieving asthma diagnosis.

Based upon this information, a retrospective chart review was conducted to determine the number and percentage of asthmatic children who received an influenza vaccination during the 2012-2013 influenza season from September 2012 to March 2013. Patient inclusion criteria include a record of asthma diagnosis by ICD-9 codes 493.00, 493.02, 493.82, 493.90, 493.92, and an age of six months or older. Patients were

excluded if they have not been seen in the office for a well or ill visit during the 2012-2013 influenza season. Individual billing numbers were employed as patient identifiers to avoid data duplication. In an effort to minimize risk, these billing numbers were destroyed following data collection. The data obtained was entered into the PSPP 2007 program as a numerical value and stored encrypted online. A code book was utilized as a reference for data collection values. Data was collected onsite over a two week period. Data collected were demographic in nature and include patient age, gender, and type of insurance. The statewide immunization information system was reviewed to determine if vaccination has occurred outside of the primary care office setting. Influenza vaccination status was recorded. Rates of documented influenza in this population were evaluated. Descriptive statistics and correlational statistics were run. The information was analyzed to determine if a disparity exists.

Upon data analysis completion, a literature review was conducted. Databases searched include CINAHL plus with full text, Cochrane database of systematic reviews, Health Source: Consumer edition, Health Source: Nursing/Academic edition, MEDLINE, and MEDLINE with full text. Only peer reviewed articles published within the last 5 years were included. Articles were not limited to the University's holdings, but were retrieved from other institutions as well in order to provide a more comprehensive review of the literature. Positive and negative indicators were included for review. Search terms included influenza vaccination increase influenza vaccination, asthma influenza in children, influenza vaccination strategies, and promote vaccination. Based upon the literature, an evidenced-based action plan intervention for increasing influenza vaccinations among asthmatic children was developed and tailored to the needs of the

local pediatric practice. The final compendium was presented at the local pediatric practice in educational sessions to the two practice physicians, nurses and office staff.

Chapter 4: Results

A retrospective chart review was conducted in accordance with the previously proposed methods. A total of 315 patient charts met the inclusion criteria for the study. Of these, 312 charts were retrievable and reviewed. Ages of patients ranged from six months to 18 years. The population was slightly male dominant at 55% compared to females at 45%. Medicaid was the predominant type of insurance at 69% compared to private insurance at 31%. One patient was identified as self-pay. Although a number of patients did receive the influenza vaccination (42%), the majority of identified patients were unvaccinated against influenza (58%). A breakdown of vaccination rates by insurance type demonstrated a disparity among Medicaid patients who were vaccinated only 36% of the time compared to patients with private insurance who had a 51% vaccination rate for the same season. Children with private insurance were 1.99 times more likely to be vaccinated than were children with Medicaid insurance (Odds ratio 1.99; 95% Confidence Interval 1.2221 to 3.2423; p 0.0057). The documented rate of influenza among the total population for the season was 3%. Correlational statistics were run. Chi-squared analysis demonstrated a statistically significant correlation between type of insurance and vaccination ($p = .01$). No other significant correlations were found.

Table 1

Population Demographics

	<u>Number</u>	<u>Percent</u>
<u>Ages</u>		
Preschool (0-5years)	111	36%
School Aged (6-12 years)	132	42%
Adolescent (13-18 years)	69	22%
<u>Gender</u>		
Male	171	55%
Female	140	45%
<u>Insurance</u>		
Medicaid	215	69%
Private Insurance	96	31%
Self-Pay	1	<1%
<u>Vaccination Status Totals</u>		
Vaccinated	129	42%
Unvaccinated	183	58%
<u>Medicaid Vaccination</u>		
Vaccinated	78	36%
Unvaccinated	137	64%
<u>Private Insurance Vaccination</u>		
Vaccinated	51	53%
Unvaccinated	45	47%
<u>Influenza Rate</u>		
Documented Incidence	9	3%

After data analysis, a review of the literature was performed. Search results yielded 2,433 articles for evaluation. Search terms included influenza vaccination (1,739 articles) increase influenza vaccination (280 articles), asthma influenza in children (70 articles), influenza vaccination strategies (193 articles), and promote vaccination (151 articles). Articles for review were screened by title and abstract. Articles were included

for review if they targeted patients in outpatient primary care settings, were focused on increasing seasonal influenza vaccination, and discussed strategies to achieve that aim. Articles were excluded if they targeted inpatient, extended care facility, school or health department venues, were focused on increasing rates among healthcare providers, explored only the economic implications of vaccination, or discussed only epidemic influenza considerations. Of the screened articles, 26 met the criteria for relevancy. These 26 articles were appraised, graded, summarized, and synthesized into strong, moderate, and weak practice guideline recommendations. The foundation for practice guidelines was based on the seven levels of evidence in the Melnyk pyramid (Melnyk & Fineout-Overholt, 2011).

Table 2

Strong, Moderate, and Weak Recommendations

<u>Strong</u>	<u>Moderate</u>	<u>Weak</u>
Patient education	Physician recommendation	Patient personal records
Reminder system	Opt-out vs. opt-in policy	Extended hours (visit length)
Periodic follow-up	Offer vaccinations to everyone	Influenza leader
Initiate conversation early	Make vaccination a personal priority	
Target previously vaccinated individuals	Use year-round scheduling	
	Decrease patients costs (financial, time, energy)	

Table 3

Graded Review of Selected Literature

<u>Author(s)</u>	<u>Title</u>	<u>Research Design</u>	<u>Results</u>	<u>Level of Evidence</u>
Conner, Godin, Norman & Sheeran	Using the question-behavior effect to promote disease prevention behaviors: two randomized controlled trials	Randomized controlled trial	Use of the question behavior model survey is associated with increased influenza vaccinations.	Level II
Humiston, Bennett, Long, Eberly, Arvelo, Stankaitis, & Szilagyi	Increasing Inner-City Adult Influenza Vaccination Rates: A Randomized Controlled Trial	Randomized controlled trial	Monitoring of patients, patient phone calls, patient education, and provider prompts were successful in increasing influenza vaccination rates.	Level II
Roca, Herrero, Resino, Torres, Penades, & Andreu	Impact of Educational Program on Influenza Vaccination Rates in Spain	Randomized open controlled study	Educational efforts increased vaccination rates. Previous vaccination status was associated with future vaccination.	Level II
Nowalk, Zimmerman, Lin, Raymund, Tabbarah, Wilson, McGaffey, Wahrenberger, Block, Hall, Fox, & Ricci	Raising Adult Vaccination Rates over 4 Years Among Racially Diverse Patients at Inner-City Health Centers	Pre and post-trial with control but without randomization	Interventions of standing orders, education, walk in clinics, and patient and provider reminders are associated with increased influenza	Level III

			vaccinations.	
Painter, Sales, Pazol, Grimes, Wingood, & Di Clemente	Development, theoretical framework, and lessons learned from implementation of a school-based influenza vaccination intervention	Non-random, three arm, controlled study across two years	Low-cost, theory based educational interventions are associated with increased acceptance of the influenza vaccine.	Level III
Logue, Dudley, Imhoff, Smucker, Stapin, DiSabato, Schueller	An Opt-Out Influenza Vaccination Policy Improves Immunization Rates in Primary Care	Two group cohort study	An opt-out policy was associated with a modest improvement in influenza vaccination rates.	Level IV
Martin	Improving Influenza Vaccination Rates for Pediatric Asthmatics by Use of an Asthma Educational Tool and a Patient Electronic Care System	Cohort Study	Use of the patient education tool was associated with significant increases in influenza vaccination uptake.	Level IV
Orhun, Duyan, Beyazova, & Bideci	The Rate of Seasonal Influenza Vaccination in Diabetic Children, the Effect of Recommendation and the Factors Influencing the Acceptance of Recommendation: An Interventional Study	One group cohort study	Physician recommendation, education, and previous vaccination status are associated with increased influenza vaccination rates.	Level IV
Paul, Eleoff, Shaffer, Bucher, Moyer, & Gusic	Improving Influenza Vaccination Rates for Children Through Year-round Scheduling	Retrospective Cohort Analysis	Year-round scheduling of influenza vaccination is associated with increased	Level IV

			influenza vaccination rates when compared to offering influenza vaccinations when the vaccine arrived on site.	
Walter, Hellkamp, Goldberg, Montgomery, Patterson, & Dolor	Improving Influenza Vaccine Coverage Among Asthmatics: A Practice-Based Research Network Study	Pre-test/ Post-test cohort study.	Educational reminders and practice based quality improvement initiatives did not increase vaccination rates.	Level IV
Cawley, Hull, & Rousculp	Strategies for implementing school-located influenza vaccination of children: a systematic review	Systematic literature review	Increased influenza vaccination education increased parental consent and child assent to vaccination. Incentives for teachers and students, strategies for consent forms, and adequate follow-up can improve school-based vaccination campaigns.	Level V
Bhatt, Block, Toback, & Ambrose	A Prospective Observational Study of US In-office Pediatric Influenza Vaccination During the 2007 to 2009 Influenza Seasons: Use and Factors Associated With Increased Vaccination Rates	Prospective, single arm, observational, non-interventional study.	Expanded time frame of influenza vaccination availability is associated with increased influenza vaccination uptake.	Level VI

Chen, Wang, Schneider, Tsai, Jiang, Hung & Lin	Using the health belief model to understand caregiver factors influencing childhood influenza vaccinations	Cross-sectional descriptive study	Predictors of vaccination include care giver age, education, employment status, child's condition of health, and perception of influenza susceptibility, value, safety, barriers, and provider recommendation.	Level VI
Gazmararian, Orenstein, Prill, Hitzhusen, Coleman, Pazol, & Oster	Maternal knowledge and attitudes toward influenza vaccination: a focus group study in metropolitan area	Qualitative study	Focus groups identified the need and desire for increased influenza education and physician prioritization and verbal recommendation of vaccine.	Level VI
McElligott & Darden	Are patient-held vaccination records associated with improved vaccination coverage rates?	Descriptive study using retrospective chart review method	Patient-held vaccination records are associated with increased vaccination rates.	Level VI
Nowalk, Tabbarah, Hart, Fox, Raymund, Wilson, & Zimmerman	Office Manager and Nurse Perspectives on Facilitators of Adult Immunization	Descriptive correlational study	Increased length of visit and high nurse vaccination rates were correlated with increased influenza vaccination rates.	Level VI
Santos-Sancho, Andres, Jimenez-Trujillo, Hernandez-Barrera, Carrasco-Garrido, Asasio-	Adherence and factors associated with influenza vaccination among subjects with asthma in Spain	Descriptive, cross sectional study	Influenza vaccination rates among Spanish asthmatics are suboptimal. Health care	Level VI

Arbiza, & Jimenez-Garcia			providers play a significant role in advocating for influenza vaccination and providing education.	
Toback, Rothstein, Bhatt, Carr, & Ambrose	In-Office Influenza Vaccination by US Pediatric Providers Varies Greatly and Is Higher Among Smaller Offices	Prescriptive, observational descriptive study	In office television reminders, small office size, and high rate of staff vaccination are associated with higher rates of influenza vaccination among patient population.	Level VI
Tsutsui, Benzion, Shahrabani & Din	A policy to promote influenza vaccination: A behavioral economic approach	Descriptive study to assess predictors of vaccination	Predictors of vaccination are compatible with the health belief model and include perception of disease susceptibility, vaccine effectiveness, influenza severity, and minimal side effects.	Level VI
Uwemedimo, Findley, Andres, Irigoyen, & Stockwell	Determinants of influenza vaccination among young children in an inner-city community	Cross-sectional descriptive study	Low-income, minority children are at greater risk for missing influenza vaccine. Predictors of vaccination include care giver traits, regular medical care, and presence of reminder systems.	Level VI

			Barrier to vaccination include lack of influenza vaccination education. The medical home model and extended clinic hours did not increase vaccination.	
Zimmerman, Nowalk, Tabbarah, Hart, Fox, & Raymund	Understanding Adult Vaccination in Urban, Lower-Socioeconomic Settings: Influence of Physician and Prevention Systems	Descriptive correlational study	Standing orders and increased visit time were associated with increased influenza vaccination rates.	Level VI
Foxhall	Physician hospital organization uses multiple strategies to increase flu vaccination rates	Expert Report	Strategies for increased vaccination include extended hours, scheduled appointments, vaccine clinic days, phone calls, mail reminders, campaign organizer, provider verbal recommendation, signage, and an opt-out approach.	Level VII
Kassianos	Vaccination for tomorrow: the need to improve immunization rates	Expert Report	Primary care providers and school nurses play a fundamental role in educating the public on the importance of influenza vaccination.	Level VII
Lehmann &	Vaccine	Expert Report	Education of	Level VII

Benson	Adherence in Adolescents		influenza vaccination is valuable. Patient reminders are associated with increased vaccination.	
Mowbray & Rubin	Notification about seasonal influenza vaccination: what is the best way to increase uptake?	Expert Report	Patient education and notification of influenza vaccination should be fundamental priorities for health care providers.	Level VII
Santibanez, Fiore, Merlin, & Redd	A primer on strategies for prevention and control of seasonal and pandemic influenza	Expert Report	Expanded coverage of all children aged 6 months and older will decrease confusion related to influenza vaccine eligibility and increase vaccine receipt. Barriers to vaccination include lack of influenza vaccine education and vaccine prioritization by primary care provider.	Level VII

Strong Recommendations

By far, patient education has been demonstrated to be one of the strongest indicators of influenza vaccination. (Cawley, Hull, & Rousculp, 2010; Kassanos, 2010; Orhun, Duyan, Beyazova, & Bideci, 2012; Painter, Sales, Pazol, Grimes, Wingood, & Di

Clemente, 2010; Paul, Eleoff, Shaffer, Bucher, Moyer, & Gusic, 2006; Roca, Herrero, Resino, Torres, Penades, & Andreu, 2012; Santibanez, Fiore, Merlin, & Redd, 2009; Santos-Sancho, Andres, Jimenez-Trujillo, Hernandez-Barrera, Carrasco-Garrido, Asasio-Arbiza, & Jimenez-Garcia, 2013; Tsutsui, Benzion, Shahrabani & Din 2010; Uwemedimo, Findley, Andres, Irigoyen, & Stockwell, 2011) In their randomized controlled trial, Roca, et al. (2012) found that a personal educational letter highlighting fundamental influenza facts was predictive of increased influenza vaccination among that population. However, a contrary study by Walter, Hellkamp, Goldberg, Montgomery, Patterson, & Dolor (2008) reported that a mailed educational tool was not associated with an increase in influenza vaccination uptake. Another means of education was employed by Martin (2008) with the use of a prescription sized educational tool for all asthmatic patients. This tool allowed him to provide concise asthma education at each visit and also contained a prompt for influenza vaccination. At the end of each visit, patients were given a carbon copy of the tool as an at-home reminder. The use of this tool was associated with a significant increase in influenza vaccinations. Additionally, patients agree that misconceptions about influenza contribute to vaccination decline and that addressing these myths could contribute to increased vaccine uptake (Gazmararian, Orenstein, Prill, Hitzhusen, Coleman, Pazol, & Oster, 2010).

Initiate a reminder system for both patients and providers. (Lehmann & Benson, 2009; Nowalk, Zimmerman, Lin, Raymund, Tabbarah, Wilson, McGaffey, Wahrenberger, Block, Hall, Fox & Ricci, 2008; Uwemedimo, et al., 2011). Research has indicated that children are five times more likely to be vaccinated in offices that employ the use of reminder systems compared to sites without these prompts (Uwemedimo, et al.,

2011). Some practices have benefited from a targeted approach where office staff makes personal reminder calls to patients to determine if they have been vaccinated elsewhere (Foxhall, 2009). The use of reminder systems is also supported by a randomized controlled trial by Humiston, et al., (2011). Researchers in this study found that having a multi-faceted approach to vaccination increased influenza vaccination uptake. Strategies employed in the study included provider reminder prompts and patient reminders sent via mail and telephone.

Consider periodic follow-up with patients. According to Uwemedimo et al., (2011), patients who were seen three or more times within the past year were more likely to be vaccinated than those seen fewer than three times. By scheduling routine follow-up for asthmatic patients every three or four months, it may be easier to keep closer tabs on patients progress, provide enhanced education, and perhaps facilitate vaccination (Uwemedimo, et al., 2011). Humiston, et al., (2011) made personal and repeat telephone calls to patients who were not scheduled for routine follow-up during the influenza season in order to encourage vaccination. The results of this randomized controlled trial were associated with statistically significant increases in influenza vaccination (Humiston, et al., 2011).

Initiate the conversation before the decision making time (Conner, Godin, Norman & Sheeran, 2011). One randomized controlled trial by Godin, et al. (2011) found that the use of a survey about health behaviors increased the odds of performing that behavior. A simple, positively phrased questionnaire provided to patients over the course of several months prior to influenza season may increase their thoughts about

vaccination, which have the potential to influence their choice to have their child vaccinated.

Target previously vaccinated groups. Studies have shown that individuals who were previously vaccinated for influenza are more likely to obtain subsequent vaccinations (Orhun, et al., 2012; Painter, et al., 2010; Roca, et al., 2012; Tsutsui, et al., 2010). These groups of individuals may represent an easy group of people to seek for vaccination.

Moderate Recommendations

Patients value and respect the thoughts, opinions, and recommendations of their providers. Studies have demonstrated that patients are more likely to comply with vaccination if their physician provides them with a verbal recommendation (Chen, Wang, Schneider, Tsai, Jiang, Hung & Lin, 2011; Foxhall, 2009; Gazmararian et al., 2010; Mowbray & Rubin, 2012; Orhun, et al., 2012;).

Consider an opt-out rather than opt-in approach with the use of a standing order (Foxhall, 2009; Nowalk, Zimmerman, Lin, Raymund, Tabbarah, Wilson, McGaffey, Wahrenberger, Block, Hall, Fox & Ricci, 2008; Zimmerman, Nowalk, Tabbarah, Hart, Fox, & Raymund, 2009). Good communication is foundational for any patient-provider relationship. Instead of asking “Are you interested in the flu shot for your child?” rephrase the question to stress the importance of vaccination. The same thought may be rephrased in the following manner: “This time of the year is flu season. In an effort to prevent this illness, we are providing that vaccination to all our patients.” Research conducted by Logue, Dudley, Imhoff, Smucker, Stapin, DiSabato, & Schueller (2011),

indicates that an opt-out policy is associated with a 1.4 fold improvement in influenza vaccinations.

Widely spread the net for vaccination by offering the flu shot to everyone. Previously confusion has arisen in regard to who meets the criteria for an influenza vaccine and who can pass on that immunization. Since experts now recommends that all children age six months and older receive an annual vaccine, practices may find that encouraging vaccination for all pediatric patients aged six months and older eliminates the confusion and increases vaccine receipt (Foxhall, 2009; Paul, et al., 2006; Santibanez, et al., 2009). If a patient chooses to decline vaccination, be sure to inquire about the reason for refusal. A patient's refusal may be tied to lack of information or misunderstanding of the vaccine.

Make vaccination an obvious priority for you and your practice (Gazmararian, et al., 2010; Santibanez, et al., 2009; Santos-Sancho, et al., 2013). Healthcare providers should all receive an annual vaccination in order to practice what they preach. Toback, Rothstein, Bhatt, Carr & Ambrose (2012) and Nowalk, Tabbarah, Hart, Fox, Raymund, Wilson, & Zimmerman, (2009) found that vaccination rates among patients were higher when office staff had high rates of vaccination themselves. Additionally, healthcare providers who make vaccination an obvious priority for themselves and their patients enhance patient perception of the illness as something to be prevented.

Use year round scheduling (Paul, et al., 2006). Flu vaccines typically arrive at a similar time every year. Since offices typically have this information readily available, patients can be scheduled for their next influenza vaccine any time they visit or call the

office. The study conducted by Paul, et al., (2006) found that encouraging patients to schedule early in the year increased flu receipt in the following season. Additional research indicates that earlier and longer spans of flu vaccination availability increased vaccinations (Bhatt, Block, Toback, & Ambrose, 2010).

Seek to decrease the cost associated with vaccination. Finances are to be considered, but perhaps more importantly, costs should be considered for patients in relation to their time and energy (Tsutsui, et al., 2010). Stream lining the process for vaccination could include flu clinic days, and special or extended hours. Nowalk, Zimmerman, Lin, Raymund, Tabbarah, Wilson, McGaffey, Wahrenberger, Block, Hall, Fox & Ricci's (2008) study indicated vaccination success in practices that offered walk in flu shots. Due to the unique demands of pediatric practice, some sites may have difficulty in leveraging staff to be able to provide this type of service. Advertising this service in advance on certain days and partnering with a local school of nursing may help to facilitate that process.

Weak Recommendations

Encourage patients to utilize their personal vaccination records and work to keep children up to date with childhood immunizations (McElligott & Darden, 2010). McElligott and Darden (2010) found that parents who utilized a personal vaccination record for their child were more likely to have children who were up to date on their immunizations. Secondly, McElligott and Darden (2010) note that children who are up to date with routine childhood immunizations were more likely to receive an annual influenza vaccine.

Research indicates mixed views on extended hours (Foxhall, 2009; Lehmann & Benson, 2009; Uwemedimo, et al., 2011). Although some have recommended extended hours (Foxhall, 2009; Lehmann & Benson, 2009), others have indicated that extended hours do not increase the number of those vaccinated (Uwemedimo, et al., 2011). Practices may find that this varies from one population to another. Two studies found that a greater length of visit was associated with increased vaccination (Zimmerman, Nowalk, Tabbarah, Hart, Fox, & Raymund, 2009; Nowalk, Tabbarah, Hart, Fox, Raymund, Wilson, & Zimmerman, 2009). This finding may suggest that longer patient visits may afford the provider an opportunity to address health maintenance topics and disease prevention strategies that cannot otherwise be accomplished within shorter time constraints.

Designate the role of influenza leader (Foxhall, 2009). An influenza leader is responsible for facilitating camaraderie, organizing vaccination efforts, reminding or prompting healthcare providers, and updating staff on progress.

Chapter 5: Discussion

The findings of the literature review coincide with the health belief model used as a theoretical framework for this study (Janz & Becker, 1984). By implementing the above strategies, the practice site has the opportunity to encourage disease prevention strategies. Efforts will likely be most effective with successive implementation of multiple strategies, utilizing a team approach. By providing education, initiating vaccination conversations, and targeting previously vaccinated groups, providers can help patients to identify themselves or their child as susceptible to influenza. Making vaccination a personal priority for healthcare providers and additional educational efforts can enhance a patient's perception of severity illness. Year round scheduling, decreasing costs, and offering extended hours can eliminate potential barriers to vaccination. Finally, regular follow-up, an opt-out program, inclusive vaccination, personal vaccination records, an influenza leader, reminder system, and personal provider recommendation are means of giving a call to take action. The combined efforts of these strategies have the ability to increase influenza vaccination among asthmatic children.

Specific recommendations for the local practice include adding an educational pamphlet to the initial asthma packet as well as having literature readily available for established asthmatic patients. The education should be provided ahead of the influenza season to generate thought and may be used as a conversation starter regarding vaccination. A visual reminder within or on the patient chart may be used to prompt the

provider to verbally recommend vaccination for the patient. Staff may telephone patients to remind them of vaccination and to facilitate vaccination scheduling. Using the chart-based vaccination record, providers and nursing staff can seek to identify patients who have been previously vaccinated in an effort to encourage subsequent vaccination. The providers may consider limiting medication refills and recommending periodic follow-up to facilitate close monitoring. Record of the employed measures may be tracked using a document within the chart. Tracking of measures and outcomes will assist in future data collection and analysis.

This study was limited by the nature of available research. Although numerous descriptive studies and expert opinions were available, the author was unable to find many current high levels of research studies. The basis of strong recommendations was made on the three available randomized controlled trials.

Future implications for research include follow-up of practice site to determine the feasibility and success of the recommended strategies. A replicable, standardized approach to influenza education would be beneficial. Additional randomized, controlled trials of interventions and a meta-analysis of randomized controlled trials are needed. Finally, additional research is warranted to fully expand the correlation between insurance type and vaccination rates.

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