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Final DNP Project Report

A Gap Analysis on Vaccine Administration for Average and High-Risk Adults

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University of Kentucky College of Nursing

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Dedication

To my wonderful husband, thank you for believing in me and pushing me along this journey. You have kept me sane, made me laugh, and supported me in so many ways. Thank you for all the sacrifices you have made over the past three years. I cannot thank you enough for your love, care and generosity.

To my Momma, I cannot thank you enough for being such a positive role model throughout my life. You have shown me how important it is to work hard and to always have faith. Your love and support have guided me every day. You have taught me how important it is to never give up. Thank you for always believing in me.

To my Dad, I cannot thank you enough for passing on your witty personality and social skills to me. You have taught me to never meet a stranger, be friendly to others, and how important it is to always have fun. I know I have made you proud.

To my late Mamaw and Papaw, thank you for always expressing the importance of education. Mamaw, on days when I wonder how I survived the last three years- I think about you and your excitement when I told you I was accepted into this program. Papaw, thanks for teaching me the importance of hard work and to take pride in everything I do.

To my brother, thank you for always teaching me to stay tough. I am thankful for our relationship, and hope the future brings me more time to spend with you and your family.

To my sweet nephew, thanks for always having a smile on your face and letting me see life through your eyes. May you always know you are so loved, never give up on yourself, and always dream big. You have taught me to keep my imagination alive.

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Abstract

Background: Nationally adult immunization rates continue to fall below the current benchmark goals. It is estimated adult vaccinations range from 20 to 60 percent, depending on the vaccine. There are different vaccine schedules for those of average-risk compared to those with high-risk conditions. Providers are being encouraged to explore their administration of vaccines as preventable, communicable diseases continue to be seen. **Objectives:** In a primary care clinic, a gap analysis was conducted to: 1.) Determine adult immunization rates, 2.) Compare vaccine administration rates of the Tdap, PCV13, PPSV23, and influenza vaccines between average and high-risk adults, 3.) Determine if specific chronic diseases correlate with increased or decreased vaccination rates. **Methods:** A retrospective chart review was conducted on a random sample of 120 patients in an urban, primary care clinic. The chart review was utilized to assess vaccine administration for those 50 to 64 years of age, who were high-risk status based on specific diseases, compared to average-risk adults, ages 65 to 80 years of age. **Results:** Comparing groups, average-risk patients had a higher rate of immunizations for three of the four vaccines (influenza, PCV13 and PPSV23), with a statistically significant difference favoring the average-risk group for PCV13 and influenza. Only the Tdap vaccine had higher frequency in the high-risk group but was not statistically significant. **Conclusions:** Immunization rates were low for both populations which concurs with national data. Possible explanations include difficulties with documentation in the EMR to the lack of emphasis placed on vaccines by patients and providers. Clearly, attention must be placed on adult immunizations and their role in preventive care.

A Gap Analysis on Vaccine Administration in Average and High-Risk Adults

Introduction

Population health has been substantially improved through the advent of vaccines for preventable diseases. Unfortunately, there is a gap in patients either accepting vaccines and/or providers recommending their administration. According to a recent report adult immunization rates continue to remain low, it is estimated adult vaccinations range from 20 to 60 percent, depending on the vaccine (Huston, 2014). The reasons for this are multifactorial and include patients' fear of their safety to providers not finding the time to discuss the recommended vaccines. The purpose of this gap analysis is to identify the current percentage of adults in a primary care practice who are vaccinated. Further, the analysis will compare rates of administration between average and high risk adults.

Background and Significance

Vaccinations play a key role in the prevention of disease. Healthy People 2020 indicates immunizations prevent 14 million cases of communicable disease (United States Department of Health and Human Services, 2017a). In addition, immunizations are said to reduce direct healthcare costs by \$9.9 billion dollars, and \$33.4 billion in indirect healthcare cost (United States Department of Health and Human Services, 2017a).

Immunization guidelines have been published by the United States Advisory Committee on Immunization Practices (ACIP) and other acting committees since 1984 (Orenstein, Pickering & Walton, 2014). These resources are used to provide clinicians on what, when, and how often specific vaccines are needed. The adult vaccine guideline recommendations are reevaluated yearly by the ACIP, the American Academy of Family Physicians (AAFP), the American College of Physicians (ACP) and the American College of Nurse Midwives (ACNM; Orenstein

et al., 2014). Currently, there are seventeen different preventable diseases listed on the adult immunization schedule that can be reduced through receiving proper vaccinations (United States Department of Health and Human Services, 2015a). The vaccinations for these diseases are recommended during adulthood based on age, prior/current immunization status, and attributing risk factors. The ACIP also identifies when vaccinations should be given for those with high-risk health conditions. For example, patients who are diagnosed with chronic obstructive pulmonary disorder (COPD) should receive their first pneumococcal vaccine between the ages of 19 to 64 years of age (Centers for Disease Control and Prevention, 2015c; Centers for Disease Control and Prevention, 2015d).

Healthy People 2020 has established adult vaccination benchmark goals, which vary depending on the type of vaccine and health status of a patient. Overall, no vaccine has reached the established, current benchmark goals (United States Department of Health and Human Services, 2015b). Reasons for this can be aligned to patient factors (fear, cost, beliefs, lack of understanding) to attention given by providers on vaccine administration (Johnson, Lipzynski, & Nichol, 2008; Ahmed et al., 2014). It is prudent for all clinicians to include vaccinations in preventive care. The first step for any primary care practice is to recognize their own benchmark in adult vaccinations, to develop a quality improvement process.

Relevant Literature

Search Description

A review of the literature was conducted by a search of the worldwide web and using the online resources available through the University of Kentucky Medical Library. The search conducted utilized CINAHL, Google, Google Scholar and PubMed. Words used during the

search consisted of: chronic disease, adult, immunizations, prevention, vaccinations, vaccines, influenza, pneumococcal, PPSV23, PCV13, Tdap, providers, and barriers.

Background on Vaccinations

Immunotherapy via vaccinations was initiated in the 18th century, with cowpox being the first developed (The College of Physicians of Philadelphia, 2017). The number of vaccines has grown exponentially since then, reducing the devastating effects of many communicable diseases, such as measles, diphtheria, and pertussis. They are meticulously tested by the Food and Drug Administration (FDA) with emphasis on effectiveness and safety (FDA, 2016a). Their use has made the sheer recognition of the diseases they cover difficult to identify. It is through childhood administration that our initial immunotherapy is initiated, and it is through repeat vaccinations in adulthood that further prevent the diseases. Only the influenza; tetanus, diphtheria and pertussis (Tdap); pneumococcal conjugate (PCV13); and pneumococcal polysaccharide (PPSV23) recommended adult vaccinations will be discussed, as they are the focus of this project (See Table 1).

Influenza vaccine.

Influenza is one of the most common communicable diseases, with recognized mortality especially in infants, children and older adults (Centers for Disease Control and Prevention, 2014). The vaccine is reassessed and formulated yearly to cover the recent strains and mutations based on prior seasons. Administration of the vaccine for flu prevention starts at the age of six months and continues throughout life (Grohskopf et al., 2016). This vaccine is the only one requiring yearly administration. Its overall efficacy rate is between 10 to 76% (Centers for Disease Control and Prevention, 2015b). Unless there is a prior severe reaction to the vaccine

there are no other contraindications to its administration (Centers for Disease Control and Prevention, 2016a; Table 1).

Tetanus, diphtheria and pertussis (Tdap) vaccine.

The initial vaccine series, known as diphtheria, tetanus and pertussis (DTap) is started in infancy and completed by age seven (Centers for Disease Control and Prevention, 2017c). The initial dose of Tdap is administered around 11 years of age with a second dose at 19 years of age (Centers for Disease Control and Prevention, 2017b; Centers for Disease Control and Prevention, 2017c). The vaccine's antigenic effect wanes overtime requiring periodic boosters. The vaccine has three components, two of these must be administered every ten years (tetanus and diphtheria) and the other (pertussis) requires one dose in adulthood (Centers for Disease Control and Prevention, 2017b). The exception to this recommendation is that women should get vaccinated with Tdap in every pregnancy (Centers for Disease Control and Prevention, 2015f). Contraindications for vaccine administration involve severe reaction to a vaccine component or encephalopathy within seven days of a prior pertussis vaccine (Centers for Disease Control and Prevention, 2017a; Table 1).

Pneumococcal vaccines.

The pneumococcal vaccine has two formulations recommended by the ACIP; the 13-valent pneumococcal conjugate vaccine (PCV13) and the 23-valent pneumococcal polysaccharide vaccine (PPSV23; Tomczyk et al., 2014). PCV13 immunizes against thirteen strains of pneumonia, while PPSV23 protects against twenty-three (FDA, 2016b; FDA, 2014; Table 1). The initial series is of the PCV13 is given in infancy and completed by 15 months of age (Centers for Disease Control and Prevention, 2017c). The Centers for Disease Control and Prevention (CDC) recommends adults, who are considered average risk, ages 65 years of age and

older, receive one dose of the PCV13 followed by the PPSV23, in six to twelve months (CDC, 2015d; Kobayashi et al., 2015).

There are differences in the vaccine administration schedule when high-risk conditions are present. The PPSV23 should be administered to those individuals with chronic lung disease, chronic heart disease, diabetes, cochlear implants, cerebrospinal fluid leaks and immunosuppression, beginning at 19 years of age and older, with one dose re-administer at age 65, unless the patient has been vaccinated within the last five years (CDC, 2017b). Additionally, cigarette smokers are considered in those who should be vaccinated earlier with PPSV23 (CDC, 2015c).

The disparity in recommendation within the CDC is who should receive the PCV13, prior to age 65, in adulthood (CDC, 2012; CDC, 2015d; CDC, 2015c; CDC, 2017b). The issue centers on what is defined as a high-risk condition. There is some thought that only those with immunosuppression, cochlear implants and cerebrospinal fluid leaks should receive the PCV13 prior to age 65, however some guidelines include diabetes mellitus, chronic lung and heart disease (CDC, 2012; CDC, 2015c; CDC, 2015d; CDC, 2017b). In 2018, the ACIP will initiate a full review of these vaccines to provide clarity for healthcare providers (Crawford, 2014a).

Contraindication for PCV13 and PPSV23 administration includes an anaphylactic reaction to a vaccine component or pregnancy (CDC, 2017a; CDC, 2015c). The PCV13 vaccine has an additional contraindication, which is if the patient has had a prior reaction to a diphtheria vaccine (CDC, 2017a; Table 1). Overall, the vaccine is considered very safe but the schedule for administration is confusing.

Current State of Vaccinations

Healthy People 2020 establishes benchmark goals to increase the number of vaccinations administered for preventable disease (United States Department of Health and Human Services, 2017a). The benchmark goals are focused on the pneumococcal vaccines, the influenza vaccine, and the zoster vaccine (United States Department of Health and Human Services, 2017b). However, this project did not focus on the zoster vaccine due to documentation issues and complications with communication of vaccine administration, as it is administered at pharmacies. Further compromising a full understanding of adult vaccination rates is the lack of monitoring by the CDC, along with children and adult data tends to be merged together.

Per the United States Department of Health and Human Services (2017b), a 70% administration rate is the yearly goal for adults, over the age of 18, to receive the influenza vaccine. Recent statistics for the 2014-2015 influenza season revealed 47% of individuals six months and older received the vaccine (Centers for Disease Control and Prevention, 2016c). The CDC (2015a) reported Kentucky's influenza administration rates was 48.3%, for the same season. The overall burden of influenza in this season, across all age groups, was forty-million flu-like illnesses, and nearly one-million hospitalizations (CDC, 2015b). In that same year, over 60% of flu-related hospitalizations, were among people 65 years and older (CDC, 2015b).

The administration goal for the pneumococcal vaccine is 90% for those of average risk and 60% for high-risk adults (United States Department of Health and Human Services, 2017b). Based upon 2014 data, only 61.3% of adults, 65 years and older, had received one of the pneumococcal vaccines (United States Department of Health and Human Services, 2015b). In this same year, Kentucky's pneumococcal immunization rate was reported at 69.3% (Trust for America's Health, 2016). In regards to the high-risk population the national current state was at

16.6% (United States Department of Health and Human Services, 2017b). There was no breakdown of administration for the PCV13 and PPSV23, separately.

Vaccine preventable diseases, not specifically listed in Healthy People 2020, also have low percentages of adults who received other vaccines, specifically, Tdap. After extensive research, no national or state goals could be found for this vaccine but it is just as necessary as the others. Although there is no established goal, a target should be what is needed to obtain herd immunity. An article by Willingham and Helft (2014) reported threshold immunization rates needed to be at 85% for the diphtheria and 95% for pertussis to attain the herd effect.

The National Health Interview Survey (NHIS), performed January through December 2014, reported of those surveyed, 19 years and older, 20.1% had received the Tdap vaccine (Williams et al., 2016). In 2012, there were over 48,000 cases of pertussis reported (CDC, 2015e), and in 2015, Northern Kentucky Independent District Health Department (2017) reported 317 cases in their area alone. Though this highly contagious disease can be managed in adults, it can be deadly for infants and children.

Patient and Provider Barriers

Barriers to vaccine administration play a key role in low vaccine rates. These are from both the provider and consumer perspective. A study conducted by Johnson et al. (2008) found that 56 to 60% of providers knew the correct vaccine guidelines. Additionally, they found 79 to 85% of patients (out of 2,002 surveyed) would be willing to get any immunizations recommended; however, this was not mentioned in their office visit (Johnson et al., 2008). Furthermore, Johnson et al. (2008) reported that over 50% of providers surveyed admitted to not following the CDC recommendations, with no explanation provided.

Another contributing factor to the deficient vaccine rates is the expense associated with vaccines. Ahmed et al. (2014) found the main reason providers do not carry, stock, or discuss vaccines is due to the lack of reimbursement. Additionally, time to discuss vaccines during an appointment was also identified (National Center for Immunizations & Respiratory Diseases, 2013). Further findings were, the providers did not want to deal with vaccines because of the associated costs, high rates of patient refusal, and the risk of expiration before administration (Ahmed et al., 2014). Yet, per the CDC, all health insurance marketplace plans and many private insurers cover the most common vaccines, without a copay or co-insurance (CDC, 2016b). Medicare also has coverage for the influenza and pneumococcal vaccines (Centers for Medicare and Medicaid Coverage, n.d.).

Patient barriers are a major factor in relation to low immunization rates. Burns, Kimmel, Wolfe and Zimmerman (2007) reported multifactorial reasons why patients were not immunized. They described patient barriers as confusion of what vaccines were needed, transportation issues to the clinic and inconvenient clinic hours. Fear of getting the disease from the vaccine (specifically influenza) was also an identified barrier in the adult population (Hall et al., 2003). Additionally, concern about the patient's ability to afford the vaccine was reported by 39% (n=71) of those surveyed (Hall et al., 2003).

Although, pediatric vaccinations are tracked with established goals, there is no consistent data, outside of convenience surveys, for adults. These surveys provide limited data on who receives vaccines, and if there is any discrepancy between the high and average risk groups. There is no national database for adult vaccination rates, it behooves clinics to evaluate their own practice, recognizing that the goal should be 100% of those eligible should be vaccinated. Thus, the aim of this project was to evaluate the adult immunization status of specified high-risk

subjects (COPD, asthma, diabetes mellitus, heart failure and specific autoimmune diseases) versus those who are at average risk for developing these diseases.

Objectives

The purpose of this study was to perform a gap analysis on vaccine administration in average and high-risk adults, between 50 to 80 years of age. The age span was used to encompass vaccine recommendations for individuals who are high risk and are eligible to receive specific vaccines before the age of 50. The site selected for this gap analysis was an urban, primary care clinic in Lexington, Kentucky. The time span selected was May 1st, 2016 through July 31st, 2016 to capture the influenza vaccine administration from the prior season. There were three objectives for this gap analysis:

Objective 1: Determine immunization status (administered, non-administered, refused)

Objective 2: Compare vaccine administration rates of the Tdap, PCV13, PPSV23, and influenza vaccines between average and high-risk adults.

Objective 3: Determine if specific co-morbidities correlate with increased or decreased vaccination rates.

Methods

Study Design

A retrospective chart review was performed through the utilization of the University of Kentucky's Center for Clinical and Translational Sciences. A retrospective review of 120 randomly selected electronic health records, of patients meeting the study criteria, were evaluated. The review included 60 individuals, 50 to 64 years old, with COPD, asthma, diabetes mellitus, heart failure or an autoimmune disorder; and 60 individuals, 65 to 80 years of age, with

no high-risk diagnosis. Immunization status for the Tdap, PCV13, PPSV23, and influenza vaccines was evaluated.

All subjects were seen at the Polk Dalton Clinic between May 1st, 2016 through July 31st, 2016. This time range was selected to assess a time when the influenza vaccine was not actively being administered, so a full season (2015-2016) season of administration could be assessed. The records were obtained through an administrator with the University of Kentucky Center for Clinical and Translational Sciences— Biomedical Informatics group. This information was then provided and stored in the University of Kentucky REDCap database. The information obtained was de-identified of all 18 personal health identifiers.

Study Population

The setting of this study was the Polk Dalton Clinic, specifically their primary care services. This clinic was developed to serve the Northside and urban community of Lexington. It strives to provide care to the entire family, from infancy to elderly.

One population of interest for this project were patients 50 to 64 years of age who had one or more of the following diagnoses: diabetes mellitus, chronic obstructive pulmonary disease, asthma, heart failure and specified autoimmune diseases. This was determined using appropriate ICD-10 and ICD-9 codes (Appendix). The other group were patients between 65 to 80 years of age with no high-risk diagnoses. The age difference between the groups is present to assess if the high-risk population is being vaccinated earlier for the pneumococcal vaccines (which is what should be occurring). There were no exclusions or exemptions made for race, ethnicity or sex/gender of any subjects for either population.

Statistical Analysis

Data analysis occurred using SPSS 22 and Microsoft Excel. Analysis of data was carried out by frequencies, Fischer's exact, Mann-Whitney U, and chi-squared tests. Comparisons were made among the two designated groups, along with demographical and individual immunizations. Chi-squared tests were utilized to show if a gap was present, and if the gap was significant. An alpha level of .05 was used to determine statistical significance.

Results

The entire sample of both average and high-risk patients had no statistically significant differences for gender and race (Table 3). The sample consisted of 62.5% females with African-Americans being the predominant race (55%). The average age in the high-risk group was 56 and in the average-risk group it was 70 years of age (Table 4). The most common high-risk condition was found to be diabetes mellitus (n=50), see figure one for a complete analysis of the various conditions. It should be noted that 18% (n=11) of the high-risk group had more than one co-morbidity.

Objective 1

The immunization status for the entire group was evaluated. In total, the influenza vaccine had the highest rate at 70%, followed by PCV13 at 48%, Tdap at 34% and PPSV23 at 18% (Table 5).

Objective 2

Immunization rates between the high and average-risk groups was evaluated. The influenza vaccine was administered to 80% (n=48) in the average risk group and in 60% (n=36) of the high-risk group. The Tdap vaccine was received by 32% (n=19) of the average risk and 37% (n=22) of the high-risk group. When assessing the pneumococcal vaccines, the PCV13 was

administered to 67% (n=40) of the average risk and 30 % (n=18) of the high-risk. Lastly, for PPSV23, 20% (n=12) of the average risk population received the vaccine, while only 15% (n=9) had received the vaccine in the high-risk group. The completion of the pneumococcal vaccines was also evaluated and noted to be completed in 18% (n=11) of the average risk and only 5% (n=3) of the high-risk patients (Table 6). There was a significant statistical difference between administration rates of influenza, PCV13 and the completion of the pneumococcal series, favoring the average risk group (Table 6). (See Figure 2 for comparison graph.)

Objective 3

Differences between the chronic diseases and administration of vaccines was evaluated with percentages and chi-squared testing. Due to the low numbers of patients with asthma, heart disease, and the absence of anyone with an immunocompromised disease, only COPD and diabetes were used for comparison. Additionally, some individuals had both COPD and diabetes mellitus so there was also analysis done on those with combined co-morbidities. Data revealed that percentages favor having both co-morbidities for influenza, PCV13 and PPSV23 administration (Table 7). The Tdap vaccine was administered to those with diabetes alone, more than having COPD or both diseases. When comparing, using chi-squared testing, there was no statistical significance between any of these groups with vaccine administration (Table 7).

Discussion

There is increasing emphasis being placed on preventative care which should decrease morbidity and mortality, as well as healthcare costs. Part of the preventative care package must be to maximize vaccination rates within all served populations. Unfortunately, adult vaccination rates for prevention of communicable diseases continues to be an issue. Providers must begin

with a baseline of their own practice before implementing changes designed to improve vaccine administration.

In the clinic used for this project the influenza vaccine reached the national goal of 70% (Table 8). This is not surprising given its national attention. There are billboards throughout the city, providers automatically order it at the same time each year, and there is extensive media coverage. The media not only addresses the importance of getting the vaccine but puts out influenza alerts, again emphasizing the importance of being vaccinated. This vaccine is not driven by the provider alone as patients actively seek it out, unlike any other. Further, being a yearly vaccine there is no confusion on its timing of administration.

The Tdap vaccine does not have a national goal, however, the rate of immunization within the clinic was 34%, which was higher than the current national rate (20.1%; Williams et al., 2016). Considering the recent outbreak of pertussis, 20% nor 34% is an acceptable vaccine rate seeing how devastating pertussis is on infants and children (Crawford, 2014b). Part of the issue surrounding this vaccine is the misconception by the public that a tetanus vaccine is only needed for an injury (Johnson et al., 2008). Secondly, the Tdap vaccine has only been associated with childhood and its administration is a relatively new recommendation for adults (Barclay & Vega, 2007). Prior to 2005, only a tetanus and diphtheria booster was recommended by the ACIP, this changed when pertussis was recognized as a reemerging disease (Barclay & Vega, 2007). Administration of the Tdap will improve when healthcare providers, as well as the public, are made aware of pertussis outbreaks and the importance of being vaccinated in adulthood.

The pneumococcal vaccines, for the average-risk population have a national goal of 90% (United States Department of Health and Human Services, 2017b). In the clinic studied rates were 67% for PCV13 and 20% for PPSV23. In their high-risk population, only 30% were

immunized with the PCV13 and 15% for PPSV23, which contrasts with the national goal of 70% for both. It is difficult to understand the full reasons behind these immunization rates. Much like the Tdap the reasoning may lie with provider and public knowledge regarding the current recommendations.

The above statistics identify a need to focus on vaccine administration within the clinic. Sadly, the high-risk population has lower rates for nearly all the vaccines when compared to the average-risk group. Comparing the diabetics to the COPD patients no statistical differences were noted in their vaccination rates. Interestingly, COPD patients were not immunized at higher rates for any of the vaccines when compared to those in the average-risk group, which is of concern as to why respiratory centered vaccines are not regularly considered by healthcare providers. However, there of course may be variables not captured that may explain the low rates of vaccine administration in this group.

Chronic care patients who typically have more clinic visits throughout the year should be well immunized. Yet it is not unusual to see inadequate administration within high-risk groups. In a study conducted by Nowalk, Zimmerman, Cleary and Bruehlman (2005) chronic care patients though seen more frequently had many missed opportunities for vaccine administration. One explanation was the amount of time providers spent on the patient's chronic care issues. Additionally, patient refusal and the ever-changing vaccine schedule adds to these missed opportunities.

There are other complicating factors that impact patients and providers. Unlike, vaccinations in childhood there is no pressure on adults to receive vaccines, unless they work in the healthcare industry. Childhood vaccinations have long been the focus of preventive care visits that are scheduled and well-funded. Current childhood vaccination rates remain at 90%

throughout the United States (Schuchat, Singleton, Whitney & Zhou, 2014). In all 50 states, there are laws stating their requirements and children are required to present immunization certificates for school entry (Buttenheim, Clymer, Davis-Hayes & Wang, 2014).

Vaccine guidelines present many difficult challenges for providers. For example, there is not one universal source with clear recommendations, the ACIP releases confusing and extensive reports, and changes are made without notification. It is also difficult for providers and patients to be current on insurance coverage for vaccines with patients being quick to ask about coverage before agreeing to administration.

Observation of the overall data reveals that neither group were consistently vaccinated at the recommended rates. It seems by far the highest rate of administration, for both groups, is the influenza vaccine. This vaccine was closest to the national benchmark goal than any other vaccine assessed for this project. All vaccines pose room for improvement with vaccination rates. Issues are present which create further question and barriers to why immunization rates may be low. Providers must make adult vaccinations as much of a priority as childhood, to increase administration.

Implications

The information from this project was to provide baseline information to identify if a problem existed with vaccine administration for the specified populations. What this gap analysis did provide is evidence that these vaccines need more focus. Additionally, education, potentially further study, and a quality improvement project may be necessary to increase immunization administration for both average and high-risk patients.

Several ideas might be considered to improve vaccination rates in this setting. Education for providers and patients would be a starting point. Providers could have a lunch-in-learn

session on adult vaccine administration, this would allow them to review the current recommendations and discuss any questions or concerns. Additionally, a creation of a quick reference pocket guide could have basic vaccine criteria for who and when someone is or is not eligible, for all staff and providers. In regards to patient education, the posting of signs throughout the waiting area, hallways and rooms about all adult vaccines would be a way to draw their attention.

The patient's immunization status should be part of the rooming process by the medical assistant, just as the medications are now currently reviewed. Furthermore, to ensure this is taking place, the creation of a hard stop in the electronic medical record (EMR) could be established to address all vaccinations. A study was recently conducted at The Iowa Clinic and the implementation of a hard stop increased immunization rates by 21% (Landi, 2017). Intrinsic within this hard stop would be the ability to document patient refusal. This would ensure every patient's immunization status is a priority during any visit.

Another idea would be to establish a clinic policy that all adults receive an immunization record, just like children. This certificate would show them what has been administered and what is needed. Additionally, these certificates could state when their next vaccine is needed. This also gives the patient some accountability in ensuring their immunizations are current.

Pharmacies providing vaccines have created an additional barrier in knowledge about vaccine administration. The clinic could work towards contacting all area pharmacies and talk with them about how they can open communication. An idea for an immunization administration notification provided from a pharmacy could be through fax or mail.

On a national level, there is no regulations for adult vaccines. The ACIP needs to be as clear and forthcoming with adult recommendations as those for children. Policies are needed to

advance adult immunizations to the rates at which we see in childhood. Nurses need to be involved at the state level to develop lifetime vaccine registries and work towards making them nationally accessible. State registries have worked well for tracking childhood vaccines and should be easily carried over to adults.

Limitations

As with any project, especially one trying to establish baseline data, limitations presented themselves when carrying out this gap analysis. The quality of data was impeded because of the limitations of the EMR. There is not a user-friendly method of making a notation if a vaccine has been refused which anecdotally is often the case.

The level of visit could not be extracted for the visit, to see whether vaccines were missed at an episodic versus an annual health appointment. This would have been richer for the clinic to understand as far as noting a potential difference. In addition, it would have been interesting to understand the number of missed opportunities for vaccine administration.

In observing the data, the PCV13 and PPSV23 vaccines were collected separately for analysis but also together to see if the series was completed. There was a statistically significant difference for the two populations on completion of the series, however there may not be a true difference because of not knowing patient eligibility for both vaccines and the gap analysis did not capture the required wait period between the two. It is unknown what patients could have been in-between the immunization wait period.

Diversity, outside of African-Americans and Caucasians was limited in this project due to the low volume of other ethnicities. Immunization rates cannot be generalized for all adults. Furthermore, the project findings cannot be generalized for any other population due to its specificity for the clinic.

Conclusion

Immunization rates are low for both average and high-risk populations in this clinic. Further information is needed to understand vaccine issues and work flow to improve administration of adult immunizations. In providing care to both average and high-risk individuals it is imperative to provide preventive care to all adults. Providers may get overwhelmed with a patient's chronic health care needs but preventive medicine is crucial to avert other diseases. These vaccines are what keep people healthy and prevent outbreaks of disease. Now that we know what the vaccine rates are, it is necessary for further action to be taken, to address the situation.

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Table 1: Background, Specifics and Contraindications of Vaccines

	Specifications	Absolute Contraindications	What It Prevents
Influenza	Recommended for all individuals without contraindications starting at 6 months of age and older. (Grohskopf et al., 2016)	Previous severe reaction to any influenza vaccine (angioedema, respiratory distress, emesis or the need to use epinephrine)- for any combination of the vaccine. For the live-attenuated vaccine, anyone who is immunosuppressed, caregivers or those in close contact with someone who is immunocompromised or pregnant women. (Grohskopf et al., 2016)	Specific strains of Influenza A and B- the vaccine and strains change yearly to adjust for identified strains and mutations from the prior season. (Grohskopf et al., 2016)
Tdap	Recommended for individuals 11 years and older. Also, may be administered to under vaccinated children 7 to 10 years of age. (CDC, 2011)	Anaphylactic reaction to a previous dose or vaccine component. Encephalopathy no attributable to another disease within 7 days of administration of a prior pertussis vaccine. (CDC, 2017a)	Tetanus, Diphtheria, and Pertussis (a.k.a. "whooping cough") (CDC, 2011)
PCV13 (Pneumococcal Conjugate Vaccine or Prevnar)	Infants and children less than 2 years of age, adults 65 years and older, and those 2 to 64 years of age with specific medical conditions (diabetes, chronic heart/lung or kidney disease, compromised immune systems, cochlear implants or cerebrospinal fluid leaks). (CDC, 2015d; CDC, 2015c)	Anaphylactic reaction to a previous PCV7 or 13 vaccine or component, also to any diphtheria toxoid. (CDC, 2017a) Pregnancy (CDC, 2015d)	The adult PCV13 protects against <i>Streptococcus pneumoniae</i> serotypes: 1, 3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F and 23F. (FDA, 2016)
PPSV23 (Pneumococcal Polysaccharide Vaccine or Pneumovax)	Adults 65 years and older, 19 through 64 years of age- who are cigarette smokers, and those 2 through 64 years of age with specific medical conditions (diabetes, chronic heart/lung or kidney disease, compromised immune systems, cochlear implants or cerebrospinal fluid leaks). (CDC, 2015d; CDC, 2015c)	Anaphylactic reaction to a previous PPSV23 vaccine or component. (CDC, 2017a) Pregnancy (CDC, 2015d)	Protects against 23 serotypes of pneumococcal disease: 1, 2, 3, 4, 5, 6B, 7F, 8, 9N, 9V, 10A, 11A, 12F, 14, 15B, 17F, 18C, 19A, 19F, 20, 22F, 23F, 33F). (FDA, 2014)

Table 2: Goals and Current State of Vaccines

	Goal	Current National State (%)	Current KY State (%)
Influenza	70%	47.0%	48.3%
Tdap	No data found	20.1%	No data found
Pneumococcal (65 years and older; average risk)	90%	61.3%	69.3%
Pneumococcal (18-64 years; high risk)	60%	16.6%	data found

Table 3: Demographical characteristics of the project sample by group (n=120)

	Total sample (n=120)	High-risk (n=60)	Average-risk (n=60)	<i>p</i>
Sex				.09
Male	45 (37.5%)	27 (45%)	18 (30%)	
Female	75 (62.5%)	33 (55%)	42 (70%)	
Race				.54
Caucasian	53 (44%)	28 (47%)	25 (42%)	
African American	66 (55%)	32 (53%)	34 (57%)	
Asian	1 (1%)	0 (0%)	1 (1%)	

Table 4: Age Groupings of Patients

		AGE_GROUPING			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Age_50_55	22	18.3	18.3	18.3
	Age_56_60	20	16.7	16.7	35.0
	Age_61_65	18	15.0	15.0	50.0
	Age_66_70	36	30.0	30.0	80.0
	Age_71_75	10	8.3	8.3	88.3
	Age_76_80	14	11.7	11.7	100.0
	Total	120	100.0	100.0	

Table 5: Total Population Vaccination Status

Vaccines	Vaccinated	Non-Vaccinated
Influenza	84 (70%)	36 (30%)
Tdap	41 (34%)	79 (66%)
PCV13	58 (48%)	62 (52%)
PPSV23	21 (18%)	99 (82%)

Table 6: Vaccination rates by group

	High risk (n=60) % vaccinated	Average risk (n=60) % vaccinated	<i>p-value</i>
Influenza	60%	80%	.017
Tdap	37%	32%	.564
PCV13	30%	67%	<.001
PPSV23	15%	20%	.471
Completion of pneumococcal series	5%	18%	.023

Table 7: Vaccine Administration for COPD and/or Diabetes Mellitus Patients

	COPD Only	Diabetes Only	COPD and Diabetes	p-value
Influenza	(n=2) 22%	(n=26) 63%	(n=6) 67%	0.07
Tdap	(n=2) 22%	(n=17) 41%	(n=3) 33%	0.54
PCV13	(n= 3) 33%	(n=10) 24%	(n=4) 44%	0.46
PPSV23	(n=1) 11%	(n=6) 15%	(n=2) 22%	0.79

Table 8: National Goals Compared to Clinic Rates

	National Goal	Clinic Rate Total (n =120)
Influenza	70%	70%
Tdap	No data found	34%
Pneumococcal (65 years and older; average risk)	90%	
PCV13		67%
PPSV23		20%
Pneumococcal (19 to 64 years of age; high- risk)	70%	
PCV13		30%
PPSV23		15%

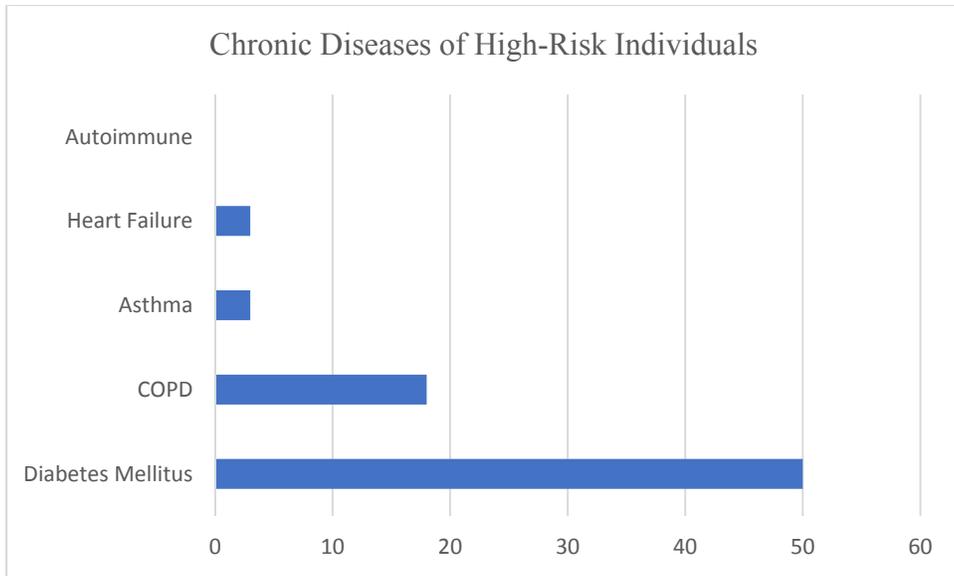


Figure 1: Chronic Diseases of High-Risk Individuals

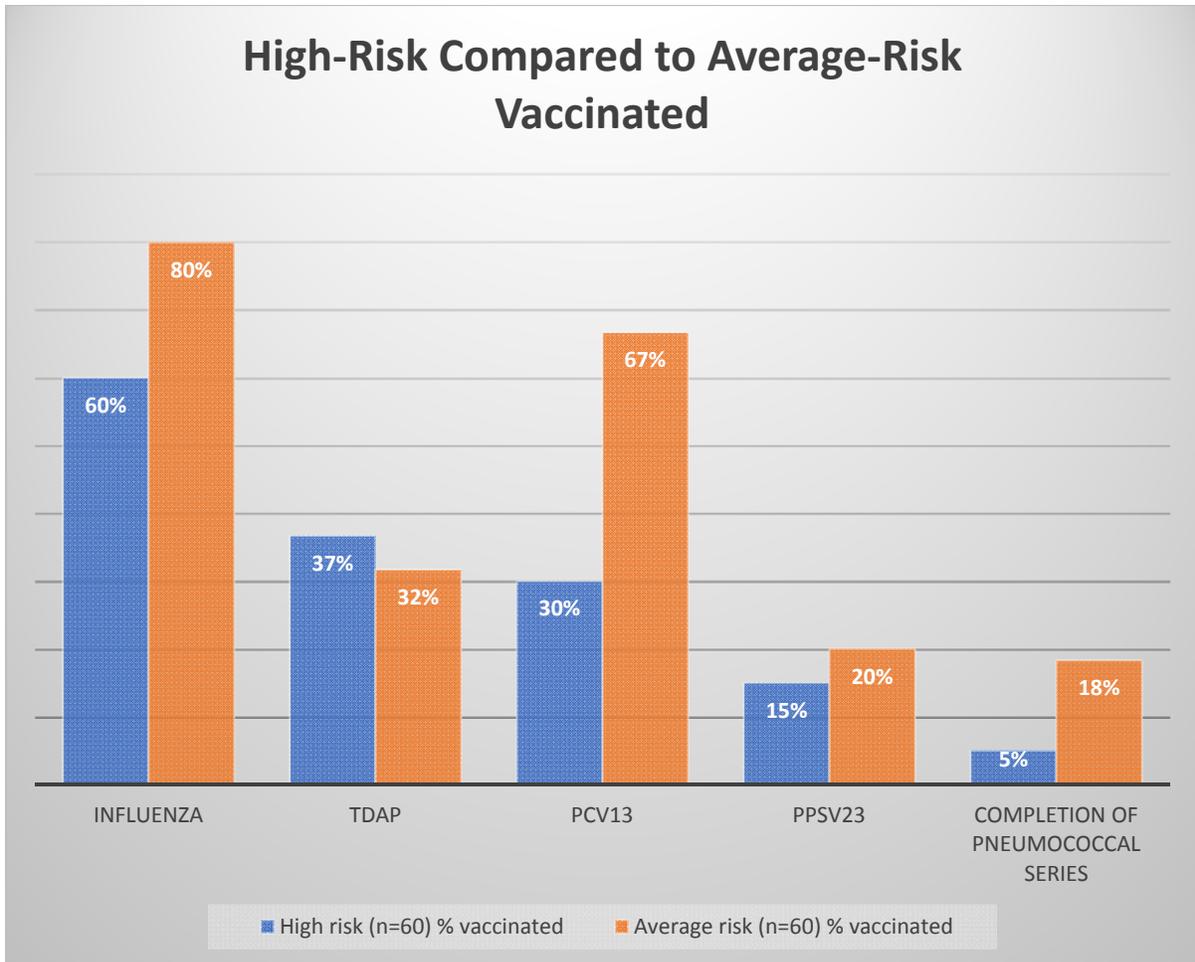


Figure 2: High-Risk Compared to Average-Risk, Vaccination Rates

Appendix

ICD Codes Used for Analysis

ICD-10 codes:

- Diabetes Mellitus (Type I and II)
Code Numbers: E10.9, E10.21, E10.22, E11.21, E11.22, E11.41, E11.42, E 11.69, E11.8 and E11.9
- Chronic Obstructive Pulmonary Disease
Code Numbers: J44.0, J44.1 and J44.9
- Asthma
Code Numbers: J45.20, J45.21, J45.22, J45.30, J45.31, J45.32, J45.40, J45.41, J45.42, J45.50, J45.51, J45.52, J45.901, J45.902, J45.909
- Heart Failure
Code Numbers: I50.20, I50.21, I50.23, I50.30, I50.31, I50.32, I50.33, I50.40, I50.41, I50.42, I50.43, I50.9
- Autoimmune Disorders
 - Rheumatoid Arthritis
Code Numbers: M05.9, M06.80, M06.9, M08.00, M08.29
 - Systemic Lupus Erythematosus
Code Numbers: M32.10, M32.9
 - Multiple Sclerosis
Code Number: G35
 - Myasthenia gravis
Code Numbers: G70.00, G70.01
 - Autoimmune thyroiditis
Code Number: E06.3

The ICD-9 Codes:

- Diabetes Mellitus (Type I and Type II)
Code numbers: 250, 250.0, 249.0, 250.01, 250.2, 250.3
- Chronic Obstructive Pulmonary Disease
Code Numbers: 490, 491, 491.2, 491.21, 492, 496
- Asthma
Code Numbers: 493, 493.2, 493.21, 493.22

(Appendix Continued)

- Heart Failure

Code Numbers: 428.0, 428.1, 428.2, 428.21, 428.22, 428.23, 428.3, 428.31,
428.32, 428.33, 428.4, 428.41, 428.42, 428.43, 428.9

- Autoimmune Disorders

- Rheumatoid Arthritis: 714.0
- Systemic Lupus Erythematosus: 710.0
- Multiple Sclerosis: 340.0
- Myasthenia Graves: 358.0, 358.00, 358.01
- Autoimmune Thyroiditis: 245.2