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Perceived Barriers To Routine Adult Influenza And Pneumococcal Vaccination In The Emergency Department. Westin M. Amberge (sponsored By Ian P. Schwartz) Dept Of Emergency Medicine, Yale University School Of Medicine, New Haven, Ct.

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Perceived Barriers to Routine Adult Influenza and Pneumococcal Vaccination in the Emergency Department

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By

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Yale School of Medicine
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PERCEIVED BARRIERS TO ROUTINE ADULT INFLUENZA AND PNEUMOCOCCAL VACCINATION IN THE EMERGENCY DEPARTMENT. Westin M. Amberge (Sponsored by Ian P. Schwartz) Dept of Emergency Medicine, Yale University School of Medicine, New Haven, CT.

Influenza and pneumococcal disease represent a substantial cause of morbidity and mortality, which is largely preventable with routine immunizations. The Emergency Department (ED) represents a unique avenue to reach a disproportionally high risk and under-vaccinated population. ED based programs for influenza and pneumococcal vaccinations are likely to be both feasible and cost effective, yet the administration of these vaccines in the ED is an uncommon practice. Little is known about the true prevalence of current ED based adult vaccination, as well as the attitudes of ED medical directors towards implementing these vaccination programs. This study used an electronic survey to study the prevalence of routine adult vaccination practices occurring in the ED and the perceptions of ED directors regarding potential barriers preventing effective ED vaccination programs. The survey was completed by 104 ED directors throughout the northeastern US, at a mixture of rural, suburban, and urban hospitals, as well as academic and non-academic hospitals. Of the 104 hospitals 45 (43%) and 36 (35%) ED directors indicate their ED provides some amount of influenza and pneumococcal vaccinations respectively, but these estimates become 16.3% and 5.8% respectively when more conservative criteria are applied. Thirty-seven ED directors (36%) indicated supporting the practice of providing routine adult immunizations in the ED. The identified barriers to ED based vaccination programs are as follows: time pressure on nurses, patients inability to provide an accurate vaccination history, lack of needed resources to store vaccinations, time pressure on ED physicians, lack of an ED vaccination protocol, belief that vaccination is the sole job of primary care physicians, and the prohibitively high cost of a vaccination program. On average, time pressure on nurses was identified as the most significant barrier to ED vaccination. It is likely that uniquely tailored community level solutions will be the most successful to solve the problem of under vaccination. The role of the ED in these programs will likely be highly variable.

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INTRODUCTION

Influenza and pneumococcal disease carry significant morbidity and mortality

Influenza and pneumococcal disease remain among the top ten causes of death in the United States, despite the existence of effective preventative vaccinations targeting both types of infection. (1) Influenza is thought to be responsible for greater than 200,000 hospitalizations per year with 20,000 to 40,000 deaths from influenza or its complications, 90% of which occur in the elderly. (2-7) These rates are often worse during years with particularly bad epidemics. (4, 7) Death from influenza is often due to a secondary bacterial infection, most commonly from *Streptococcus pneumoniae* (Pneumococcus). Pneumococcal infection is the most common vaccine preventable bacterial infection, accounting for more deaths than any other bacterial infection. (8, 9) Per year, pneumococcal disease is responsible for over 500,000 cases of community acquired pneumonia, 50,000 cases of bacteremia, 3,000 cases of meningitis, and more than 40,000 deaths annually. (10-13) The overall estimated incidence of bacteremia is 15-30 cases per 100,000 people, which rises to 50-83 per 100,000 people for adults 65 or older. It is associated with a case-fatality rate of 15-20% among adults, climbing to 30-40% among the elderly. (13) One epidemiological study in the late 1990's found 33% of the cases of invasive pneumococcal disease to occur in people over 65 years old, with 96% of the cases requiring hospitalization. (10) Pneumococcus is the most common cause of community acquired pneumonia, representing 30-50% of cases. (12) Of the cases of pneumococcal pneumonia, 10-25% will progress to pneumococcal bacteremia, while 60-80% of cases of bacteremia are associated with a preceding pneumococcal pneumonia. (13) Collectively, older adults represent approximately 90% of deaths due to influenza and pneumonia. (4, 8)(4, 8, 12) As the number of older people continues to steadily rise with the aging Baby-Boomer population, it is to be expected that the prevalence of cases of influenza and pneumococcal disease with significant morbidity and mortality will continue to rise as well.

Influenza and pneumococcal vaccines are effective

Effective vaccines for the prevention of both influenza and pneumococcal infection exist, indicating a large percentage of the morbidity and mortality associated with these infections is likely preventable. The efficacy of influenza vaccination has been found to be 70-90% effective in preventing infection in healthy adults. In the elderly (age ≥ 65), it has been shown to be 30-70% effective in reducing hospitalizations and 50-80% effective in preventing all cause mortality. (14-20) While it is known that the effectiveness of the influenza vaccine depends in part on the age and immunocompetence of the recipient as well as the correlation between the vaccine strains and those in circulation, the efficacy of the vaccine against laboratory confirmed influenza illness was 50-77% in studies conducted when the vaccine strains and circulating strains were antigenically dissimilar. (7, 21-23) The most recent of these studies indicated an effectiveness of 90%. (22) Additionally, an effective immune response to vaccination has been shown in both immunocompromised patients and pregnant women. (7) Subpopulation studies have shown a clear benefit in patients with chronic diseases including COPD and CHF. (24, 25) In patients 65 or older with CVD, influenza vaccination correlated with a 60% reduction in death from all causes. (26) In 2006, the American Heart Association and the American College of Cardiology recommended influenza vaccination in adults with coronary vascular disease as a secondary prevention measure. From a public health perspective, mass immunization against influenza has been proven to be helpful in reducing size and severity of new epidemics. (27) In the recent past, influenza vaccine has been recommended to be offered to all people over 50 years old. One study estimated that offering influenza vaccine to patients

50 and older would prevent 2.64 million cases of influenza-like illness, 180,000 hospitalizations, 40,500 deaths, and result in 275,000 quality adjusted life years (QALYs) saved. (28)

Similarly, pneumococcal vaccination has been shown to have an overall correlation with a reduced rate of death, complications, and patient length of stay. (29) A sero-prevalence study using the CDC's pneumococcal surveillance system showed that an antigen-specific antibody response occurs in 80% of healthy adult recipients within two to three weeks after vaccination. (13) This study demonstrated a 57% overall protective effect against invasive infections caused by all included serotypes. A similar antibody response is seen in the elderly, as well as in patients with alcoholic cirrhosis, COPD, diabetes mellitus, and asplenia; however, the antibody response in immunocompromised patients was noted to be diminished or absent in several studies. Antibody levels often remain elevated for at least five years after the initial vaccination event. (13) The vaccine has been shown to be consistently effective in preventing bacteremia, while less effective in preventing other types of pneumococcal disease including pneumonia. (13) A meta-analysis of nine randomized clinical trials did not show a protective effect against non-bacteremic pneumonia in high risk groups. (30) Overall, it has been shown that systemic pneumococcal illness is preventable in 56-81% of cases by the use of the 23-valent pneumococcal vaccine. Vaccination has also been shown to specifically be effective in preventing pneumococcal bacteremia in older patients. (13, 31-34)

<u>Rates of routine adult immunization are low</u>

The CDC has listed immunization as one of the top ten public health achievements of the 20th century. (35) One of the main goals of the Healthy People 2010 initiative set forth by the U.S. Department of Health and Human Services is to increase the rate of adult immunization against influenza and pneumococcus to 90% or greater for adults over 65 and 60% or greater for adults 18 to 64 with high risk conditions. Despite these goals, the most recent available data from the National Health Immunization Survey (NHIS) indicates immunization rates far below these goals. In 2006, the immunization rate for adults 65 or older against influenza and pneumococcus were 64% and 57% respectively. For adults aged 18 to 64 with high risk conditions indicating the need for vaccination, these rates fall further to 28% and 18% respectively. (36) Prior studies and survey data from the NHIS have demonstrated subgroup analysis showing immunization rates among ethnic groups, especially Blacks and Hispanics are often significantly lower than that of Whites, likely reflecting a known difference in access to primary medical care between the groups. (37) An overarching national goal of reducing racial and ethnic health disparities, including disparities in vaccination coverage, is not being met. (36)

The populations to be vaccinated against influenza and pneumococcus represent those established by the Advisory Committee on Immunization Practices (ACIP) of the CDC as the highest risk of complications due to infection and those most likely to contribute to the spread of disease to this at risk population. Specifically in regards to adults, the populations recommended for vaccination are as follows. For influenza vaccination, it is recommended that all adults age 50 or older, pregnant women, persons with compromised immune responses, and persons with chronic medical conditions including pulmonary, cardiovascular, renal, hepatic, hematologic, malignant, or metabolic disease should be vaccinated. In addition, all people in nursing homes or chronic care facilities, healthcare personnel, as well as any healthy household contact of a person at high risk. Although 83% of the US population is included in one or more of these high risk categories, during the 2007 to 2008 flu season only 40% of the US population was vaccinated. (7)

ACIP recommendations for pneumococcal vaccination target those persons at highest risk of complication from infection. These groups include all persons 65 years of age or older, patients with chronic cardiovascular, pulmonary, renal, or hepatic disease, diabetes mellitus, functional asplenia, alcoholism, and persons with a compromised immune response. Additionally, all Native Americans and Alaskan natives, as well as patients residing in chronic care facilities are through to be at high risk as well. Revaccination is often indicated after 5 years from the initial vaccination. Epidemiologic studies have indicated that approximately 91% of patients with pneumococcal bacteremia have at least one of the CDC listed risk factors indicating the need for vaccination. (13)

The ED population has a high prevalence of unvaccinated, high risk patients

In 2006 there were 119.2 million ED visits nationwide to fewer than 4,500 EDs, averaging to 40.5 visits per 100 persons. The number of ED visits has continued to rise, up 32% since 1996, yet the number of visits for emergent conditions has not changed since 1995. (38-42) It is estimated that more than 20% of Americans visit an ED annually and some prefer to visit EDs over primary care. {{}}

It is known that a large percentage of the ED patient population consists of people with chronic illness who are uninsured or under-insured with poor access to primary care, representing a patient population that is likely to be high risk and unvaccinated. (38, 43) The ED is often the primary site of contact with the healthcare system for the nation's more than 45 million and rising uninsured population. (44, 45) As expected, a study looking at the prevalence of basic primary care health provisions, found the ED patient population in particular need for primary care. (46) Furthermore, it has been shown that lower socio-demographic status (based on low income and education level) is associated with low vaccination rates. (47) Because the ED sees a disproportionate number of ill, elderly, poor, and minorities – all groups which are at high risk for both respiratory disease and under-immunization – it represents a unique venue to reach an otherwise unreachable high risk population. (38) The rate of African American utilization of the ED has increased to 75.4 visits per 100 African Americans, which is roughly double the rate for white Americans at 35.9 visits per 100 white Americans. (48) Additionally, it has been shown that African American and Hispanic patients are significantly less likely to receive influenza and pneumococcal vaccinations. (49) The current situation represents a significant disparity in the treatment of various racial groups, which can potentially be remedied by increased ED vaccination efforts due to the high concentration of minorities in this population.

A number of studies have specifically looked at the prevalence of vaccination against influenza and pneumococcus in the ED population. In a study conducted at a large, urban ED in Chicago, Slobodkin et al. found generally low rates of adult immunization. During a 6 week period, out of 11,000 non-emergent patients, 40% were considered high risk by CDC guidelines, yet only 30% and 6% of these high risk patients were immunized against influenza and pneumococcus respectively. (50) In a follow-up study, 27% of patients were found to be at high risk, while only 28% and 3% reported influenza or pneumococcal immunization. (51) A study conducted by Rodriguez, et al. at the UCLA ED which specifically looked at all the patients over 65 years old seen within a two month period, found respective vaccination rates of 37% and 18% for influenza and pneumococcus. (52) In the most recent study, conducted at an inner city ED in New Mexico over a three week period, 69% of patients were at high risk for influenza, yet only 16% of these patients were previously vaccinated. Additionally, 45% were high risk for pneumococcal disease, and only 18% of these patients had been previously vaccinated. (53)

A study conducted by a group at Vanderbilt University found 57% and 75% of high risk patients were not currently up-to-date with influenza and pneumococcal vaccination respectively. Interestingly, although approximately half of high risk patients were not up-to-date with vaccines, roughly 80% identified a PCP. (54) An ED based immunization study conducted in Canada, a nation with nationalized healthcare, found similar results to the previously mentioned American studies. It was found that 65% and 62% of high risk patients were unvaccinated against influenza and pneumococcus respectfully and had no plans for future vaccination. (55) The net results from all studies looking at the vaccination rates of high risk adult ED patients indicate rates ranging from 16 to 43% and 3 to 25% for influenza and pneumococcus respectively, confirming the ED population contains a significant number of high risk unvaccinated patients. (50-54, 56, 57)

Missed opportunities for vaccination frequently occur in the ED

Of the approximately 120,000 ED visits per year, only a small proportion, roughly 12.8%, are admitted. (38) Although many hospitals have adopted standing orders for influenza and/or pneumococcal immunization to eligible in-patients, these standing orders are usually not in place in the ED for non-admitted patients. Even for admitted patients, one study demonstrated the opportunity to provide pneumococcal immunization to hospitalized elderly patients was missed in 80% of admissions. (58) A similar study demonstrated 36-70% of patients hospitalized for pneumococcal bacteremia had been inpatients at the same hospital during the previous five years. (59, 60) Similarly, opportunities for influenza vaccination are often missed. In a study of hospitalized Medicare patients, only 32% were vaccinated prior to admission, 2% during admission, and 10% after admission. (61) High risk patients are often seen in the ED prior to admission for influenza or pneumococcal disease. In one retrospective study by Stack *et al*, it was shown that 55% of 188 patients admitted for pneumococcal bacteremia had been seen in that hospital's ED within the previous six years, during which 88% had indications for pneumococcal vaccination. Furthermore, patients often had multiple missed ED vaccination opportunities during this timeframe, averaging 3.2 ED visits per admitted patient. (62)

ED based vaccination programs have shown the potential to reach more high risk unvaccinated patients than either inpatient or general medical clinic settings. A retrospective chart review for all patients with pneumococcal bacteremia admitted in a four year period found that 70% had risk factors indicating the need for vaccination, and that 95% of these high risk patients had a missed opportunity for vaccination in the five years prior to admission. If all of these high risk patients had been immunized at a prior contact, 87% would have been immunized in the ED, compared to 50% as admitted patients and 31% at a general medical clinic. This study indicated that, depending on the efficacy of the pneumococcal vaccine, 15-28 bacteremic episodes admitted to this hospital might have been prevented with an ED vaccination program, as compared to 9-17 as admitted patients, and 5-10 at a general medical clinic. (63)

ED based vaccination programs are feasible

Many of the previously mentioned studies looking at ED population vaccination rates also examined ED based interventions to provide influenza and pneumococcal vaccination to identified high risk and unvaccinated patients. These studies have demonstrated that ED based programs are both feasible and effective at increasing immunization rates. The first reported analysis of ED based adult vaccination occurred over 20 years ago by Polis et al, who was the first to report low vaccination rates among ED patients, and found that 60% of unvaccinated high risk patients would accept immunization in the ED. He also demonstrated the potential of missed opportunities for vaccination, as 80% of patients not seen by a primary care provider (PCP) within the past three years had been hospitalized or seen in the ED during that time. (64)

In 1988, Polis et al. implemented a trial ED vaccination program that vaccinated 37% of high risk unvaccinated patients presenting to the ED. However, this study was limited as it required PCP approval for vaccination, and while two groups of PCPs made blanket requests that their patients not be immunized in the ED, only 61% of their patients had previously been vaccinated. (57)

In the initial ED based vaccination interventions conducted by Slobodkin et al, standing orders were used for screening and immunization to be completed by the nursing team at triage. Normal staffing levels were compared with using an additional nurse assigned to the triage team whose sole responsibility was screening for and providing immunizations. This trial was compared to a second intervention where immunization duties were given to nurses caring for patients in the treatment area. Overall, immunization in the ED was accepted by 70% and 61% of high risk patients offered influenza and pneumococcal vaccination respectively. Their analysis estimated that generalized ED based influenza vaccination could immunize 2.8 million high risk patients each influenza season. Furthermore, ED based pneumococcal vaccination would reach 7 million patients during the first year, and 24 million over five years, beyond which they estimated 500,000 pneumococcal immunizations per year based on the rate of population growth. In comparing the various interventions, no difference was seen in assigning vaccination duties to nurses at triage or in the patient care area; additionally, no difference was seen by adding a dedicated immunization nurse beyond normal staffing levels. Finally, a time motion study of nursing activities showed the median time for all immunization activities was four minutes, and was not associated with noticeable delays in patient care. (50, 51)

A follow up study looking specifically at pneumococcal vaccination in the ED, over a 2 month period, found that 82% of screened patients met high risk criteria for vaccination. Of these patients, 84% accepted pneumococcal immunization in the ED. This study also used nursing standing orders for screening and vaccination. The high prevalence of high risk patients in the study was thought to be influenced by preferential screening and documentation by the nursing staff, with the actual estimated high risk patient prevalence being around 44% of ED patients. (56)

At UCLA, an ED immunization study by Rodriguez et al. screened only for all patients over 65 years old (not using all of the CDC's high risk criteria), resulting in immunization of 50% and 58% of unvaccinated high risk patients against influenza and pneumococcus respectively. (52) Simplified screening interventions such as this potentially represent potential modification to vaccination criteria that can be used in EDs to vaccinate a large population while dedicating little additional time to the screening process. Rimple et al. at the University of New Mexico conducted a three week intervention in which vaccination against influenza was provided to 67% of the high risk patients and pneumococcal vaccine to 66% of the high risk patients. This intervention increased the vaccination rate of ED patients from 16% to 83% in the case of influenza, and 18% to 84% in the case of pneumococcus. (53) The Vanderbilt based study provided influenza and pneumococcal vaccine to 46% and 53% of high risk patients respectfully. (54) The previously mentioned Canadian study had rates of ED based immunization for influenza and pneumococcus of 65% and 60% of high risk patients vaccinated in the ED respectfully. (55) The net results of all ED based immunization interventions provided collective rates of vaccination of high risk unvaccinated patients ranging from 46-70% for influenza and 53-84% for pneumococcus. (50-54, 56, 57)

A corollary demonstration of the feasibility of ED based immunization is seen with the common ED practice of providing tetanus vaccination for patients with penetrating injuries. A study analyzing vaccination practices from 1992 to 2000 estimated that 27.7 million vaccines were given in EDs nationwide during this period. Of the administered vaccinations, 93% were for tetanus prophylaxis. The majority of the other 7% predominantly consisted of hepatitis and rabies vaccines. Approximately 250,000 of vaccinations were for influenza and pneumococcus. After excluding an outlier hospital where the majority of these vaccines were administered, they were administered too infrequently to provide a statistically significant estimate of the national rate of their usage in EDs. (65) Since tetanus immunization began in EDs in the 1970s, it has become a common and widespread practice. Previous literature has indicated an annual incidence of tetanus as 0.16 cases per million people, equating to roughly 50 cases per year. (66) While the low incidence of tetanus is largely attributable to effective immunization practices, it can be seen that the number of ED patients immunized against tetanus is clearly high, yet the number of patients that contract tetanus is extremely low. Conversely, the number of ED patients who are vaccinated against influenza and pneumococcus is extremely low, while the number of ED patients presenting with these infections is clearly high.

Influenza and pneumococcal vaccination is cost-effective

Healthcare interventions do not need to be cost saving to warrant adoption, rather they have to be cost effective to prove the investment in the intervention is worth the health benefits to be gained. Historically, policymakers have generally considered costs up to 50,000 to 100,000 dollars per QALY saved as acceptable costs. (67, 68) Virtually all estimates of the cost of influenza and pneumococcal vaccination programs have proven to be cost effective if not cost saving. (14, 18, 69-71)

Based on 2003 population statistics and dollars, the direct medical costs of influenza have been estimated as 10.4 billion dollars annually, while the estimated lost earnings due to illness and loss of life add an additional economic cost of 16.3 billion. (72) Through the use of projected statistical values, the total economic burden of influenza epidemics has been estimated to be an average of 87.1 billion dollars. Influenza vaccination can reduce both the medical costs and the indirect costs from decreased work productivity and absenteeism. (73, 74) The annual net cost of influenza vaccination programs is 1.5 billion dollars, resulting in a cost of 4,600 dollars per QALY saved, which falls within reasonable cost-effective intervals. Further analysis shows that the cost per QALY for immunizing patients 50-64 is 28,000 dollars per QALY. The cost further decreases to 980 dollars per QALY for people 65 and older when accounting for costs of time and travel to get the vaccination; however, the cost drops to a net cost savings of 17 dollars per year when these costs are not accounted for as would be the case with an ED based immunization program. (28) Multiple studies have demonstrated substantial economic benefit for influenza vaccination of high risk patients, with virtually all showing cost effectiveness and many demonstrating cost savings. (14, 25, 70, 71, 75) A study conducted by the CDC or Medicare beneficiaries demonstrated costs ranging from cost saving to a cost of 145 dollars per year of life gained. (76)

Additionally, pneumococcal vaccination has also consistently been shown to be either cost-effective or cost saving. (69, 77) In a 1997 study, pneumococcal vaccination was shown to be cost saving for people over 65 years of age, saving approximately 8 dollars in net medical costs and gaining 1.21 days of healthy life per person vaccinated. These data suggest that pneumococcal vaccination is one of few interventions that both improves health and saves costs. It was estimated that vaccination of 23 million unvaccinated elderly would gain 78,000 years of healthy life and save 194 million just based on reductions in the incidence of pneumococcal bacteremia. (69) Pneumococcal vaccination may be even more cost effective for African Americans, a group overrepresented in the ED patient population, as the rates of pneumococcal bacteremia are more than two times the rate for Caucasians.

ED based vaccination programs are equally cost-effective and may have further cost-savings beyond that of the direct medical effects of vaccination. A number of ED vaccination feasibility studies have suggested that vaccination is an effective way to decrease the number of patients admitted to the same hospital for vaccine-preventable diseases. (50, 51, 54, 62) As the uninsured are over-represented in the ED population, ED based immunization programs could help reduce the hospitalization of uninsured patients, which would likely result in additional cost savings. Slobodkin et al. estimated that ED based influenza immunization at a cost of 10 dollars per immunization would cost 25 million dollars per year, reduce hospitalizations by 1,000 patients, prevent 300 premature deaths, and save 225 million dollars of treatment costs per year. This study also estimated that ED based pneumococcal immunization at a cost of 15 dollars per immunization would cost 400 million in the first 5 years and then 27 million yearly thereafter, would prevent 4,000 premature deaths and save two billion dollars in treatment costs per year. (50) As previously noted, one study of patients with pneumococcal bacteremia noted that 88% had been seen in the ED during the previous five years, from which it was estimated that an ED based vaccination program would save 400,000 dollars per year, or 160,000 dollars per year with the most conservative estimates. (62) Influenza outbreaks are associated with a significant increase in the elderly use of the ED for influenza related infections, resulting in increased resource use, admission rates, ED length of stay, ED saturation time, ambulance diversion, and the number of patients leaving the ED prior to being seen. These data implicate influenza outbreaks as contributing to ED overcrowding. (78-80)

Medicare has been paying for pneumococcal and influenza vaccination since 1981 and 1993 respectively. (58) Furthermore, Medicare Part B reimburses for administering these vaccines at a rate above the inpatient diagnosis-related group payment for hospitalized patients providing further financial incentive for ED based immunization as opposed to inpatient based programs. (81) Reimbursement is also made easier by roster billing in which hospitals need only submit names at Medicare numbers. (82) Many large insurance companies and employer sponsored insurance plans are currently covering annual influenza vaccines, and often cover or offer pneumococcal vaccinations at reduced costs. However, there are still many private insurance plans that require covered individuals to purchase vaccinations separately or pay significant co-pay. In these instances and when vaccines are provided to the uninsured, the costs for the vaccine and its administration may not be reimbursed.

Potential barriers to ED based immunization

Immunization has long been perceived as the responsibility of the primary care physician. When immunization is addressed in the ED, often the main intervention consists of referral to primary care for immunization; however, it has been demonstrated that referring patients outside of the ED for immunization is ineffective at increasing vaccination rates. (83) Concern in regards to re-vaccination may limit an emergency physician's (EP's) willingness to administer a vaccine. One study addressing this concern, found that self-reporting of vaccination status has sensitivity in the high 90's and specificity in the 70's. It was determined that a patient's self-reported vaccination status has a 70% positive predictive value, as validated against medical record documentation. (84, 85) Furthermore, the Advisory Committee on Immunization Practices (ACIP) of the CDC recommends that patient self-report of Influenza vaccination should be accepted in clinical practice as proof of vaccination status. (7)

Experience with utilizing standing orders for the administration of routine immunizations indicates that ED based immunization will unlikely be limited secondary to EP time constraints or difficult in remembering to offer indicated immunizations. Immunization programs that have relied on nurse standing orders achieved better rates of vaccination than programs relying on physicians to issue patient specific orders. (86, 87) As previously indicated in a study by Slobodkin *et al*, the addition of a dedicated immunization nurse did not increase ED based immunization coverage above rates achieved with normal staffing levels, with a time-motion study indicating all nursing immunization activities taking an average of 4 minutes with no appreciable delays in patient care. (51)

Little is known about ED Directors' perceptions of ED based immunization

The number of studies examining EP's perceptions of ED based vaccination programs is small. A survey returned by 38 EPs in Winnipeg, found that 46% rarely and 16% never screened for influenza vaccination, and 57% never offered it. (88) Only three EPs (8%) reported often screening for and administering influenza vaccines, while 76.3% indicated willingness to offer routine influenza immunization. Nine of the surveyed EPs (23.7%) were unwilling to offer vaccination, with eight of nine indicating immunization as the role of primary care. A study based in one Tennessee ED found that physicians in this ED were generally willing to order vaccinations, but felt they were either too busy or would not remember to offer vaccination. Consensus between EPs' and nurses' preferences indicated that a nurse standing order combined with physician notification prior to administration was the most preferred approach. (89) A larger study by this research group surveyed the Tennessee members of the American College of Emergency Physicians (ACEP) using a standard mail-in survey, receiving a 50% response rate representing 128 EPs. (54) Eighty percent of responding EPs indicated they never provided influenza vaccination, followed by 9% providing it rarely (less than once per year). Seventy-one percent indicated never providing pneumococcal immunization, followed by 23% providing it rarely, with the most frequent indication being emergency splenectomy. However, 52% of EPs indicated they were willing to administer vaccines, indicating a significant portion of

EPs that are willing to provide vaccinations that are not currently providing them. The main reasons cited for unwillingness to administer vaccines were a belief that vaccination is the role of primary care (65%), inadequate time or personnel (51%), adverse reactions (29%), and cost of vaccines (17%). While this study is the largest to date, its limited by its geographic isolation to Tennessee EPs, which may not adequately represent the national perceptions of ED based vaccination. As ED based vaccination is an emerging concept, the results of this analysis obtained in 1994 may have significantly shifted during the past 15 years. Furthermore, utilizing standard mail as a survey method as opposed to an e-mail based survey increases the likelihood that practitioners with strong opinions are more likely to respond, resulting in a greater potential for response bias. While the perceptions of EPs are important in the willingness to accept and carryout ED based vaccination programs, the impetus to begin such a program would likely need to arise from the EDD specifically making the opinions of these practitioners valuable in examining the roadblocks to ED based adult immunization programs.

PURPOSE, HYPOTHESIS, AIMS

Purpose

The academic literature is robust with studies showing the feasibility and effectiveness of ED based adult vaccination against pneumococcus and influenza, yet the practice of providing routine vaccinations in the ED has not been widely adopted. The purpose of this project is to provide an estimation of the current prevalence of ED based routine adult immunization against pneumococcus and influenza, as well as to examine the reasons ED directors (EDD) cite as barriers to the provision of routine vaccinations in the ED.

The Specific Aims of the proposed project are:

1. To estimate the current prevalence of ED based efforts for screening for immunization status, immunization provision, and referral to primary care for routine adult influenza and pneumococcus immunization.
2. To determine the perceived road blocks to ED based adult immunization programs for influenza and pneumococcus from the perspective of the EDD.
3. To determine if certain perceived road blocks to ED based immunization programs correlate with hospital setting or annual ED census via subgroup analysis.

The associated hypotheses are:

1. The prevalence of EDs that routinely administer adult immunizations against influenza and pneumococcus will be less than 5% of the survey population.

2. The most commonly cited road blocks to ED based immunization programs will include belief that immunization is a responsibility of primary care physicians and that a lack of time prevents immunization screening and administration.
3. EDDs at hospitals located in urban settings with a high annual ED census will be more likely to perceive time constraints placed on the staff as a road block to ED immunization, while the prevalence of the belief that immunization is a responsibility of primary care physicians will be unaffected by hospital setting or ED annual census.

METHODS

Overview

An electronic survey was designed to be sent to EDDs throughout the Northeast. The survey included questions to collect information about the size and setting of the hospital, the current practices regarding screening for and provision of routine adult vaccinations against pneumococcus and influenza in the ED, and the perception of the EDD being surveyed regarding what he or she perceived the barriers to the use of ED based routine vaccination in his or her ED. EDD contact information was collected via the internet and phone calls placed to individual hospital emergency departments. The survey results were tabulated and analyzed using SPSS to conduct various Chi-squared tests of independence. All aspects of the methods described below were completed by the primary researcher (Westin Amberge), with guidance from faculty advisors.

Survey Creation

The electronic survey was created and administered via the survey hosting website SurveyMonkey (www.surveymonkey.com). In its final version, the survey contained five sections: informed consent, basic hospital information, current vaccination practices, EDD perceptions of ED based vaccination, and an open section for comments. See Appendix Figure 1 for a full copy of the administered survey.

The survey began with the informed consent of the participant in which he or she was informed of the purpose of the study and information regarding the privacy protection of all collected information. The respondent was e-mailed a unique four digit code with the initial request for participation in the study. The code was used to track responses in order to segregate individuals who completed the survey and did not require follow-up and those who had been contacted but had not yet completed the survey.

The first section of the survey pertained to the collection of information about the hospital setting in which the respondent worked. Information regarding the location, hospital type, and academic affiliation were collected, along with the approximate annual number of adult ED visits and in-patient beds. The second section of the survey was directed at collecting information about current practices regarding routine adult vaccinations in the ED. ED directors were asked to estimate the frequency in which patients were screened for vaccination status against influenza and pneumococcus, were provided vaccinations against influenza and pneumococcus, and were educated and referred to primary care for vaccination. Additionally, the frequency of use of standing orders for the provision of vaccinations was estimated. These frequencies were estimated with the following qualitative terms: never, rarely, sometimes, usually, and always. The next section of the survey used a five-point Likert scale (strongly disagree, disagree, neutral, agree, strongly agree) to assess the level of agreement ED directors had to various statements indicating potential barriers to ED based vaccination. The potential barriers indicted in the survey were as follows:

- Belief that routine immunization is the sole responsibility of primary care physicians
- Concern over time constraints on physicians
- Concern over time constraints on nurses
- Need for additional resources to store and administer immunizations
- Concern that patients are unable to provide an accurate immunization history
- Concern over adverse effects of immunizations
- Concern regarding medicolegal liability
- Concern over cost of providing routine immunizations

- Concern that patients do not want routine immunizations to be administered in the ED
- Concern that patients do not understand the need for routine immunizations
- Concern that influenza and pneumococcal vaccinations are ineffective
- Lack of structured immunization screening and administration protocol
- Belief that the patient population at your ED is mostly up-to-date on immunizations

The last section of the survey was an optional open comments section that allowed respondents to provide any additional comments they had regarding routine adult vaccination against influenza and pneumococcus in the ED.

The survey was validated for clarity and readability by four independent ED physicians prior to finalization and distribution.

HIC Approval

The proposed study was submitted to the Human Investigation Committee IRB of the Yale University School of Medicine, and approved on August 19th, 2009. HIC # 09070054971243

Study Population & Survey Administration

The study population enrolled in the study was defined as ED directors of acute care adult emergency departments located in the northeastern United States. For the purpose of this study the northeastern United States was defined as including the following states: Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. Because the total population of ED directors is relatively small, the study population was limited to this specific geographic region in order to obtain results that were closer to a census of a more limited population than a strategic sampling across the United States would allow. Additionally, it was thought that leveraging local relationships would allow for a higher response rate to be obtained. Comprehensive lists of hospitals in each of the included states were obtained from the respective state hospital associations. Hospitals that were excluded included any hospital without a dedicated adult emergency department. Such hospitals included dedicated pediatric hospitals, psychiatric hospitals, rehabilitation facilities, and niche specialty hospitals such as oncology, cardiology, or orthopedics hospitals without an associated general acute care ED. Yale New Haven Hospital in New Haven, CT was excluded from the study do to its direct affiliation with the research project. Additionally, hospitals where the ED director was not a medical doctor, hospitals with a vacancy in the position of ED director, and any other hospital without an identifiable ED director were excluded from the study. Finally, for hospital groups in which the ED director oversaw multiple hospitals, the ED director was instructed to respond in regards to the primary hospital in which he or she worked.

For included hospitals, an extensive internet search was conducted to identify the emergency department director and obtain his or her e-mail address for survey administration. For hospitals where identification of the appropriate person was not possible via the internet, direct phone calls were placed in an effort to obtain the needed information. The survey was directly e-mailed to ED directors along with a unique four digit identifier code used to track survey responses. The e-mail contained an overview of the study and its purpose, as well as instructions to complete the survey and a direct hyperlink to the online survey. As surveys were completed, the unique four digit code was used to check off the associated hospital and ED director from the list of potential respondents. If no response was received after two weeks since the original e-mail was sent, a follow-up reminder was sent. After the respondent was checked off as having completed the survey, the survey responses were dissociated from the four digit code linking the survey response to a particular ED director. When the obtained e-mail address for the ED director of a particular hospital was not functional or incorrect the respondent was removed from the sample.

Analysis of Results

As surveys were completed, data were extracted from each completed survey and tabulated in a password secured Microsoft Excel spreadsheet on a password protected laptop in sole position of the primary investigator. Data were dissociated from all identifying information including the unique four digit code used to track responses.

The aggregated data for each specific question were examined for mean and standard deviation. These data were used to determine the frequencies of employment of current immunization related practices in the ED, the percentage of ED directors who support ED based routine adult immunization, as well as a relative ranking of perceived importance of the potential barriers to ED based vaccination programs.

The data were transformed into binomial categorical data for analysis using the Chi-square test of independence. The following transformations were made to assist in analysis. The collected data reporting the hospital setting were simplified into hospitals in "densely populated areas" (by grouping "urban" and "suburban") and hospitals in "sparsely populated areas" (by grouping "rural" and "small municipality"). The data reporting hospital funding were consolidated into "private" and "public", which was expanded to incorporate any responses from VA hospitals. The reported results for annual ED patient census were grouped into two categories comprised of hospitals with less than or equal to 40,000 patients and greater than 40,000 patients per year. The vaccination related practices data, aimed at determining the frequency of screening, immunization, and other practices, were reported in the form of "never, rarely, sometimes, usually, or always". These data were simplified into the categories "no" (combining "never" and "rarely") and "yes" (combining "sometimes", "usually" and "always"). The data from the responses assessing ED director agreement with the various potential barriers to ED based vaccination were originally reported as a five-point Likert scale (strongly disagree, disagree, neutral, agree, and strongly agree). These data were simplified into three categories: "agree" (combining "strongly agree" and "agree"), "neutral", and "disagree" (combining "strongly disagree" and "disagree").

The transformed data were analyzed using multiple Chi-squared tests of independence on various combinations of data. Because the Chi-squared test of independence assumes counts to be greater than or equal to five as it is based on the compilation of normal approximations, when this assumption was not met Fisher's Exact Test was used. See appendix figure 2 for a chart showing all the specific associations that were tested.

RESULTS

Survey Dissemination & Response Rates

Overall, 399 distinct hospitals with adult acute care emergency departments were identified in the northeastern United States as meeting the hospital level inclusion criteria. Of these 399 hospitals, ED directors and their e-mail contact information were successfully located for 218 hospitals. These 218 ED directors were e-mailed a request to complete the study survey, of which 104 responded either with the initial request or a follow-up e-mail. See appendix figure 3. Of the 114 ED directors labeled as not responding, five began to complete the survey but did not finish. The data from these five partially completed surveys were excluded from data analysis. The overall response rate for contacted ED directors was 47.7%, and surveys were completed by ED directors representing 26.1% of all hospitals with adult emergency departments identified in the Northeast. The state by state response rates ranged from 66.7% for the state of Rhode Island to 38.4% for the state of New York. Due to the large population of hospitals meeting inclusion criteria, the states of New York and Massachusetts represent 32% and 28% of the collected survey data respectively. See appendix figures 4 and 5 for state by state survey collection data.

Respondent Hospital Characteristics

Of the hospitals represented by the 104 ED director respondents, the frequency of hospitals described as urban, suburban, small municipality, and rural was 44, 25, 16, and 19 hospitals respectively. The percentage of the results by hospital type was similarly 42%, 24%, 16%, and 18% for urban, suburban, small municipality, and rural hospitals respectively. See appendix figures 6 and 7 for graphical representations. Seventy-one hospitals were identified by the ED director respondents as being majority privately funded, while 31 were identified as majority public funded. Additionally, two respondents represented the emergency departments of a VA hospital. The respective percentages of the total collected results represented by each of these categories were 68% for private funding, 30% for public funding, and 2% for VA hospitals. See appendix figures 8 and 9 for graphical representations.

The survey also ascertained whether the respondent hospital was academically affiliated (i.e. a teaching hospital) or not. Of the 104 responses, 50 hospitals (48%) were identified as teaching hospitals, while the remaining 54 hospitals (52%) had no academic affiliation. See appendix figure 10 for graphical representation.

Information regarding the number of in-patient hospital beds and the annual ED census was also collected. The mean number of in-patient hospital beds was 250 beds, with a standard deviation of 207 beds. For hospitals self identified as rural, small-municipality, suburban, and urban, the mean number of in-patient beds were 89 (σ = 75), 100 (σ = 112), 184 (σ = 102), and 400 (σ = 218) beds, respectively. The mean number of in-patient beds for teaching and non-teaching hospitals were 371 (σ = 228) and 135 (σ = 93) respectively. The mean annual ED census for respondent hospitals was 48,985 patients, with a standard deviation of 31,198 patients. For hospitals self identified as rural, small-municipality, suburban, and urban, the mean annual ED census was 21,897 (σ = 12,663), 31,000 (σ = 12,175), 44,384 (σ = 19,382), and 69,989 (σ = 33,000) patients, respectively. The mean annual ED census for teaching and non-teaching hospitals was 67,050 (σ = 33,721) and 32,258 (σ = 15,727) respectively. See appendix figures 11 and 12 for graphical representation of the relationship between self-described setting and the number of in-patient beds and annual ED census. See appendix figure 13 for a side by side comparison of the number of in-patient beds and annual ED census in teaching and non-teaching hospitals.

Immunization Related Practices

ED directors were asked to indicate the frequency of which specific vaccination practices occurred in their respective emergency departments. The practices included screening for influenza and pneumococcal immunization statuses, administration of the influenza and pneumococcal vaccines, the use of standing orders to administer vaccines, and education and referral to primary care for vaccination. Of the 104 responses, screening for influenza vaccination status was reported as “never” in 24 responses, “rarely” in 24 responses, “sometimes” in 26 responses, “usually” in 23 responses, and “always” in 7 responses. The frequencies for screening for pneumococcal vaccination status were 32, 30, 20, 15, and 7 responses for the never, rarely, sometimes, usually, and always categories respectively.

Fifty-nine ED directors indicated their ED never provides influenza vaccinations, leaving 45 respondents reporting some influenza vaccination activity in their ED. Thus, approximately 43% of respondents indicate some amount of influenza vaccines being administered in their ED. Of these 45 responses, 28 indicated vaccines were provided “rarely”, 11 indicated “sometimes”, 5 reported “usually”, and 1 respondent indicated “always” providing influenza vaccines. Grouping the respondents that chose “never” and “rarely” as similarly not providing vaccinations, then 17 of 104 respondents (16%) provide some level of influenza vaccination. Of the 104 respondents, 68 indicated their EDs “never” provided pneumococcal vaccination, leaving 36 providing some level of vaccination, which correlates to roughly 35% of respondents. Of the ED directors indicating some level of pneumococcal vaccination in their respective EDs, 30 indicated “rarely”, 3 indicated “sometimes”, 3 indicated “usually”, and zero chose “always”. If the respondents who chose “never” and “rarely” are once again grouped, then 6 of 104 respondents (6%) provide some level of pneumococcus vaccination.

Eighty-one respondents indicated “never” using standing orders, while 6 chose “always”. In regards to education and referral, the respondents chose never, rarely, sometimes, usually, and always with frequencies of 10, 17, 38, 31, and 8 respectively. See appendix figure 14 for a table of the composite frequencies for each practice and answer choice. See appendix figure 15 for a graphical representation of the percentages of each response choice for each immunization practice.

Assigning a quantitative weight of 1, 2, 3, 4, and 5 to responses of never, rarely, sometimes, usually, and always respectively, yielded the following average scores for each type of practice. The average scores for screening for influenza and pneumococcal immunization status are 2.66 ($\sigma = 1.24$) and 2.38 ($\sigma = 1.25$) respectively, indicating the average response as between “rarely” and “sometimes”. The average scores for the administration of influenza and pneumococcal vaccines are 1.66 ($\sigma = 0.92$) and 1.43 ($\sigma = 0.69$) respectively, indicating the average response as between “never” and “rarely”. For the practice of using standing orders to administer vaccines, the average score is 1.55 ($\sigma = 1.16$), also correlating to an average response of roughly “never” to “rarely”. Lastly, the average score for education and referral to primary care for vaccination is 3.10 ($\sigma = 1.08$), indicating the average response as roughly “sometimes”. See appendix figure 16 for a table consolidating the average response data.

<u>Support for ED Based Routine Adult Immunizations</u>

Of the 104 ED directors who responded to the survey, 37 respondents reported supporting ED based routine adult vaccination against influenza and pneumococcus. The remaining 67 respondents did not support routine ED based vaccination. These response frequencies correspond to 36% and 64% of ED directors supporting vaccination and opposing vaccination respectively. See appendix figure 17 for a graphical representation.

Perceived Barriers to ED Immunization

The survey respondents were asked to indicate if they agreed or disagreed with several common concerns as significant barriers to effective ED based vaccination programs. The responses were in the form of a five point Likert scale where strongly disagree, disagree, neutral, agree, and strongly agree corresponded to responses of 1, 2, 3, 4, and 5 respectively. The concerns receiving an average score above 3.0 (neutral) were labeled as the most significant barriers to ED based immunization. These concerns, in order of the level of ED director agreement, are that nurses do not have enough time to administer vaccines ($\mu = 4.22$, $s = 0.88$), that patients are unable to provide an accurate vaccination history ($\mu = 3.94$, $s = 0.99$), that EDs do not have the needed resources to store vaccinations ($\mu = 3.90$, $s = 0.99$), that time pressure on ED physicians precludes an effective vaccination program ($\mu = 3.80$, $s = 1.05$), that the lack of an effective ED vaccination protocol is a significant barrier to ED based vaccination ($\mu = 3.46$, $s = 1.19$), that vaccination is the sole job of primary care physicians ($\mu = 3.43$, $s = 1.11$), and that an ED based vaccination program would be too costly ($\mu = 3.23$, $s = 1.18$).

The remaining potential barriers to ED based vaccination, received average scores less than 3.0 and were labeled as less significant barriers to ED based vaccination programs. Continuing in descending order of average score, these potential barriers are that ED patients do not understand the need for vaccinations ($\mu = 2.94$, $s = 0.93$), that patients do not want vaccinations in the ED ($\mu = 2.56$, $s = 0.87$), that physicians are concerned over the adverse effects of vaccinations ($\mu = 2.46$, $s = 1.07$), that physicians are concerned over the potential medicolegal liability of ED based vaccination programs ($\mu = 2.43$, $s = 1.05$), that ED patients are mostly up to date on routine vaccinations ($\mu = 2.18$, $s = 0.82$), and that vaccines are ineffective ($\mu = 1.44$, $s = 0.60$). See appendix figure 18 and 19 for a tabular summary and graphical representation of these data. See appendix figure 20 for a percentage distribution of responses for each potential barrier to ED vaccination.

<u>Association with Hospital Setting</u>

Chi-square tests of independence were used to test for statistical associations between the respondent's hospital setting and vaccination practices, support for ED vaccination, and perceived barriers to ED vaccination. Data regarding hospital setting were grouped into "densely populated" (includes urban and suburban) and "sparsely populated" (includes rural and small municipality).

Of the respondent hospitals, 35 (33.7%) were identified as sparsely populated and 69 (66.3%) were identified as densely populated. Of the hospitals located in sparsely populated areas, 17 (48.6%) do some screening for influenza vaccination status (defined as a response of sometimes, usually, or always), 15 (42.9%) do some screening for pneumococcal vaccination status, 5 (14.3%) do some administration of the influenza vaccine, and 1 (2.9%) does some administration of the pneumococcal vaccine. Of the hospitals located in densely populated areas, 39 (56.5%) do some screening for influenza vaccination status, 27 (39.1%) do some screening for pneumococcal vaccination status, 12 (17.4%) do some administration of the influenza vaccine, and 5 (7.2%) do some administration of the pneumococcal vaccine. No significant relationship was found between the setting description and screening for influenza vaccination status ($X^2(df = 1, N = 104) = 0.59$, $p = 0.533$), screening for pneumococcal vaccination status ($X^2(df = 1, N = 104) = 0.13$, $p = 0.833$), administration of the influenza vaccine ($X^2(df = 1, N = 104) = 0.164$, $p = 0.785$), and administration of the pneumococcal vaccine ($X^2(df = 1, N = 104) = 0.823$, $p = 0.661$). See appendix figures 21 and 22 for a cross tabulation of the data frequencies and percentages as well as the statistical output from the Chi-Square tests.

Of the ED directors of hospitals in sparsely populated areas, 12 (34.3%) support ED based routine adult vaccination, while 25 (36.2%) of ED directors from densely populated areas support routine ED vaccination. There was no statistically significant relationship between hospital setting and support for provision of ED based routine adult vaccinations (X^2(df = 1, N = 104) = 0.038, p = 1.000). See appendix figures 23 and 24 for cross tabulation of frequencies and percentages and results of the statistical analysis. Analysis of a potential link between hospital setting and the belief in specific factors as barriers to ED based vaccination programs resulted in one statistically significant relationship. Of the 35 respondents from hospitals located in sparsely populated areas, 17 (48.6%) believed that patients not understanding the need for vaccinations is a significant barrier to ED based vaccination programs, compared to 14 (20.3%) of 69 respondents from hospitals in densely populated areas (X^2(df = 2, N = 104) = 9.184, p = 0.010; LR = 8.988, p = 0.011). See appendix figures 25 and 26 for the cross tabulated frequencies and percentages, as well as the results from the chi-square analyses, of the other potential relationships.

Association with ED Annual Census

Potential relationships between the annual ED patient census and ED vaccination practices, support for ED vaccination, and perceived barriers to ED vaccination were tested using Chi-square tests of independence. The reported results on ED patient census were grouped into hospitals with less than or equal to 40,000 patients per year and greater than 40,000 patients per year. The data for the number of in-patient hospital beds were not tested separately, as the ED census data were thought to be a better predictor of the level of activity in ED and roughly tracked the data for in-patient beds. See appendix figure 27 for a graphical representation of ED annual census compared to in-patient beds. There were 53 hospitals with ≤ 40,000 pts/yr, compared to 51 hospitals with > 40,000 pts/yr.

Of the 53 hospitals with a smaller annual ED census, 28 (52.8%) do some level of screening for influenza vaccination status, 20 (37.7%) do some level of screening for pneumococcal vaccination status, 9 (17.0%) do some administration of the influenza vaccine, and 3 (5.7%) do some administration of the pneumococcal vaccine. This is compared to the 51 hospitals with >40,000 ED patient visits per year, of which 28 (54.3%) report some level of screening for influenza vaccination status, 22 (43.1%) report some level of screening for pneumococcal vaccination status, 8 (15.7%) report some administration of the influenza vaccine, and 3 (5.9%) report some administration of the pneumococcal vaccine. Chi-squared tests of independence showed no relationship between ED annual census and screening for influenza vaccination status (X^2(df = 1, N = 104) = 0.045, p = 0.847), screening for pneumococcal vaccination status (X^2(df = 1, N = 104) = 0.315, p = 0.690), administration of the influenza vaccine (X^2(df = 1, N = 104) = 0.032, p = 1.000), and administration of the pneumococcal vaccine (X^2(df = 1, N = 104) = 0.002, p = 1.000). See appendix figures 28 and 29 for the cross tabulation and statistical analysis output.

The collected ED census data were also analyzed for a potential relationship to whether the respondent ED director does or does not support ED based vaccination programs, as well as for a relationship with the perceived barriers to ED based vaccination. Of the hospitals with a small (≤ 40,000 pts) annual ED census, 21 (39.6%) support ED based vaccination programs, compared to 16 (31.4%) of the hospitals with a larger (> 40,000 pts) annual ED census. However, no statistically significant relationship between ED census and support for ED vaccination was found (X^2(df = 1, N = 104) = 0.772, p = 0.418; LR = 0.774, p = 0.379). See appendix figures 30 and 31 for the cross tabulation and statistical output. Chi-squared analysis for a relationship between the annual ED census and perceived barriers to ED based vaccination resulted in two statistically significant relationships. Of the 53 hospitals with a smaller annual ED census, 10 (18.9%) agreed that medicolegal liability is a significant barrier to ED based adult vaccination programs, while 13 (24.5%) were neutral and 30 (56.6%) disagreed. This compares to the 51 hospitals with larger annual ED patient censuses, where 3 (5.9%) agreed that medicolegal liability was a significant barrier, while 22 (43.1%) were neutral and 26 (51%) disagreed (X^2(df = 2, N = 104) = 6.333, p = 0.042; LR = 6.565, p = 0.038). Additionally, there was a statistically significant relationship between ED annual census and the belief that patients are up to date on vaccinations. Of the 53 respondents from hospitals with a smaller annual ED patient census, 7 (13.2%), 12 (22.6%), and 34 (64.2%) respectively agreed, were neutral, or disagreed that patients being up to date on vaccinations is a significant barrier to ED based adult vaccination programs. This compares to hospitals with larger annual ED census, were 0, 13 (25.5%), and 38 (74.5%) respondents indicated they agreed, were neutral, or disagreed respectively (X^2(df = 2, N = 104) = 7.226, p = 0.027; LR = 9.928, p = 0.007). See appendix figures 32 and 33 for the cross tabulation and statistical output.

Association with Academic Status

The data were analyzed for possible associations between the academic status of the respondents' hospital (teaching hospital v. non-teaching hospital) and vaccination related practices, support for ED vaccination, and agreement with potential barriers to ED based vaccination. Of the 104 survey responses, 54 respondents self identified as being from non-academic hospitals, while the remaining 50 responses were from ED directors at hospitals with an academic affiliation. Within the group of respondents from non-academic hospitals, there were 28 (51.9%) and 22 (40.7%) respondents who report screening for influenza and pneumococcal vaccination status respectively. In comparison, 28 (56%) and 20 (40%) of the respondents from teaching hospitals reported screening for these vaccinations respectively. Additionally, there were 5 (9.3%) and 3 (5.6%) of the non-academically affiliated respondents who report administering some level of influenza and pneumococcal vaccine in the ED respectively. This compares to 12 (24%) and 3 (6%) of the respondents from academically affiliated hospitals who report administering some level of these vaccines respectively. However, no statistically significant relationship was found between any of the vaccination related practices and the hospital's academic status. The chi-squared test of independence between academic status and the administration of the influenza vaccine trended towards highlighting a possible relationship between these variables (X^2(df = 1, N = 104) = 4.125, p = 0.062; LR = 4.211, p = 0.04). See appendix figures 34 and 35 for the cross tabulation and statistical analysis.

Chi-squared tests of independence were also used to analyze for a potential relationship between the academic status of the respondent's hospital and support for ED based vaccination programs, as well as the belief in specific barriers to these programs. Seventeen (31.5%) of the 54 respondents from hospitals with no academic affiliation support ED based adult vaccination, while 20 (40%) of the 50 respondents from academic hospitals are in support of ED based vaccination programs. However, no statistically significant relationship between hospital academic status and support for ED based vaccination was found (X^2(df = 1, N = 104) = 0.822, p = 0.416). See appendix figures 36 and 37 for the cross tabulation and statistical analysis output for this comparison. Additionally, no statistically significant relationships between hospital academic status and belief in specific barriers to ED based vaccination. However, one analysis showed a trend towards statistical significance where 37 (68.5%) of respondents from non-academically affiliated hospitals agreed that vaccination is solely the job of primary care physicians, compared to 24 (48%) of respondents at academically affiliated hospitals (X^2(df = 2, N = 104) = 4.954, p = 0.084; LR = 5.003, p = 0.082). See appendix figures 38 and 39 for the respective cross tabulation and statistical output.

Association with Administration of Influenza Vaccine

Out of 104 respondents, 17 reported administering the influenza vaccine in the ED at a frequency of sometimes, usually, or always, while 87 reported administering it rarely or never. Of the 87 ED directors whose ED's do not administer the influenza vaccine, 25 (28.7%) support ED based adult vaccination programs. In comparison, 12 (70.6%) out of the 17 who do report some level of ED based influenza vaccine support routine adult immunization in the ED. The chi-squared test of independence demonstrated a statistically significant relationship between administration of some level of influenza vaccine in the ED and support for ED based routine vaccination programs (X^2(df = 1, N = 104) = 10.869, p = 0.002; LR = 10.764, p = 0.001). See appendix figures 40 and 41 for the respective cross tabulation and statistical output.

The data were analyzed for potential relationships between the administration of some level of influenza vaccinations in the ED and belief in specific barriers to immunization, of which three statistically significant relationships were found. Out of the 87 respondents who report their EDs do not administer the influenza vaccine on any significant level, 55 (63.2%) agreed with the statement that administration of routine adult vaccinations is the sole responsibility of primary care physicians, while 18 (20.7%) were neutral, and 14 (16.1%) disagreed. Comparatively, of the 17 respondents who do administer the influenza vaccine on a significant level, 6 (35.3%) agreed, 2 (11.8%) were neutral, and 9 (52.9%) disagreed (X^2(df = 2, N = 104) = 11.211, p = 0.004; LR = 9.625, p = 0.008). Seventy-eight (89.7%) of the respondents who do not administer the influenza vaccine agreed that nursing time constraints is a significant barrier to

ED based vaccination programs, while 7 (8.0%) were neutral, and 2 (2.3%) disagreed. In comparison, 13 (76.5%) of the respondents who administer some level of influenza vaccine in the ED agreed that nursing time constraints were a significant barrier, while 4 (23.5%) disagreed (X^2(df = 2, N = 104) = 12.761, p = 0.002; LR = 9.625, p = 0.008). Lastly, of the 87 ED directors who deny any significant level of influenza vaccine administration in their EDs, 13 (14.9%) agreed that medicolegal liability was a significant barrier to ED based adult vaccination programs, while 24 (27.6%) were neutral, and 50 (57.5%) disagreed. Conversely, none of the 17 respondents who report administering the influenza vaccine agreed with this potential barrier, 11 (64.7%) were neutral, and 6 (35.3%) disagreed (X^2(df = 2, N = 104) = 9.662, p = 0.008; LR = 10.926, p = 0.004). See appendix figures 42 and 43 for the cross tabulation and statistical output from the chi-squared tests of independence.

Association with Administration of Pneumococcal Vaccine

Of all the respondents, only 6 reported administering the pneumococcal vaccine in the ED at some significant level, while the remaining 98 reported rarely or never administering the vaccine. Of the six respondents who do administer the vaccine, 4 (66.7%) report supporting the administration of routine adult vaccinations in the ED, compared to 33 (33.7%) of the 98 respondents that do not administer the pneumococcal vaccine in the ED. The chi-square test of independence did not demonstrate a statistically significant difference between the two groups in relation to support for ED vaccination programs (X^2(df = 1, N = 104) = 2.685, p = 0.183). See appendix figures 45 and 46 for the respective cross tabulation and statistical output.

The data were analyzed for potential relationships between the administration of some level of pneumococcal vaccinations in the ED and belief in specific barriers to immunization, of which three statistically significant relationships were found. Out of the 98 respondents who report their EDs do not administer the pneumococcal vaccine on any significant level, 87 (88.8%) agree that the time constraint placed on nurses is a significant barrier to the administration of ED based routine vaccinations, compared to 7 (7.1%) who were neutral and 4 (4.1%) who disagreed. Of the 6 respondents who administer the pneumococcal vaccine on some level, 4 (66.7%) agreed that nurse time constraints were a significant barrier while the remaining 2 respondents (33.3%) disagreed. The chi-square test of independence showed a statistically significant relationship between these variables (X^2(df = 2, N = 104) = 9.13, p = 0.01; LR = 5.42, p = 0.066). Next, 78 (79.6%) respondents who report not administering the pneumococcal vaccine in the ED agree that the need for resources to store the vaccinations is a significant barrier to ED based vaccination programs, while 12 (12.2%) were neutral and 8 (8.2%) disagreed. Of the respondents who do administer the pneumococcal vaccine in the ED, only 1 (16.7%) agreed that the need for resources to store the vaccine is a significant barrier, while 2 (33.3%) were neutral and 3 (50%) disagreed (X^2(df = 2, N = 104) = 9.13, p = 0.01; LR = 5.42, p = 0.066). Lastly, of the 98 ED directors who do not administer the pneumococcal vaccine in their EDs, 49 (50%) agree that cost is a significant barrier to ED based vaccination programs, while 21 (21.4%) are neutral and 28 (28.6%) disagree. Of those that administer the pneumococcal vaccine, none agree that cost is a significant barrier, and 2 (33.3%) are neutral while 4 (66.7%) disagree that cost is a significant barrier to ED based vaccination (X^2(df = 2, N = 104) = 6.03, p = 0.049; LR = 8.18, p = 0.017). See appendix figures 46 and 47 for the cross tabulation and statistical output from the chi-squared tests of independence.

<u>Association with Support for ED Vaccination</u>

Of the 104 respondents, 37 support ED based vaccination programs and 67 do not support these programs. Comparing the responses of these two subgroups to the questions assessing agreement with various potential barriers for ED vaccination programs, six statistically significant relationships were found. First, of the 67 respondents who do not support ED vaccination, 47 (70.1%) agree that belief that vaccination is the sole job of primary care is a significant barrier, while 15 (22.4%) are neutral, and 5 (7.5%) disagree. This compares to the 37 respondents who do support ED vaccination, where 14 (37.8%) agree, 5 (13.5%) are neutral, and 18 (48.6%) disagree (X^2(df = 2, N = 104) = 23.5, p = 0.000; LR = 23.1, p = 0.000). Fifty-four (80.6%) of the respondents who do not support ED vaccination agree that physician time constraints are a significant barrier, while 7 (10.4%) are neutral and 6 (9%) disagree. In comparison, 20 (54.1%) of the 37 respondents who support ED vaccination agree that physician time constraints are a significant barrier, while 8 (21.6%) are neutral and 9 (24.3%) disagree (X^2(df = 2, N = 104) = 8.327, p = 0.016; LR = 8.116, p = 0.017). Sixty-five (97%) of those who do not support ED vaccination programs agree that nurse time constraints are a significant barrier, while 2 (3%) are neutral and none disagree. On the other hand, 26 (70.3%) of the respondents who support vaccination agree, along with 5 (13.5%) who are neutral and 6 (16.2%) who disagree (X^2(df = 2, N = 104) = 16.74, p = 0.000; LR = 18.14, p = 0.000). Fifty-six (83.6%) of the respondents who do not support ED vaccination agree that the need for additional resources to store vaccines is a significant barrier, while 6 (9%) are neutral and 5 (7.5%) disagree. In comparison, of the 37 respondents who support ED vaccination, 23 (62.2%) agree, 8 (21.6%) are neutral, and 6 (16.2%) disagree (X^2(df = 2, N = 104) = 6.007, p = 0.05; LR = 5.816, p = 0.055). Thirteen (19.4%) of the 67 respondents who do not support ED based vaccination agree that medicolegal liability is a significant barrier to ED vaccination programs, while 22 (32.8%) are neutral, and 32 (47.8%) disagree. On the other hand, of the 37 respondents who support ED vaccination, none agree that medicolegal liability is a significant barrier, while 13 (35.1%) are neutral, and 24 (64.9%) disagree (X^2(df = 2, N = 104) = 8.512, p = 0.014; LR = 12.73, p = 0.002).

Lastly, 20 (29.9%) of respondents who do not support ED vaccination agree that patients not understanding the need for vaccinations is a significant barrier to ED vaccination programs, while 32 (47.8%) are neutral, and 15 (22.4%) disagree. Comparatively, of the respondents who support ED vaccination, 11 (29.7%) agree, while 9 (24.3%) are neutral and 17 (45.9%) disagree (X^2(df = 2, N = 104) = 7.621, p = 0.022; LR = 7.68, p = 0.021). See appendix figures 48 and 49 for the full cross tabulation and statistical output.

Comments

ED directors were also solicited for comments pertaining to the topic of ED based routine adult vaccination against influenza and pneumococcus. Of the 104 respondent physicians, 35 chose to provide a comment. See appendix figure 50 for the aggregated collection of comments.

DISCUSSION

Current Practices

The collected data indicate that roughly 43% and 35% of ED directors work in hospitals that administer some level of ED based influenza and pneumococcal vaccinations respectively. These frequencies are unexpectedly high compared to anecdotal experience, but when the data are adjusted to exclude the responses where vaccinations were “rarely” given then the rates become 16.3% and 5.8% respectively. From the sampled population, these rates are likely to be the most accurate for the generalization to the population of EDs as a whole, and are correlated with antidotal experience of few EDs routinely administering vaccinations. These rates are still higher than expected, as it was hypothesized that less than 5% of the surveyed population would report any significant level of ED vaccination administration.

Looking at the average scores for the vaccine related practices, the majority of respondents indicate screening for influenza and pneumococcal vaccination status with a frequency averaging between “rarely” and “sometimes”, while the administration of these vaccines averages between “never” and “rarely”. The average response for referral to primary care was roughly “sometimes”. Thus, it can be extrapolated that the most common practice patterns are not screening for and not administering routine adult vaccinations, followed by screening for vaccination status and referral to primary care for vaccine administration. Unfortunately, referral to primary care from the ED for routine health has been seen to be largely ineffective at increasing vaccination rates. (83) Finally, the data analysis indicates there may be a relationship between working at a teaching hospital and the administration of the influenza vaccine, where EDs at teaching hospitals may be more likely to administer influenza vaccinations. The chi-squared test of independence resulted in a value of 4.125 ($p = 0.062$), which would likely become statistically significant with an increase in the power of the sample, while the analysis resulted in an LR of 4.211 ($p = 0.04$). There was no significant relationship between teaching hospital status and the administration of the pneumococcal vaccine.

Support for ED Vaccination

While the results estimating the frequency of ED based routine adult vaccination suggests that this practice is not very prevalent, the collected data indicate that 36% of respondents support ED based routine vaccination against influenza and pneumococcus. There are several possible explanations for this suggested discrepancy in the results. First, it simply may be the case that many more practitioners support providing these vaccinations, but simply do not routinely provide them due to an existing precedent of non-vaccination at their institution. While the survey respondents were composed of the ED physician leadership at the various surveyed hospitals, there may be significant opposition from other practitioners, administration, or existing precedents. As expected, the data analysis did show a strongly statistically significant relationship between supporting ED based vaccination and routinely administering the influenza vaccine. There is likely an experiential bias partially explaining these results, in that ED directors working at EDs that provide routine vaccinations have experienced these programs and can more adequately assess the effect the program has on the ED and the barriers or lack thereof to these programs. However, there were also many responses where the respondent indicated support for ED based vaccination, yet indicated that their ED does not provide a significant level of ED based vaccinations. The converse situation was also frequent, in which an ED director indicated opposition to ED vaccination, but indicated that their ED provided a significant number of ED based vaccinations. These apparent contradictions may be due to the autonomy for practice related decisions that clinicians often enjoy, in which some clinicians who support ED vaccination can choose to administer the vaccines while others may not. Finally, some ED directors may wish to administer vaccines but feel limited from doing so by the various potential barriers to vaccination they identify. For example, an ED director may wish to start an ED based vaccination program, but is precluded from doing so by lack of support from the nursing staff who believe that it would be a significant and unjustified burden to their clinical responsibilities. Overcoming perceived opposition from various groups in favor of an experiential learning approach, would likely be a significant but necessary challenge for any new ED based vaccination program.

Barriers to ED Vaccination

Of the potential barriers to ED based vaccination programs that were examined, the most significant barriers in order of significance are as follows: time pressure on nurses, patients inability to provide an accurate vaccination history, lack of needed resources to store vaccinations, time pressure on ED physicians, lack of an ED vaccination protocol, belief that vaccination is the sole job of primary care physicians, and the prohibitively high cost of a vaccination program.

Time pressure on nurses was the most significant barrier identified and likely represents the most limiting factor for the success of an ED based vaccination programs. Slobodkin et al found that ED vaccination related efforts took roughly four minutes per patient and were not associated with any delays in treatment. (51) However, EDs often experience an ebb and flow of patient volume and acuity, and while there may be times when vaccination is very feasible task for the nurses to engage in, there are clearly periods when the time pressure and acuity of patients prevents all but the efforts needed to treat the acute illness from being accomplished. Physician time pressure was also identified as a barrier to ED vaccination, although on average it was indicted as less significant barrier than time pressure on nurses. The physician time needed for vaccination related efforts is largely reduced by the use of standing orders for screening and administration of vaccines, which this study indicates are used on an infrequent basis with the average response being between "never" and "rarely". (86, 87) Not surprisingly, the data analysis indicated that there was a statistically significant relationship where respondents who oppose ED based vaccination and work in EDs that do not routinely provide influenza and pneumococcal vaccines were more likely to believe that nurse time constraints is a significant barrier to ED based vaccination programs. It was also found that respondents who do not support ED based vaccination were more likely to believe that physician time constraints are a significant barrier to vaccination programs as well. Taken together, it can be concluded that time constraints on staff performing vaccination related activities is believed to be the most significant barrier to implementing a successful ED based vaccination program. It was hypothesized that the hospitals with larger annual ED censuses would represent the busier EDs, where respondents would be more likely to believe that time constraints on nurses is a significant barrier to ED vaccination programs. While the results trended towards a significant relationship, the chi-squared test of independence did not show a statistically significant value at a 95% confidence interval ($X^2 = 4.190$, $p = 0.123$).

The second most important factor indicated as a barrier to ED based vaccination was the patient's inability to provide an accurate vaccination history. It can be inferred that the concern would be that patients would provide inaccurate histories that would cause patients who have already been vaccinated to be re-vaccinated or that patients who are un-vaccinated would remain un-vaccinated due to their inability to provide a clear history. This argument against ED vaccination is largely proven insignificant by the available literature. First, self-reported vaccination status as a tool to determine vaccination status has a sensitivity in the high 90's and a specificity in the 70's, with at least a 70% PPV as validated against the patient's medical record. (84, 85) Additionally, with a minimal risk for adverse effects from re-vaccination, the ACIP recommends acceptance of the patient self-report as proof of vaccination status. (7) An important area for future investigation would be to determine if ED based vaccination programs have a significant repeat vaccination rate and the effect this has on the cost-effectiveness of immunization programs.

The lack of needed resources to store vaccines was the third most important identified barrier to ED based vaccination programs. Additionally, an estimated high cost of ED vaccination programs was also identified as a significant barrier. The need for more funding and resources to provide a specific intervention is often a concern for the ED leadership and administration of a hospital. Administration of the influenza vaccine has been found to be cost-effective, and administration of the pneumococcal vaccine is one of the few interventions that has been found to be cost-saving. (14, 18, 69-71) However, these studies generally determine the cost to community as a whole as opposed to the institution providing the intervention. These studies would likely need to be conducted before hospital administration is ready to financially support an ED vaccination initiative. Several studies have determined that an ED vaccination program will likely reduce costly hospitalizations in patients that would return to the same hospital with a vaccine preventable illness. (50, 51, 54, 62) There was a statistically significant relationship between opposition to ED based vaccination programs and the belief that needing resources to store vaccines is a significant barrier to these programs. The data analysis also showed a statistically significant relationship in which respondents who routinely administered the pneumococcal vaccine were less likely to believe that needing additional resources to store vaccines or the cost of a vaccination program were significant barriers to ED based vaccination programs. As the influenza vaccine is administered more commonly in the ED compared to the pneumococcal vaccination, the few EDs that are routinely administering the pneumococcal vaccine likely have the most experience with ED based vaccination programs with the ability to analyze the financial ramifications of these programs.

Another important barrier to ED vaccination programs that was identified by respondents was the lack of an ED vaccination protocol. While this may prevent the administration of vaccines in some hospitals, it is unlikely that this is a critical road block to the establishment of ED vaccination programs in EDs with practitioners that support these programs.

The belief that vaccination is the sole responsibility of primary care providers was identified as one of the significant barriers to ED based vaccination programs. As expected, this is a common belief in respondents that do not support ED based vaccination. The chi-squared analysis identified a statistically significant relationship exists between supporting ED vaccination programs, administering the influenza vaccination on a significant level, and disagreeing with the statement that vaccination is the sole responsibility of primary care. The data analysis did not demonstrate any difference in the agreement or disagreement with this potential barrier to ED based vaccination between hospitals with different annual ED censuses or demographic characteristics. While an ideal healthcare system would place vaccination as the sole responsibility of primary care, it is widely known that many patients do not have primary care or inappropriately use the ED for primary care. Referral to primary care from the ED for vaccinations has proven to be largely unsuccessful. (83) Thus, in can be reasoned that one of three outcomes will occur: development of more successful methods for primary care referral, acceptance that patients will remain un-vaccinated despite medical indication, or acceptance of more ED physicians that some aspects of primary care need to be delivered in the ED for the current lack of a better alternative.

While the other tested barriers to ED based vaccination programs were not on average identified as significant barriers to vaccination, several interesting associations emerged from the data analysis. Respondents from hospitals with a smaller annual ED census, those that oppose ED based vaccination, and those that do not administer a significant level of influenza vaccination were all more likely to agree that medicolegal liability is a significant barrier to ED based vaccination programs. Additionally, respondents who oppose ED based vaccination and respondents from hospitals in densely populated areas were found to be statistically more likely to believe that their patients' inability to understand the need for vaccinations is a significant barrier to ED based vaccination programs. Finally, respondents working at hospitals with a smaller annual ED census were found to be statistically more likely to believe that their patients being up-to-date on vaccinations is a barrier to ED based vaccination programs.

Limitations & Future Directions

Because of the diverse nature of different ED settings and the differing experiences of the ED directors, it is difficult to use a simple survey to ascertain the complete spectrum of perceptions regarding a particular subject due to the large number of confounding variables. One limitation of this study is that it simplifies and categorizes the potential barriers to ED based vaccination into what was thought to be a largely comprehensive list of barriers; however, multiple permutations and extenuating circumstances likely exist within and beyond this list. For instance, ED directors may see time as a significant barrier to vaccination when the ED is crowded and busy, but might support vaccination efforts during off-peak periods. Additionally, vaccination may be deemed acceptable by certain ED directors in times of outbreaks, or for special patient populations. The study did not contain an appropriate mechanism to appropriately survey these possibilities. Additionally, this study was aimed at ascertaining the baseline perceptions of the ED directors regarding vaccination practices. A significant number of ED directors are likely not familiar with the existing literature regarding ED based vaccination, and the survey did not ascertain if the ED director had previously entertained the idea of offering ED based vaccinations. Examining the potential for shifting perceptions of ED directors in response to increased awareness of the existing literature regarding studies testing the feasibility of ED based vaccination is a potential avenue for future research.

Several flaws with the design of the study ended up limiting the applicability of the conclusions. While the study was aimed to determine a census opinion from the EDD in the states included in the study, the low response rate relative to the total number of EDDs resulted in an improperly randomized sample being drawn. Additionally, the response bias that is typically inherent in studies utilizing survey responses also limits the applicability of the results, as EDDs with very positive or very negative opinions are more likely to respond than other EDDs without similarly strong opinions. The combination of a poorly randomized sample from a limited region of the United States and an inherent response bias limits the generalization of the results to the entire population of EDDs.

The relatively small number of EDDs responding to the survey also significantly lowered the statistical power of the analysis. Aside from sampling a larger population of EDDs, another means to increase the statistical power is to use a study design incorporating a likelihood ratio as the primary means for testing statistically significant relationships. A survey design that does not necessitate collapsing certain data would facilitate also facilitate more power for data analysis. While roughly 26% of all adult ED directors in the northeast responded to the survey, the overall subject population is inherently small. ED directors were targeted for the study as this group was thought to represent the main “decision-makers” regarding ED medical practices. The study may have gained the needed power to bring out more subtle associations in the data if the target population had been expanded to include all EPs. The process of making any change made to ED medical policy would likely involve a collective majority of the ED physicians practicing at that site, as well as various other stake holders. An appropriate follow-up study could investigate the opinions of ED physicians at large, as well as other groups including nurses and administrative personnel. These other stake holder groups will likely have significantly different priorities than ED physicians, such as increased pressure for nurses and concerns about cost and cost savings for administrative personnel.

The study was useful for ascertaining an estimate of the current frequency of ED vaccination related practices. One limitation of this aspect of the study is that only qualitative estimates were sought (never, rarely, sometimes, often, and always) and no quantitative data were collected. This decision was based on the belief that ED directors would not know these specific frequencies without doing some needed research and that asking questions requiring significant work on behalf of the respondent ED director would significantly reduce the survey response rate. This study provided evidence that more influenza and pneumococcal vaccines are being administered than previously believed based on antidotal observation. However, more supporting evidence in regards to quantitative estimates is needed to solidify this conclusion.

Conclusions

Currently, ED based vaccination of adults against influenza and pneumococcus exists in various states, ranging from fully implemented programs to EDs with no vaccination efforts. The debate regarding the appropriateness of ED based vaccination will likely continue far into the future, as opinions about the role of public health concerns in the future of emergency medicine are diverse and often divergent. Vaccination is inherently a function of primary care physicians, yet in the current state of affairs, many ED patients go without primary care (or receive it in the ED). The medical community largely agrees that the high risk group of patients that frequents the ED needs to be vaccinated, but the best means to provide these vaccinations is far from consensus. There is no one size fits all solution and programs tailored specifically for various communities will likely have the greatest success. It is up to the medical leaders of these communities to determine the appropriate role for the ED in these efforts.

While an ideal health care system would employ primary care for all healthcare functions related to disease prevention, immunization included, it is clear that the current system is far from this ideal goal. While system level changes are needed to move closer to a more ideal operating model, in the interim the under vaccinated and at risk population of patients that frequent hospital emergency departments receive a sub-optimal level of preventive medical care. Emergency departments are frequently over-burdened by high volumes of patients and little resources; however, they are uniquely positioned to be arguably one of the most effective sites for reaching a large percentage of the at risk and under vaccinated population. Coordinated vaccination efforts utilizing public health resources and the ED setting would be a highly effective interim solution to close the gap between the CDC's vaccination goals and current vaccination levels. The long term solution rests in refining our health delivery systems and increasing the access to primary care.

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APPENDIX

Figure 1: Electronic survey administered to ED directors.

Page 1: Informed Consent

The following survey is part of an HIC approved study from the Department of Emergency Medicine at the Yale University School of Medicine (HIC #09070054971243). The purpose of the study is to evaluate the attitudes and perceptions of Emergency Department Directors regarding routine adult immunization against influenza and pneumococcal disease in the Emergency Department. The survey takes approximately 5 minutes to complete. All responses will remain anonymous. The four digit survey code supplied in the e-mail is used to track responses, and it will not be used to link specific survey data to particular hospitals or individuals. Your e-mail address and contact information will not be used for any other purposes other than the completion of this survey. Thank you in advance for your participation.

Please enter the 4 digit survey code supplied in the e-mail if you agree to participate in the study. ______

Page 2: Hospital & ED Information

Please complete the following questions regarding characteristics of your hospital/ED to the best of your ability.

1. Please characterize the demographic setting in which the hospital where you work is located.

- ☐ Rural
- ☐ Small Municipality
- ☐ Suburban
- ☐ Urban

2. Is the hospital at which you work considered public (government run or majority publicly funded) or private?

- ☐ Private
- ☐ Public (non-VA)
- ☐ VA
- ☐ Unsure

3. What is the teaching status of the hospital at which you work?

- ☐ Teaching/Academic
- ☐ Non-Teaching/Non-academic

4. Indicate the approximate combined annual patient census for all parts of your ED (ED patients per year) including any separate acute care section if such exists. Also, please indicate the number of in-patient beds of the hospital for which you work. (Answers should be in numerical digits without comas.)

Annual ED patient census: ____

Hospital In-patient beds: ____

Page 3: Immunization Practices in the ED

Please estimate the frequency of which the following activities occur in your ED for the treatment of non-admitted ED patients only.

	Never	Rarely	Sometimes	Usually	Always
Screening for influenza immunization status					
Screening for pneumococcal immunization status					
Administration of influenza vaccine when indicated					
Administration of pneumococcal vaccine when indicated					
Use of standing orders for administration of vaccines					
Education and referral to primary care provider for administration of needed immunizations					

Page 4: Barriers to ED Immunization

1. Do you support the administration of routine adult immunizations against influenza and pneumococcus in the emergency department?

- ☐ Yes
- ☐ No

2. Please indicate your level of agreement with the following factors as barriers to ED based routine adult immunization against influenza and pneumococcal disease specifically in regards to your ED and personal practice beliefs.

	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
Belief that routine immunization is the sole responsibility of primary care physicians					
Concern over time constraints on physicians					
Concern over time constraints on nurses					
Need for additional resources to store and administer immunizations					
Concern that patients are unable to provide an accurate immunization history					
Concern over adverse effects of immunizations					
Concern regarding medicolegal liability					
Concern over cost of providing routine immunizations					
Concern that patients do not want routine immunizations to be administered in the ED					
Concern that patients do not understand the need for routine immunizations					
Concern that influenza and pneumococcal vaccinations are ineffective					
Lack of structured immunization screening and administration protocol					
Belief that the patient population at your ED is mostly up-to-date on immunizations					

Page 5: Additional Comments

Please provide any additional comments you have regarding routine adult immunization against influenza and pneumococcal disease in the ED. (Optional)

____

Figure 2: Chi-Squared Tests of Independence

Variable 1	Variable 2
ED Census	Screening for Influen Vac
"	Screening for Pnemo Vac
"	Admin of Influen Vac
"	Admin of Pneumo Vac
"	Support for ED Vac
"	Barriers to Immunization
	- Job of Primary Care
	- Physician Time
	- Nurse Time
	- Resources to Store
	- Unable to Provide History
	- Adverse Effects
	- Mediolegal Liabilty
	- Cost
	- Pts Don't Want
	- Pts Don't Understand Need
	- Vaccine Ineffective
	- Lack of Protocol
	- Pts are Up to Date
Hospital Setting	Screening for Influen Vac
"	Screening for Pnemo Vac
"	Admin of Influen Vac
"	Admin of Pneumo Vac
"	Support for ED Vac
"	Barriers to Immunization
Academic Status	Screening for Influen Vac
"	Screening for Pnemo Vac
"	Admin of Influen Vac
"	Admin of Pneumo Vac
"	Support for ED Vac
"	Barriers to Immunization
Admin of Infleun Vac	Support for ED Vac
"	Barriers to Immunization
Admin of Pneumo Vac	Support for ED Vac
"	Barriers to Immunization

Figure 3: ED directors identified, contacted, and responded.

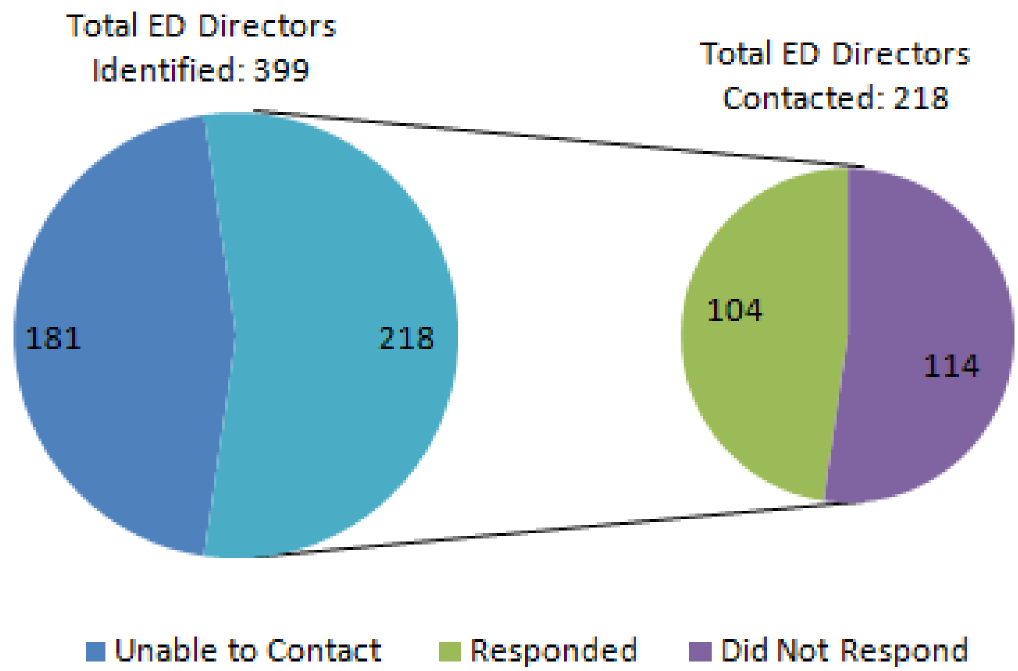


Figure 4: ED directors identified, contacted, and responded by state.

	Emergency Department Directors…			
	Identified	Contacted	Responded	Response Rate
CT	31	25	16	64.0%
MA	75	57	29	50.9%
MN	36	19	8	42.1%
NH	26	14	7	50.0%
NY	206	86	33	38.4%
RI	11	6	4	66.7%
VT	14	11	7	63.6%
Total	399	218	104	**47.7%**

Figure 5: State by state contribution to total collected results.

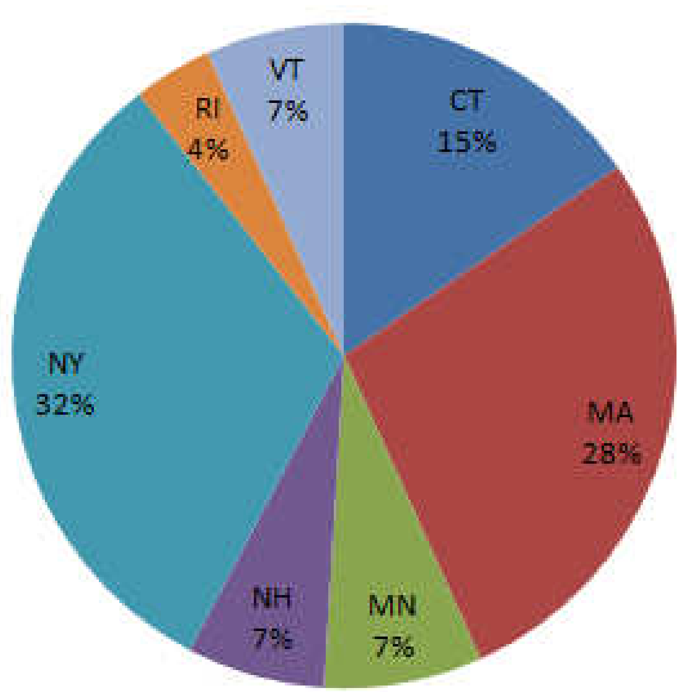


Figure 6: Respondent Hospital Setting (by frequency)

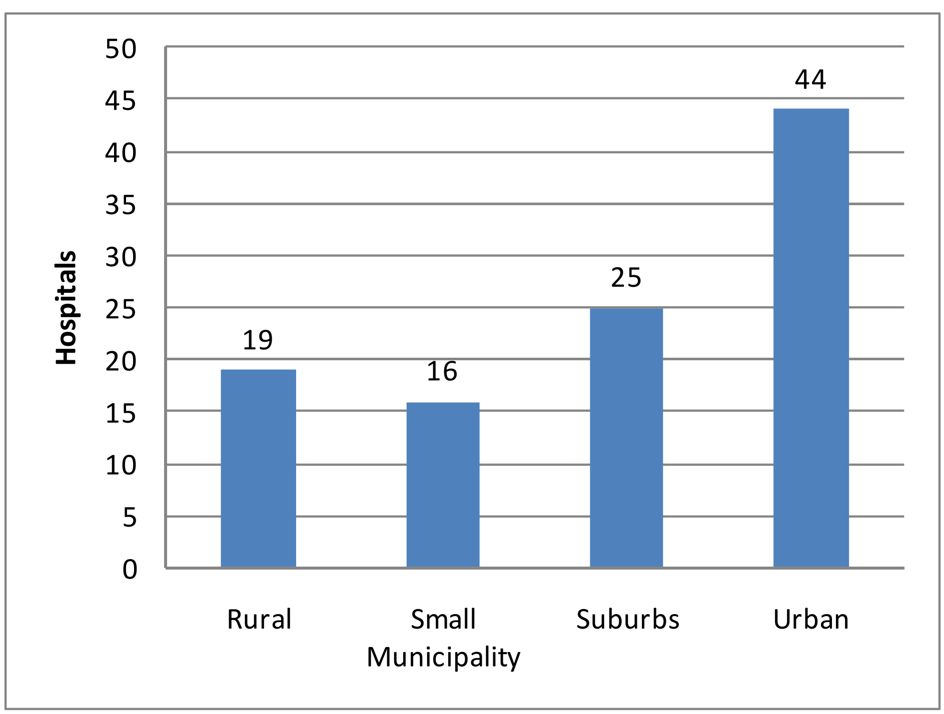


Figure 7: Respondent Hospital Setting (by percentage)

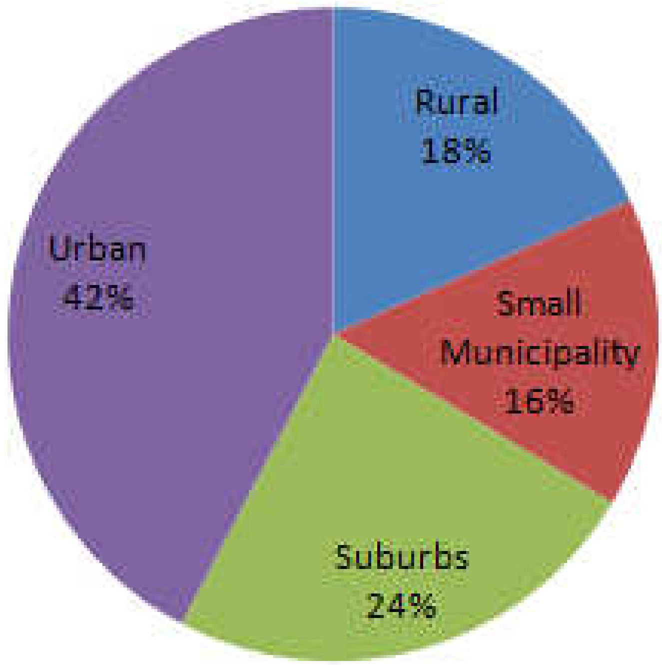
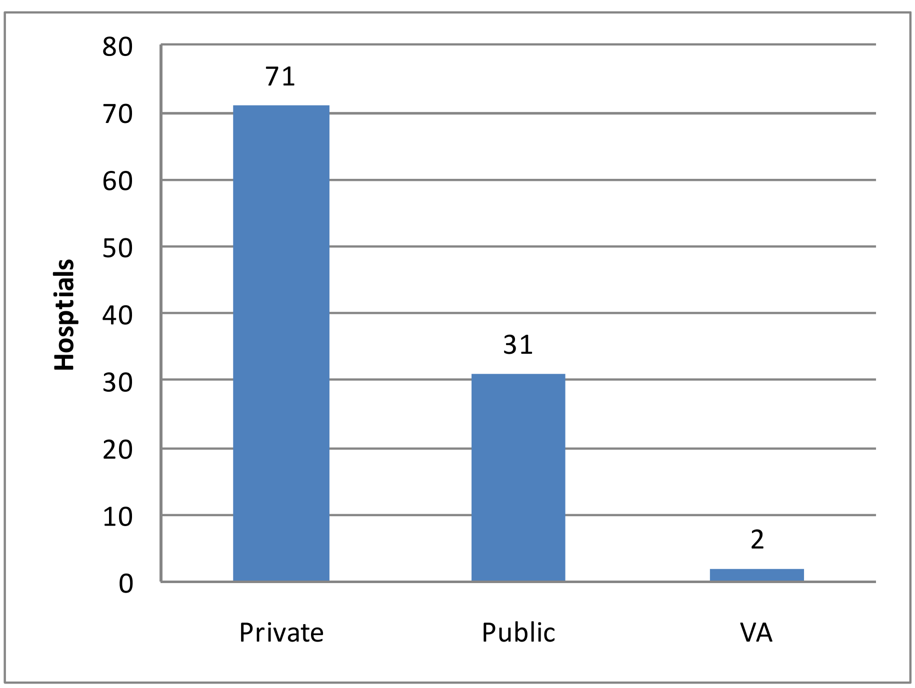
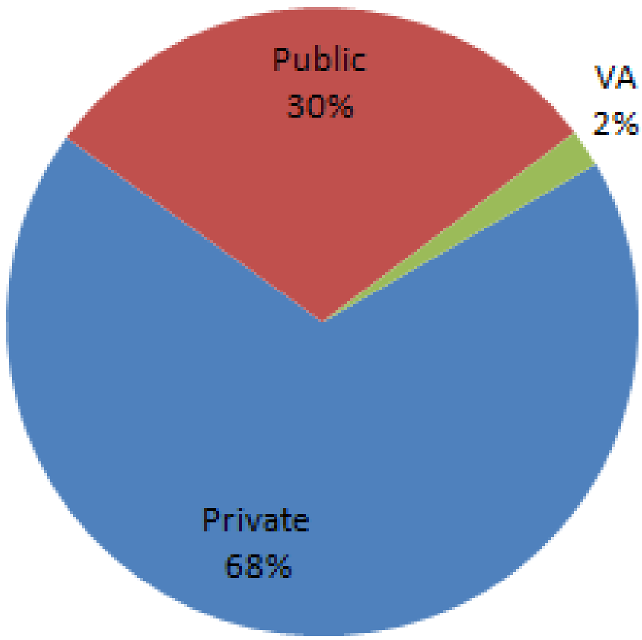


Figure 8: Respondent Hospital Funding (by frequency)



<u>Figure 9</u>: Respondent Hospital Funding (by percentage)



<u>Figure 10</u>: Respondent Hospital Academic Status (by percentage)

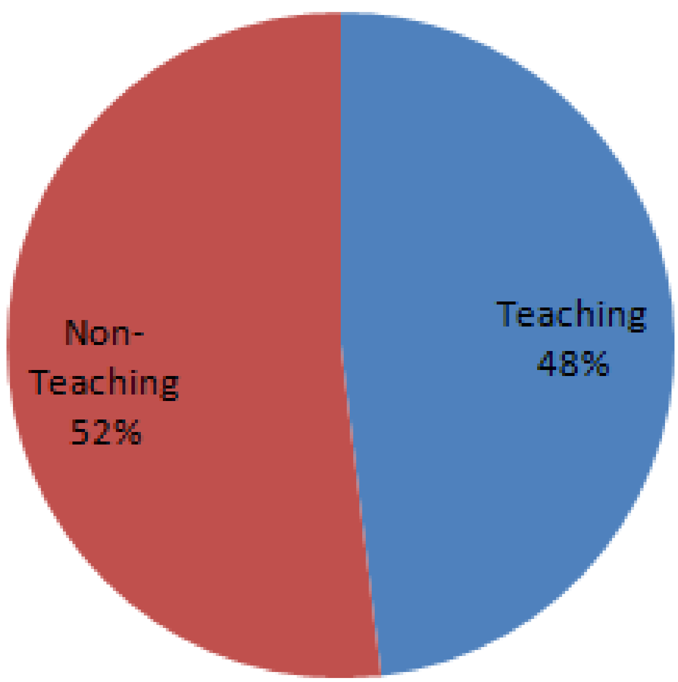


Figure 11: Relationship between Setting and Number of In-Patient Beds

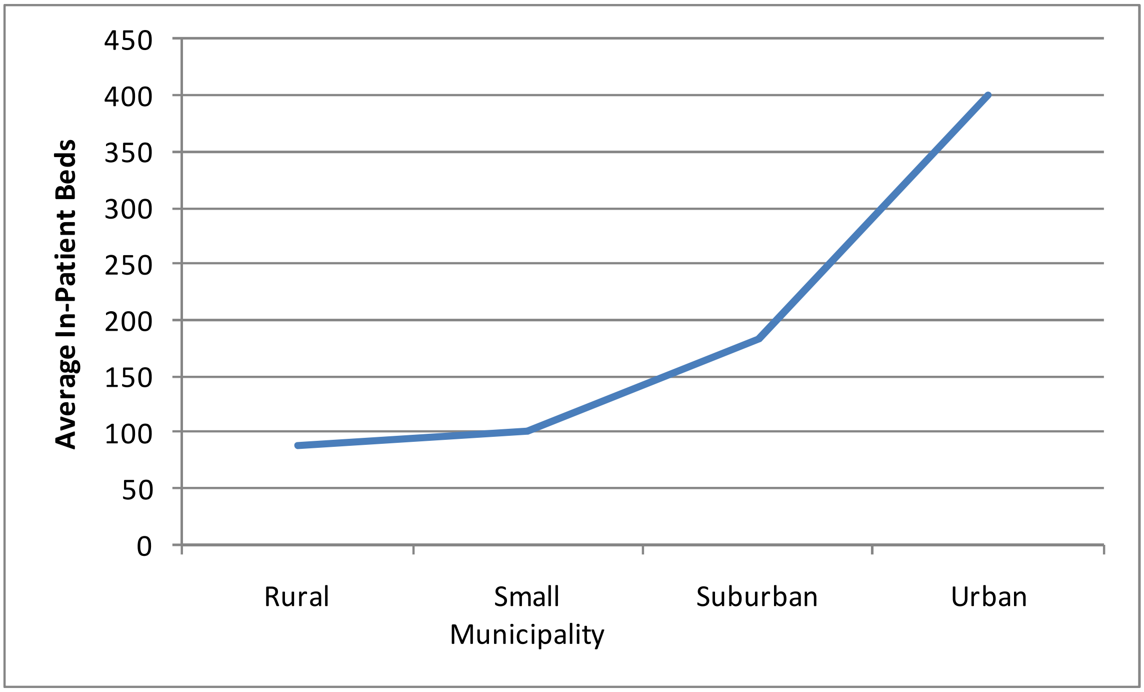


Figure 12: Relationship between Setting and Annual ED Census

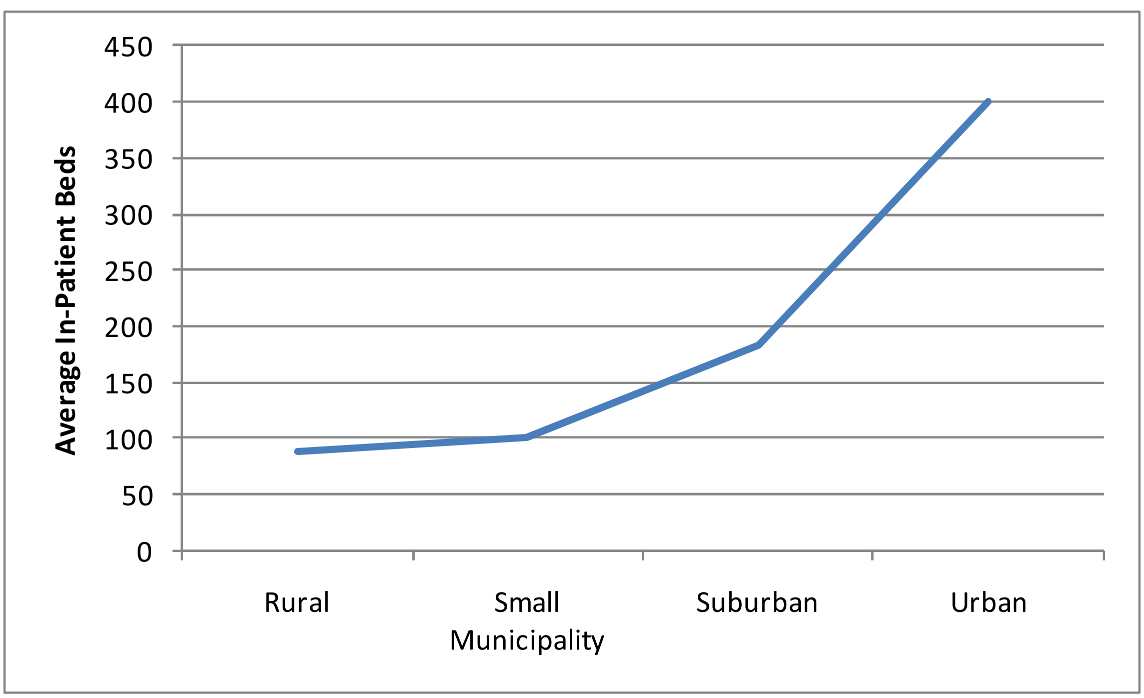


Figure 13: In-Patient Beds and ED Census by Teaching Status

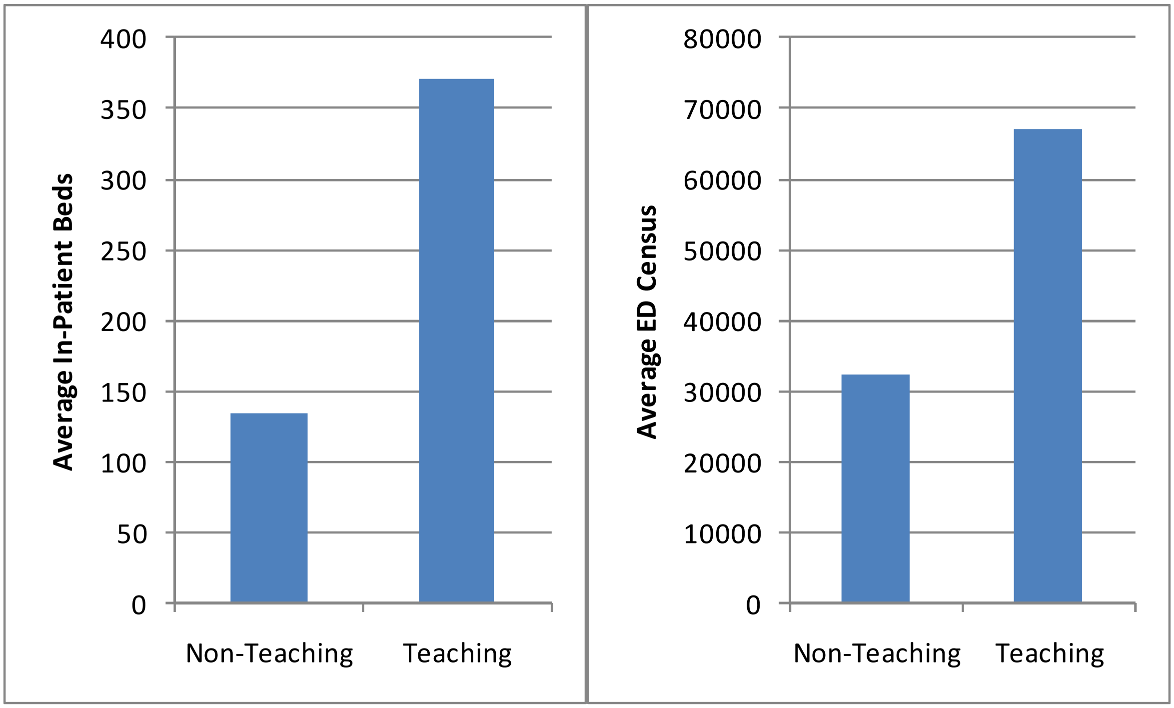


Figure 14: Immunization Practices (by frequency)

	Screening for Influenza	Screening for Pneumococcal	Administration of Influenza	Administration of Pneumococcal	Use of Standing Orders	Education and Referral to PCP
Never	24	32	59	68	81	10
Rarely	24	30	28	30	5	17
Sometimes	26	20	11	3	8	38
Usually	23	15	5	3	4	31
Always	7	7	1	0	6	8
Total	104	104	104	104	104	104

Figure 15: Immunization Practices (by percentage)

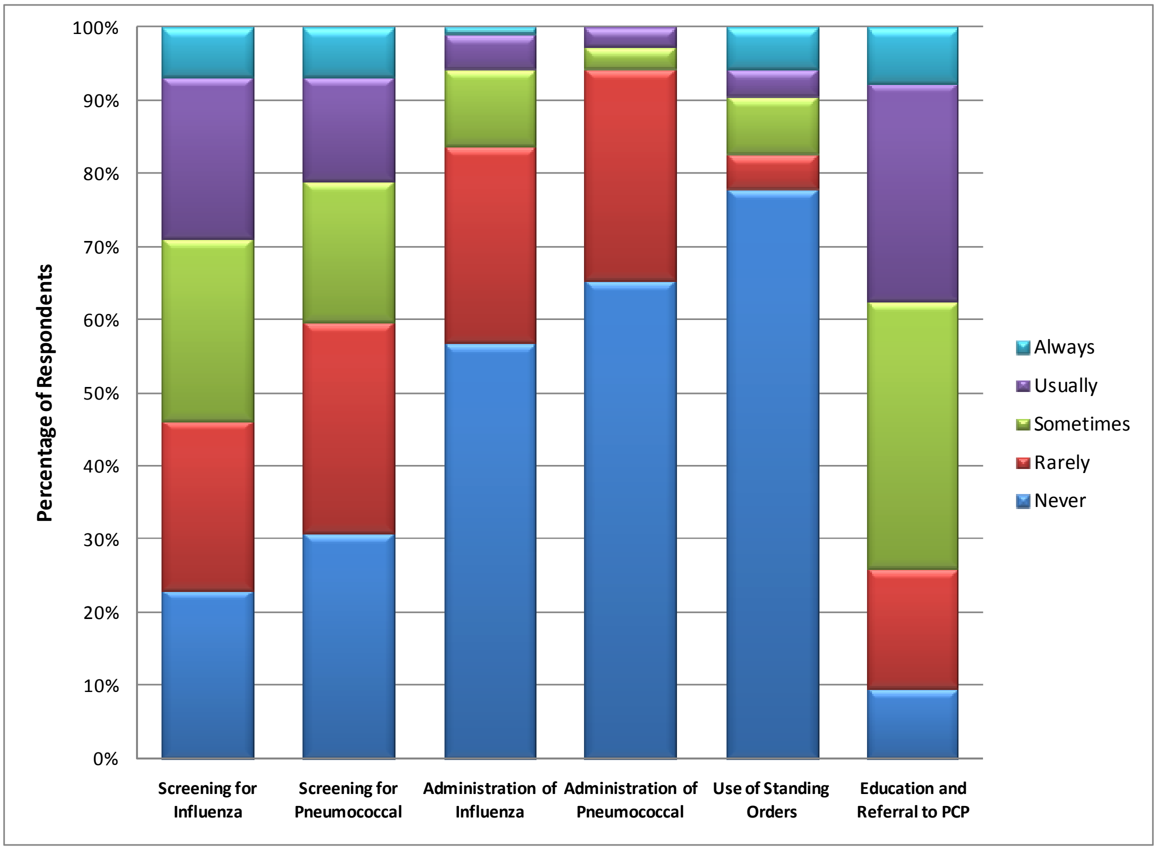


Figure 16: Average Responses for Immunization Practices

	Average	Standard Deviation	Corresponding Response
Screening for Influenza	2.66	1.24	Rarely to Sometimes
Screening for Pneumococcal	2.38	1.25	Rarely to Sometimes
Administration of Influenza	1.66	0.92	Never to Rarely
Administration of Pneumococcal	1.43	0.69	Never to Rarely
Use of Standing Orders	1.55	1.16	Never to Rarely
Education and Referral to PCP	3.10	1.08	Sometimes

Figure 17: Support for ED Based Routine Adult Vaccination

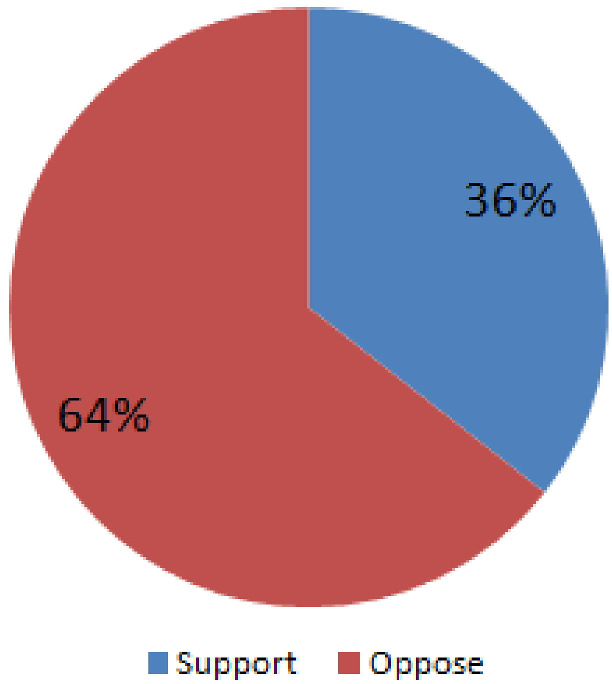


Figure 18: Evaluation of Potential Barriers to ED Based Routine Vaccination

Rank of Percieved Importance	Potential Barrier to ED Vaccination	Average Score	Std Dev
1	**Nurse Time**	**4.22**	**0.88**
2	**Unable to Provide History**	**3.94**	**0.99**
3	**Resources to Store**	**3.90**	**0.99**
4	**Physician Time**	**3.80**	**1.05**
5	**Lack of Protocol**	**3.46**	**1.19**
6	**Job of Primary Care**	**3.43**	**1.11**
7	**Cost**	**3.23**	**1.18**
8	Pts Don't Understand Need	2.94	0.93
9	Pts Don't Want	2.56	0.87
10	Adverse Effects	2.46	1.07
11	Medicolegal Liability	2.43	1.05
12	Up to Date	2.18	0.82
13	Vacc Ineffective	1.44	0.60

Figure 19: Average Scores of Potential Barriers to ED Vaccination

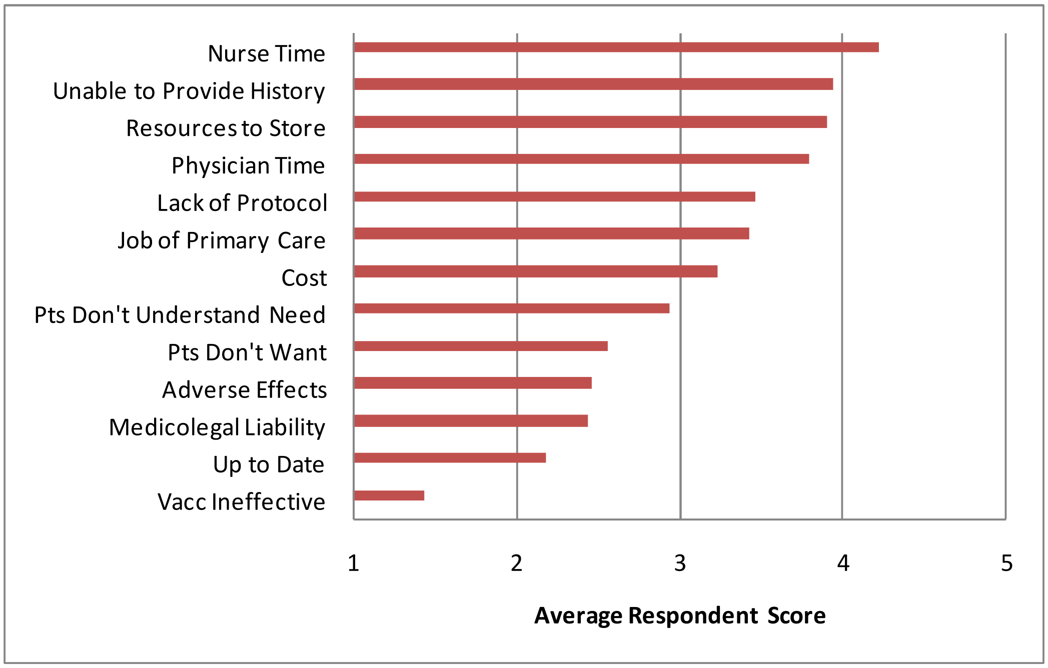


Figure 20: Percentage Distribution of Responses to Barriers to Vaccination

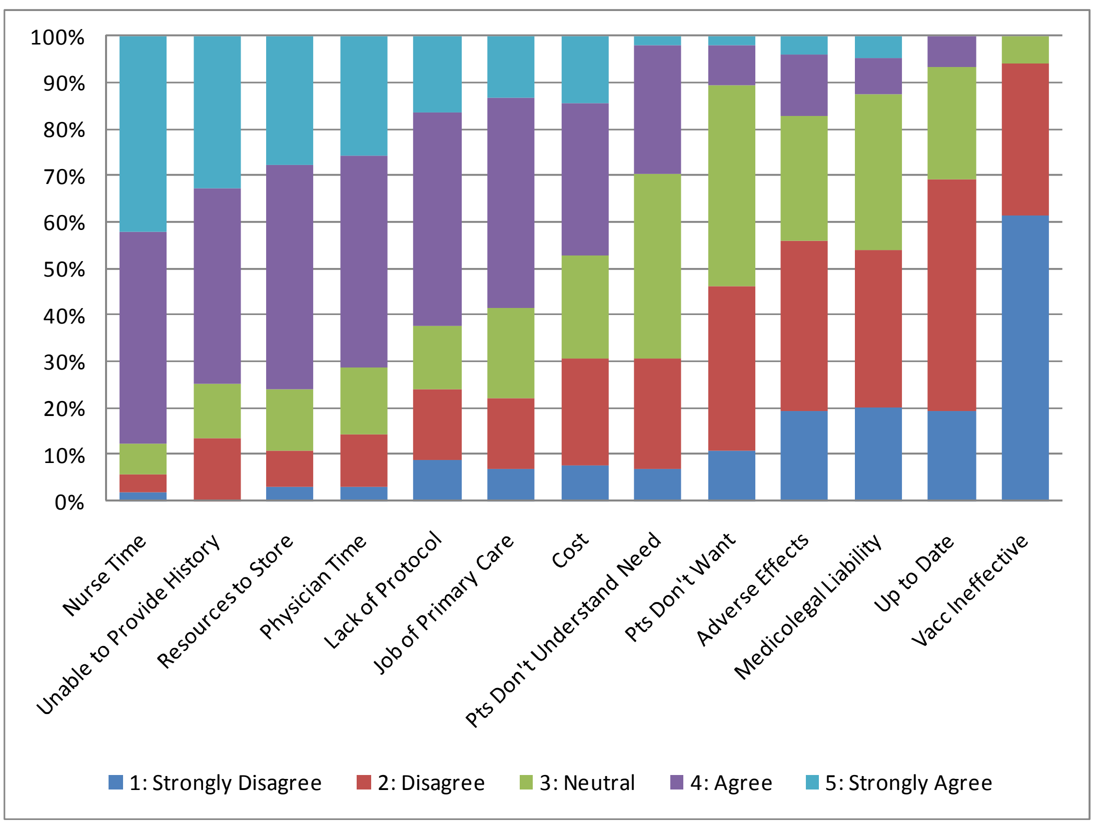


Figure 21: Cross tabulation: Setting v. Vaccination Practices

			Screening influenza		Total	Screening pneumococcal		Total	Administration influenza		Total	Administration pneumococcal		Total
			No	Yes		No	Yes		No	Yes		No	Yes	
Setting	Sparsely Populated	Count	18	17	35	20	15	35	30	5	35	34	1	35
		% within Setting	51.4%	48.6%	100.0%	57.1%	42.9%	100.0%	85.7%	14.3%	100.0%	97.1%	2.9%	100.0%
		% within Screening or Admin	37.5%	30.4%	33.7%	32.3%	35.7%	33.7%	34.5%	29.4%	33.7%	34.7%	16.7%	33.7%
		% of Total	17.3%	16.3%	33.7%	19.2%	14.4%	33.7%	28.8%	4.8%	33.7%	32.7%	1.0%	33.7%
	Densely Populated	Count	30	39	69	42	27	69	57	12	69	64	5	69
		% within Setting	43.5%	56.5%	100.0%	60.9%	39.1%	100.0%	82.6%	17.4%	100.0%	92.8%	7.2%	100.0%
		% within Screening or Admin	62.5%	69.6%	66.3%	67.7%	64.3%	66.3%	65.5%	70.6%	66.3%	65.3%	83.3%	66.3%
		% of Total	28.8%	37.5%	66.3%	40.4%	26.0%	66.3%	54.8%	11.5%	66.3%	61.5%	4.8%	66.3%
Total		Count	48	56	104	62	42	104	87	17	104	98	6	104
		% within Setting	46.2%	53.8%	100.0%	59.6%	40.4%	100.0%	83.7%	16.3%	100.0%	94.2%	5.8%	100.0%
		% within Screening or Admin	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	46.2%	53.8%	100.0%	59.6%	40.4%	100.0%	83.7%	16.3%	100.0%	94.2%	5.8%	100.0%

Figure 22: Chi-Square analysis: Setting v. Vaccination Practices

	Test	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Setting v. Screen for Influenza Vacc	Pearson Chi-Square	0.591	1	0.442		
	Continuity Correction	0.314	1	0.575		
	Likelihood Ratio	0.590	1	0.442		
	Fisher's Exact Test				0.533	0.287
	Linear-by-Linear Assoc	0.585	1	0.444		
	N of Valid Cases	104				
Setting v. Screen for Pneumo Vacc	Pearson Chi-Square	0.134	1	0.714		
	Continuity Correction	0.024	1	0.877		
	Likelihood Ratio	0.134	1	0.715		
	Fisher's Exact Test				0.833	0.437
	Linear-by-Linear Assoc	0.133	1	0.716		
	N of Valid Cases	104				
Setting v. Admin of Influenza Vacc	Pearson Chi-Square	0.164	1	0.686		
	Continuity Correction	0.015	1	0.901		
	Likelihood Ratio	0.167	1	0.683		
	Fisher's Exact Test				0.785	0.459
	Linear-by-Linear Assoc	0.162	1	0.687		
	N of Valid Cases	104				
Setting v. Admin of Pneumo Vacc	Pearson Chi-Square	0.823	1	0.364		
	Continuity Correction	0.214	1	0.644		
	Likelihood Ratio	0.921	1	0.337		
	Fisher's Exact Test				0.661	0.338
	Linear-by-Linear Assoc	0.815	1	0.367		
	N of Valid Cases	104				

Figure 23: Cross tabulation: Setting v. Support for ED Vaccination

			Support		Total
			No	Yes	
Setting	Sparsely Populated	Count	23	12	35
		% within Setting	65.7%	34.3%	100.0%
		% within Support	34.3%	32.4%	33.7%
		% of Total	22.1%	11.5%	33.7%
	Densely Populated	Count	44	25	69
		% within Setting	63.8%	36.2%	100.0%
		% within Support	65.7%	67.6%	66.3%
		% of Total	42.3%	24.0%	66.3%
Total		Count	67	37	104
		% within Setting	64.4%	35.6%	100.0%
		% within Support	100.0%	100.0%	100.0%
		% of Total	64.4%	35.6%	100.0%

Figure 24: Chi-Square analysis: Setting v. Support for ED Vaccination

Test	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	0.038	1	0.845		
Continuity Correction	0	1	1		
Likelihood Ratio	0.038	1	0.844		
Fisher's Exact Test				1	0.511
Linear-by-Linear Assoc	0.038	1	0.845		
N of Valid Cases	104				

Figure 25: Cross tabulation: Setting v. Barriers to ED Vaccination

			Job of Primary Care			Total	Physician Time Constraint			Total	Nurse Time Constraint			Total	Need Resources to Store			Total	Pts Unable to Provide Hx			Total
			Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree	
Setting	Sparsely Populated	Count	7	7	21	35	7	6	22	35	2	3	30	35	6	3	26	35	4	4	27	35
		% within Setting	20.0%	20.0%	60.0%	100.0%	20.0%	17.1%	62.9%	100.0%	5.7%	8.6%	85.7%	100.0%	17.1%	8.6%	74.3%	100.0%	11.4%	11.4%	77.1%	100.0%
		% within Potential Barrier	30.4%	35.0%	34.4%	33.7%	46.7%	40.0%	29.7%	33.7%	33.3%	42.9%	33.0%	33.7%	54.5%	21.4%	32.9%	33.7%	28.6%	33.3%	34.6%	33.7%
		% of Total	6.7%	6.7%	20.2%	33.7%	6.7%	5.8%	21.2%	33.7%	1.9%	2.9%	28.8%	33.7%	5.8%	2.9%	25.0%	33.7%	3.8%	3.8%	26.0%	33.7%
	Densely Populated	Count	16	13	40	69	8	9	52	69	4	4	61	69	5	11	53	69	10	8	51	69
		% within Setting	23.2%	18.8%	58.0%	100.0%	11.6%	13.0%	75.4%	100.0%	5.8%	5.8%	88.4%	100.0%	7.2%	15.9%	76.8%	100.0%	14.5%	11.6%	73.9%	100.0%
		% within Potential Barrier	69.6%	65.0%	65.6%	66.3%	53.3%	60.0%	70.3%	66.3%	66.7%	57.1%	67.0%	66.3%	45.5%	78.6%	67.1%	66.3%	71.4%	66.7%	65.4%	66.3%
		% of Total	15.4%	12.5%	38.5%	66.3%	7.7%	8.7%	50.0%	66.3%	3.8%	3.8%	58.7%	66.3%	4.8%	10.6%	51.0%	66.3%	9.6%	7.7%	49.0%	66.3%
Total		Count	23	20	61	104	15	15	74	104	6	7	91	104	11	14	79	104	14	12	78	104
		% within Setting	22.1%	19.2%	58.7%	100.0%	14.4%	14.4%	71.2%	100.0%	5.8%	6.7%	87.5%	100.0%	10.6%	13.5%	76.0%	100.0%	13.5%	11.5%	75.0%	100.0%
		% within Potential Barrier	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	22.1%	19.2%	58.7%	100.0%	14.4%	14.4%	71.2%	100.0%	5.8%	6.7%	87.5%	100.0%	10.6%	13.5%	76.0%	100.0%	13.5%	11.5%	75.0%	100.0%

			Adverse Effects			Total	Medicolegal Liability			Total	Cost is Prohibitive			Total	Pts Don't Want			Total	Pts Don't Understand Need			Total
			Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree	
Setting	Sparsely Populated	Count	20	8	7	35	19	10	6	35	10	6	19	35	16	15	4	35	9	9	17	35
		% within Setting	57.1%	22.9%	20.0%	100.0%	54.3%	28.6%	17.1%	100.0%	28.6%	17.1%	54.3%	100.0%	45.7%	42.9%	11.4%	100.0%	25.7%	25.7%	48.6%	100.0%
		% within Potential Barrier	34.5%	28.6%	38.9%	33.7%	33.9%	28.6%	46.2%	33.7%	31.3%	26.1%	38.8%	33.7%	33.3%	33.3%	36.4%	33.7%	28.1%	22.0%	54.8%	33.7%
		% of Total	19.2%	7.7%	6.7%	33.7%	18.3%	9.6%	5.8%	33.7%	9.6%	5.8%	18.3%	33.7%	15.4%	14.4%	3.8%	33.7%	8.7%	8.7%	16.3%	33.7%
	Densely Populated	Count	38	20	11	69	37	25	7	69	22	17	30	69	32	30	7	69	23	32	14	69
		% within Setting	55.1%	29.0%	15.9%	100.0%	53.6%	36.2%	10.1%	100.0%	31.9%	24.6%	43.5%	100.0%	46.4%	43.5%	10.1%	100.0%	33.3%	46.4%	20.3%	100.0%
		% within Potential Barrier	65.5%	71.4%	61.1%	66.3%	66.1%	71.4%	53.8%	66.3%	68.8%	73.9%	61.2%	66.3%	66.7%	66.7%	63.6%	66.3%	71.9%	78.0%	45.2%	66.3%
		% of Total	36.5%	19.2%	10.6%	66.3%	35.6%	24.0%	6.7%	66.3%	21.2%	16.3%	28.8%	66.3%	30.8%	28.8%	6.7%	66.3%	22.1%	30.8%	13.5%	66.3%
Total		Count	58	28	18	104	56	35	13	104	32	23	49	104	48	45	11	104	32	41	31	104
		% within Setting	55.8%	26.9%	17.3%	100.0%	53.8%	33.7%	12.5%	100.0%	30.8%	22.1%	47.1%	100.0%	46.2%	43.3%	10.6%	100.0%	30.8%	39.4%	29.8%	100.0%
		% within Potential Barrier	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	55.8%	26.9%	17.3%	100.0%	53.8%	33.7%	12.5%	100.0%	30.8%	22.1%	47.1%	100.0%	46.2%	43.3%	10.6%	100.0%	30.8%	39.4%	29.8%	100.0%

			Believe Vacc is Ineffective			Total	Lack of Protocol			Total	Pts are Up-to-Date			Total
			Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree	
Setting	Sparsely Populated	Count	32	3	0	35	7	4	24	35	26	6	3	35
		% within Setting	91.4%	8.6%	0.0%	100.0%	20.0%	11.4%	68.6%	100.0%	74.3%	17.1%	8.6%	100.0%
		% within Potential Barrier	32.7%	50.0%	0.0%	33.7%	28.0%	28.6%	36.9%	33.7%	36.1%	24.0%	42.9%	33.7%
		% of Total	30.8%	2.9%	0.0%	33.7%	6.7%	3.8%	23.1%	33.7%	25.0%	5.8%	2.9%	33.7%
	Densely Populated	Count	66	3	0	69	18	10	41	69	46	19	4	69
		% within Setting	95.7%	4.3%	0.0%	100.0%	26.1%	14.5%	59.4%	100.0%	66.7%	27.5%	5.8%	100.0%
		% within Potential Barrier	67.3%	50.0%	0.0%	66.3%	72.0%	71.4%	63.1%	66.3%	63.9%	76.0%	57.1%	66.3%
		% of Total	63.5%	2.9%	0.0%	66.3%	17.3%	9.6%	39.4%	66.3%	44.2%	18.3%	3.8%	66.3%
Total		Count	98	6	0	104	25	14	65	104	72	25	7	104
		% within Setting	94.2%	5.8%	0.0%	100.0%	24.0%	13.5%	62.5%	100.0%	69.2%	24.0%	6.7%	100.0%
		% within Potential Barrier	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	94.2%	5.8%	0.0%	100.0%	24.0%	13.5%	62.5%	100.0%	69.2%	24.0%	6.7%	100.0%

Figure 26: Chi-Square analysis: Setting v. Barriers to ED Vaccination

Setting v.	Test	Value	df	Asymp. Sig. (2-sided)
Job of Primary Care	Pearson Chi-Square	0.139	2	0.933
	Likelihood Ratio	0.141	2	0.932
	Linear-by-Linear	0.093	1	0.761
	N of Valid Cases	104		
Physician Time Constraint	Pearson Chi-Square	1.918	2	0.383
	Likelihood Ratio	1.868	2	0.393
	Linear-by-Linear	1.883	1	0.17
	N of Valid Cases	104		
Nurse Time Constraint	Pearson Chi-Square	0.285	2	0.867
	Likelihood Ratio	0.275	2	0.871
	Linear-by-Linear	0.059	1	0.808
	N of Valid Cases	104		
Need Resources to Store	Pearson Chi-Square	3.107	2	0.212
	Likelihood Ratio	3.045	2	0.218
	Linear-by-Linear	0.81	1	0.368
	N of Valid Cases	104		
Pts Unable to Provide Hx	Pearson Chi-Square	0.195	2	0.907
	Likelihood Ratio	0.199	2	0.905
	Linear-by-Linear	0.18	1	0.671
	N of Valid Cases	104		
Adverse Effects	Pearson Chi-Square	0.563	2	0.755
	Likelihood Ratio	0.567	2	0.753
	Linear-by-Linear	0.016	1	0.901
	N of Valid Cases	104		

Setting v.	Test	Value	df	Asymp. Sig. (2-sided)
Medicolegal Liability	Pearson Chi-Square	1.317	2	0.518
	Likelihood Ratio	1.286	2	0.526
	Linear-by-Linear	0.187	1	0.665
	N of Valid Cases	104		
Cost is Prohibitive	Pearson Chi-Square	1.248	2	0.536
	Likelihood Ratio	1.262	2	0.532
	Linear-by-Linear	0.61	1	0.435
	N of Valid Cases	104		
Pts Don't Want	Pearson Chi-Square	0.04	2	0.98
	Likelihood Ratio	0.04	2	0.98
	Linear-by-Linear	0.02	1	0.888
	N of Valid Cases	104		
Pts Don't Understand Need	Pearson Chi-Square	9.184	2	0.01
	Likelihood Ratio	8.988	2	0.011
	Linear-by-Linear	4.894	1	0.027
	N of Valid Cases	104		
Lack of Protocol	Pearson Chi-Square	0.831	2	0.66
	Likelihood Ratio	0.842	2	0.656
	Linear-by-Linear	0.744	1	0.388
	N of Valid Cases	104		
Pts Are Up-to-Date	Pearson Chi-Square	1.504	2	0.471
	Likelihood Ratio	1.554	2	0.46
	Linear-by-Linear	0.146	1	0.702
	N of Valid Cases	104		

Setting v.	Test	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Believe Vaccine is Ineffective	Pearson Chi-Square	0.762	1	0.383		
	Continuity Correction	0.183	1	0.669		
	Likelihood Ratio	0.722	1	0.395		
	Fisher's Exact Test				0.402	0.323
	Linear-by-Linear	0.755	1	0.385		
	N of Valid Cases	104				

Figure 27: Comparison of ED Annual Census and In-Patient Beds

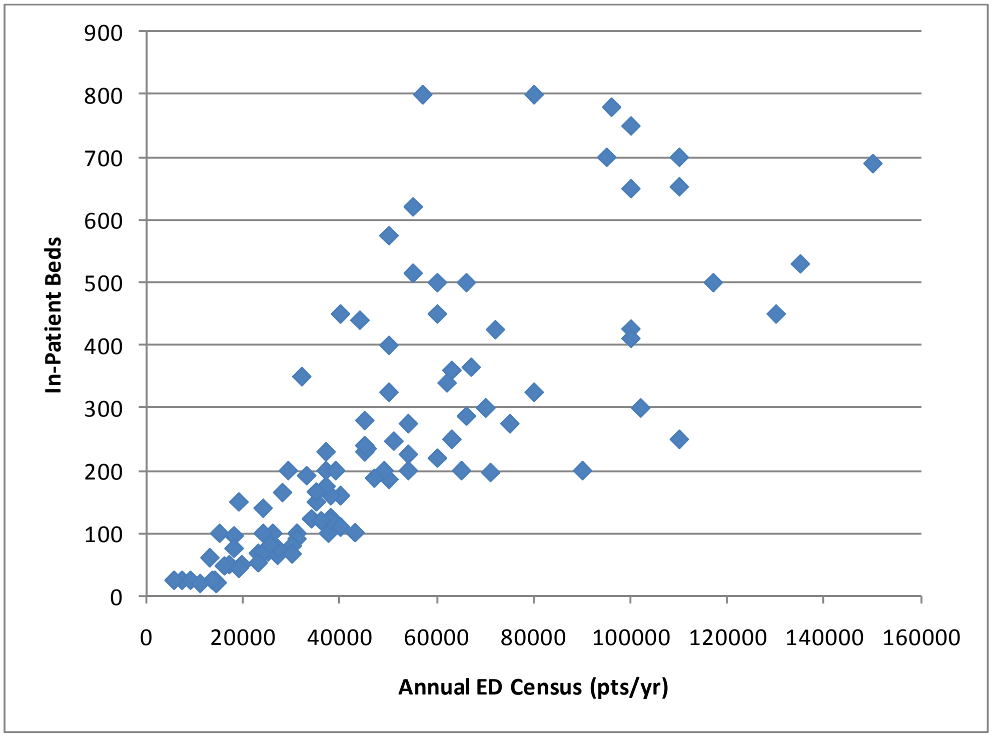


Figure 28: Cross tabulation: ED Census v. Vaccination Practices

			Screening influenza		Total	Screening pneumococcal		Total	Administration influenza		Total	Administration pneumococcal		Total
			No	Yes		No	Yes		No	Yes		No	Yes	
Annual ED Census (pts/yr)	Small (≤ 40,000)	Count	25	28	53	33	20	53	44	9	53	50	3	53
		% within ED Census	47.2%	52.8%	100.0%	62.3%	37.7%	100.0%	83.0%	17.0%	100.0%	94.3%	5.7%	100.0%
		% within Screening or Admin	52.1%	50.0%	51.0%	53.2%	47.6%	51.0%	50.6%	52.9%	51.0%	51.0%	50.0%	51.0%
		% of Total	24.0%	26.9%	51.0%	31.7%	19.2%	51.0%	42.3%	8.7%	51.0%	48.1%	2.9%	51.0%
	Large (> 40,000)	Count	23	28	51	29	22	51	43	8	51	48	3	51
		% within ED Census	45.1%	54.9%	100.0%	56.9%	43.1%	100.0%	84.3%	15.7%	100.0%	94.1%	5.9%	100.0%
		% within Screening or Admin	47.9%	50.0%	49.0%	46.8%	52.4%	49.0%	49.4%	47.1%	49.0%	49.0%	50.0%	49.0%
		% of Total	22.1%	26.9%	49.0%	27.9%	21.2%	49.0%	41.3%	7.7%	49.0%	46.2%	2.9%	49.0%
Total		Count	48	56	104	62	42	104	87	17	104	98	6	104
		% within ED Census	46.2%	53.8%	100.0%	59.6%	40.4%	100.0%	83.7%	16.3%	100.0%	94.2%	5.8%	100.0%
		% within Screening or Admin	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	46.2%	53.8%	100.0%	59.6%	40.4%	100.0%	83.7%	16.3%	100.0%	94.2%	5.8%	100.0%

Figure 29: Chi-Square analysis: ED Census v. Vaccination Practices

	Test	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
ED Census v. Screen for Influenza Vacc	Pearson Chi-Square	0.045	1	0.832		
	Continuity Correction	0	1	0.988		
	Likelihood Ratio	0.045	1	0.832		
	Fisher's Exact Test				0.847	0.494
	Linear-by-Linear Assoc	0.044	1	0.833		
	N of Valid Cases	104				
ED Census v. Screen for Pneumo Vacc	Pearson Chi-Square	0.315	1	0.575		
	Continuity Correction	0.131	1	0.718		
	Likelihood Ratio	0.315	1	0.575		
	Fisher's Exact Test				0.69	0.359
	Linear-by-Linear Assoc	0.312	1	0.576		
	N of Valid Cases	104				
ED Census v. Admin of Influenza Vacc	Pearson Chi-Square	0.032	1	0.858		
	Continuity Correction	0	1	1		
	Likelihood Ratio	0.032	1	0.858		
	Fisher's Exact Test				1	0.535
	Linear-by-Linear Assoc	0.032	1	0.859		
	N of Valid Cases	104				
ED Census v. Admin of Pneumo Vacc	Pearson Chi-Square	0.002	1	0.961		
	Continuity Correction	0	1	1		
	Likelihood Ratio	0.002	1	0.961		
	Fisher's Exact Test				1	0.642
	Linear-by-Linear Assoc	0.002	1	0.961		
	N of Valid Cases	104				

Figure 30: Cross tabulation: ED Census v. Support for ED Vaccination

			Support		Total
			No	Yes	
Annual ED Census (pts/yr)	Small (≤ 40,000)	Count	32	21	53
		% within ED Census	60.4%	39.6%	100.0%
		% within Support	47.8%	56.8%	51.0%
		% of Total	30.8%	20.2%	51.0%
	Large (> 40,000)	Count	35	16	51
		% within ED Census	68.6%	31.4%	100.0%
		% within Support	52.2%	43.2%	49.0%
		% of Total	33.7%	15.4%	49.0%
Total		Count	67	37	104
		% within ED Census	64.4%	35.6%	100.0%
		% within Support	100.0%	100.0%	100.0%
		% of Total	64.4%	35.6%	100.0%

Figure 31: Chi-Square analysis: ED Census v. Support for ED Vaccination

Test	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	0.77	1	0.38		
Continuity Correction	0.45	1	0.501		
Likelihood Ratio	0.77	1	0.379		
Fisher's Exact Test				0.418	0.25
Linear-by-Linear Assoc	0.76	1	0.382		
N of Valid Cases	104				

Figure 32: Cross tabulation: ED Census v. Barriers to ED Vaccination

		Job of Primary Care			Total	Physician Time Constraint			Total	Nurse Time Constraint			Total	Need Resources to Store			Total	Pts Unable to Provide Hx			Total
		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree	
Annual ED Census (pts/yr): Small (≤ 40,000)	Count	11	10	32	53	11	7	35	53	5	5	43	53	7	7	39	53	6	6	41	53
	% within ED Census	20.8%	18.9%	60.4%	100.0%	20.8%	13.2%	66.0%	100.0%	9.4%	9.4%	81.1%	100.0%	13.2%	13.2%	73.6%	100.0%	11.3%	11.3%	77.4%	100.0%
	% within Barrier	47.8%	50.0%	52.5%	51.0%	73.3%	46.7%	47.3%	51.0%	83.3%	71.4%	47.3%	51.0%	63.6%	50.0%	49.4%	51.0%	42.9%	50.0%	52.6%	51.0%
	% of Total	10.6%	9.6%	30.8%	51.0%	10.6%	6.7%	33.7%	51.0%	4.8%	4.8%	41.3%	51.0%	6.7%	6.7%	37.5%	51.0%	5.8%	5.8%	39.4%	51.0%
Annual ED Census (pts/yr): Large (> 40,000)	Count	12	10	29	51	4	8	39	51	1	2	48	51	4	7	40	51	8	6	37	51
	% within ED Census	23.5%	19.6%	56.9%	100.0%	7.8%	15.7%	76.5%	100.0%	2.0%	3.9%	94.1%	100.0%	7.8%	13.7%	78.4%	100.0%	15.7%	11.8%	72.5%	100.0%
	% within Barrier	52.2%	50.0%	47.5%	49.0%	26.7%	53.3%	52.7%	49.0%	16.7%	28.6%	52.7%	49.0%	36.4%	50.0%	50.6%	49.0%	57.1%	50.0%	47.4%	49.0%
	% of Total	11.5%	9.6%	27.9%	49.0%	3.8%	7.7%	37.5%	49.0%	1.0%	1.9%	46.2%	49.0%	3.8%	6.7%	38.5%	49.0%	7.7%	5.8%	35.6%	49.0%
Total	Count	23	20	61	104	15	15	74	104	6	7	91	104	11	14	79	104	14	12	78	104
	% within ED Census	22.1%	19.2%	58.7%	100.0%	14.4%	14.4%	71.2%	100.0%	5.8%	6.7%	87.5%	100.0%	10.6%	13.5%	76.0%	100.0%	13.5%	11.5%	75.0%	100.0%
	% within Barrier	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	22.1%	19.2%	58.7%	100.0%	14.4%	14.4%	71.2%	100.0%	5.8%	6.7%	87.5%	100.0%	10.6%	13.5%	76.0%	100.0%	13.5%	11.5%	75.0%	100.0%

		Adverse Effects			Total	Medicolegal Liability			Total	Cost is Prohibitive			Total	Pts Don't Want			Total	Pts Don't Understand Need			Total
		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree	
Annual ED Census (pts/yr): Small (≤ 40,000)	Count	30	13	10	53	30	13	10	53	17	13	23	53	23	23	7	53	15	21	17	53
	% within ED Census	56.6%	24.5%	18.9%	100.0%	56.6%	24.5%	18.9%	100.0%	32.1%	24.5%	43.4%	100.0%	43.4%	43.4%	13.2%	100.0%	28.3%	39.6%	32.1%	100.0%
	% within Barrier	51.7%	46.4%	55.6%	51.0%	53.6%	37.1%	76.9%	51.0%	53.1%	56.5%	46.9%	51.0%	47.9%	51.1%	63.6%	51.0%	46.9%	51.2%	54.8%	51.0%
	% of Total	28.8%	12.5%	9.6%	51.0%	28.8%	12.5%	9.6%	51.0%	16.3%	12.5%	22.1%	51.0%	22.1%	22.1%	6.7%	51.0%	14.4%	20.2%	16.3%	51.0%
Annual ED Census (pts/yr): Large (> 40,000)	Count	28	15	8	51	26	22	3	51	15	10	26	51	25	22	4	51	17	20	14	51
	% within ED Census	54.9%	29.4%	15.7%	100.0%	51.0%	43.1%	5.9%	100.0%	29.4%	19.6%	51.0%	100.0%	49.0%	43.1%	7.8%	100.0%	33.3%	39.2%	27.5%	100.0%
	% within Barrier	48.3%	53.6%	44.4%	49.0%	46.4%	62.9%	23.1%	49.0%	46.9%	43.5%	53.1%	49.0%	52.1%	48.9%	36.4%	49.0%	53.1%	48.8%	45.2%	49.0%
	% of Total	26.9%	14.4%	7.7%	49.0%	25.0%	21.2%	2.9%	49.0%	14.4%	9.6%	25.0%	49.0%	24.0%	21.2%	3.8%	49.0%	16.3%	19.2%	13.5%	49.0%
Total	Count	58	28	18	104	56	35	13	104	32	23	49	104	48	45	11	104	32	41	31	104
	% within ED Census	55.8%	26.9%	17.3%	100.0%	53.8%	33.7%	12.5%	100.0%	30.8%	22.1%	47.1%	100.0%	46.2%	43.3%	10.6%	100.0%	30.8%	39.4%	29.8%	100.0%
	% within Barrier	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	55.8%	26.9%	17.3%	100.0%	53.8%	33.7%	12.5%	100.0%	30.8%	22.1%	47.1%	100.0%	46.2%	43.3%	10.6%	100.0%	30.8%	39.4%	29.8%	100.0%

		Believe Vacc is Ineffective			Total	Lack of Protocol			Total	Pts are Up-to-Date			Total
		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree	
Annual ED Census (pts/yr): Small (≤ 40,000)	Count	48	5	0	53	11	7	35	53	34	12	7	53
	% within ED Census	90.6%	9.4%	0.0%	100.0%	20.8%	13.2%	66.0%	100.0%	64.2%	22.6%	13.2%	100.0%
	% within Barrier	49.0%	83.3%	0.0%	51.0%	44.0%	50.0%	53.8%	51.0%	47.2%	48.0%	100.0%	51.0%
	% of Total	46.2%	4.8%	0.0%	51.0%	10.6%	6.7%	33.7%	51.0%	32.7%	11.5%	6.7%	51.0%
Annual ED Census (pts/yr): Large (> 40,000)	Count	50	1	0	51	14	7	30	51	38	13	0	51
	% within ED Census	98.0%	2.0%	0.0%	100.0%	27.5%	13.7%	58.8%	100.0%	74.5%	25.5%	0.0%	100.0%
	% within Barrier	51.0%	16.7%	0.0%	49.0%	56.0%	50.0%	46.2%	49.0%	52.8%	52.0%	0.0%	49.0%
	% of Total	48.1%	1.0%	0.0%	49.0%	13.5%	6.7%	28.8%	49.0%	36.5%	12.5%	0.0%	49.0%
Total	Count	98	6	0	104	25	14	65	104	72	25	7	104
	% within ED Census	94.2%	5.8%	0.0%	100.0%	24.0%	13.5%	62.5%	100.0%	69.2%	24.0%	6.7%	100.0%
	% within Barrier	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	94.2%	5.8%	0.0%	100.0%	24.0%	13.5%	62.5%	100.0%	69.2%	24.0%	6.7%	100.0%

Figure 33: Chi-Square analysis: ED Census v. Barriers to ED Vaccination

ED Census v.	Test	Value	df	Asymp. Sig. (2-sided)
Job of Primary Care	Pearson Chi-Square	0.153	2	0.927
	Likelihood Ratio	0.153	2	0.927
	Linear-by-Linear Assoc	0.151	1	0.698
	N of Valid Cases	104		
Physician Time Constraint	Pearson Chi-Square	3.512	2	0.173
	Likelihood Ratio	3.642	2	0.162
	Linear-by-Linear Assoc	2.627	1	0.105
	N of Valid Cases	104		
Nurse Time Constraint	Pearson Chi-Square	4.19	2	0.123
	Likelihood Ratio	4.476	2	0.107
	Linear-by-Linear Assoc	4.07	1	0.044
	N of Valid Cases	104		
Need Resources to Store	Pearson Chi-Square	0.793	2	0.673
	Likelihood Ratio	0.803	2	0.669
	Linear-by-Linear Assoc	0.613	1	0.434
	N of Valid Cases	104		
Pts Unable to Provide Hx	Pearson Chi-Square	0.453	2	0.797
	Likelihood Ratio	0.453	2	0.797
	Linear-by-Linear Assoc	0.428	1	0.513
	N of Valid Cases	104		
Adverse Effects	Pearson Chi-Square	0.396	2	0.82
	Likelihood Ratio	0.396	2	0.82
	Linear-by-Linear Assoc	0.01	1	0.922
	N of Valid Cases	104		

ED Census v.	Test	Value	df	Asymp. Sig. (2-sided)
Medicolegal Liability	Pearson Chi-Square	6.333	2	0.042
	Likelihood Ratio	6.565	2	0.038
	Linear-by-Linear Assoc	0.283	1	0.595
	N of Valid Cases	104		
Cost is Prohibitive	Pearson Chi-Square	0.662	2	0.718
	Likelihood Ratio	0.663	2	0.718
	Linear-by-Linear Assoc	0.359	1	0.549
	N of Valid Cases	104		
Pts Don't Want	Pearson Chi-Square	0.886	2	0.642
	Likelihood Ratio	0.896	2	0.639
	Linear-by-Linear Assoc	0.705	1	0.401
	N of Valid Cases	104		
Pts Don’t Understand Need	Pearson Chi-Square	0.401	2	0.818
	Likelihood Ratio	0.402	2	0.818
	Linear-by-Linear Assoc	0.396	1	0.529
	N of Valid Cases	104		
Lack of Protocol	Pearson Chi-Square	0.706	2	0.702
	Likelihood Ratio	0.707	2	0.702
	Linear-by-Linear Assoc	0.694	1	0.405
	N of Valid Cases	104		
Pts Are Up-to-Date	Pearson Chi-Square	7.226	2	0.027
	Likelihood Ratio	9.928	2	0.007
	Linear-by-Linear Assoc	3.874	1	0.049
	N of Valid Cases	104		

ED Census v.	Test	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Believe Vaccine is Ineffective	Pearson Chi-Square	2.67	1	0.102		
	Continuity Correction	1.472	1	0.225		
	Likelihood Ratio	2.913	1	0.088		
	Fisher's Exact Test				0.205	0.112
	Linear-by-Linear Assoc	2.644	1	0.104		
	N of Valid Cases	104				

Figure 34: Cross tabulation: Academic v. Vaccination Practices

			Screening influenza		Total	Screening pneumococcal		Total	Administration influenza		Total	Administration pneumococcal		Total
			No	Yes		No	Yes		No	Yes		No	Yes	
Academic Status	Non-Academic	Count	26	28	54	32	22	54	49	5	54	51	3	54
		% within Academic Status	48.1%	51.9%	100.0%	59.3%	40.7%	100.0%	90.7%	9.3%	100.0%	94.4%	5.6%	100.0%
		% within Screening or Admin	54.2%	50.0%	51.9%	51.6%	52.4%	51.9%	56.3%	29.4%	51.9%	52.0%	50.0%	51.9%
		% of Total	25.0%	26.9%	51.9%	30.8%	21.2%	51.9%	47.1%	4.8%	51.9%	49.0%	2.9%	51.9%
	Academic	Count	22	28	50	30	20	50	38	12	50	47	3	50
		% within Academic Status	44.0%	56.0%	100.0%	60.0%	40.0%	100.0%	76.0%	24.0%	100.0%	94.0%	6.0%	100.0%
		% within Screening or Admin	45.8%	50.0%	48.1%	48.4%	47.6%	48.1%	43.7%	70.6%	48.1%	48.0%	50.0%	48.1%
		% of Total	21.2%	26.9%	48.1%	28.8%	19.2%	48.1%	36.5%	11.5%	48.1%	45.2%	2.9%	48.1%
Total		Count	48	56	104	62	42	104	87	17	104	98	6	104
		% within Academic Status	46.2%	53.8%	100.0%	59.6%	40.4%	100.0%	83.7%	16.3%	100.0%	94.2%	5.8%	100.0%
		% within Screening or Admin	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	46.2%	53.8%	100.0%	59.6%	40.4%	100.0%	83.7%	16.3%	100.0%	94.2%	5.8%	100.0%

Figure 35: Chi-Square analysis: Academic v. Vaccination Practices

	Test	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Academic Status v. Screen for Influenza Vacc	Pearson Chi-Square	0.18	1	0.672		
	Continuity Correction	0.052	1	0.82		
	Likelihood Ratio	0.18	1	0.672		
	Fisher's Exact Test				0.698	0.41
	Linear-by-Linear Assoc	0.178	1	0.673		
	N of Valid Cases	104				
Academic Status v. Screen for Pneumo Vacc	Pearson Chi-Square	0.006	1	0.939		
	Continuity Correction	0	1	1		
	Likelihood Ratio	0.006	1	0.939		
	Fisher's Exact Test				1	0.549
	Linear-by-Linear Assoc	0.006	1	0.939		
	N of Valid Cases	104				
Academic Status v. Admin of Influenza Vacc	Pearson Chi-Square	4.125	1	0.042		
	Continuity Correction	3.118	1	0.077		
	Likelihood Ratio	4.211	1	0.04		
	Fisher's Exact Test				0.062	0.038
	Linear-by-Linear Assoc	4.086	1	0.043		
	N of Valid Cases	104				
Academic Status v. Admin of Pneumo Vacc	Pearson Chi-Square	0.009	1	0.923		
	Continuity Correction	0	1	1		
	Likelihood Ratio	0.009	1	0.923		
	Fisher's Exact Test				1	0.623
	Linear-by-Linear Assoc	0.009	1	0.923		
	N of Valid Cases	104				

<u>Figure 36</u>: Cross tabulation: Academic v. Support for ED Vaccination

Academic Status			Support: No	Support: Yes	Total
Academic Status	Non-Academic	Count	37	17	54
		% within Academic	68.5%	31.5%	100.0%
		% within Support	55.2%	45.9%	51.9%
		% of Total	35.6%	16.3%	51.9%
	Academic	Count	30	20	50
		% within Academic	60.0%	40.0%	100.0%
		% within Support	44.8%	54.1%	48.1%
		% of Total	28.8%	19.2%	48.1%
Total		Count	67	37	104
		% within Academic	64.4%	35.6%	100.0%
		% within Support	100.0%	100.0%	100.0%
		% of Total	64.4%	35.6%	100.0%

<u>Figure 37</u>: Chi-Square analysis: Academic v. Support for ED Vaccination

Test	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	0.82	1	0.365		
Continuity Correction	0.49	1	0.483		
Likelihood Ratio	0.82	1	0.365		
Fisher's Exact Test				0.416	0.241
Linear-by-Linear Assoc	0.81	1	0.367		
N of Valid Cases	104				

Figure 38: Cross tabulation: Academic v. Barriers to ED Vaccination

			Job of Primary Care			Total	Physician Time Constraint			Total	Nurse Time Constraint			Total	Need Resources to Store			Total	Pts Unable to Provide Hx			Total
			Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree	
Academic Status	Non-Academic	Count	8	9	37	54	9	7	38	54	3	5	46	54	7	5	42	54	4	6	44	54
		% within Academic Status	14.8%	16.7%	68.5%	100.0%	16.7%	13.0%	70.4%	100.0%	5.6%	9.3%	85.2%	100.0%	13.0%	9.3%	77.8%	100.0%	7.4%	11.1%	81.5%	100.0%
		% within Barrier	34.8%	45.0%	60.7%	51.9%	60.0%	46.7%	51.4%	51.9%	50.0%	71.4%	50.5%	51.9%	63.6%	35.7%	53.2%	51.9%	28.6%	50.0%	56.4%	51.9%
		% of Total	7.7%	8.7%	35.6%	51.9%	8.7%	6.7%	36.5%	51.9%	2.9%	4.8%	44.2%	51.9%	6.7%	4.8%	40.4%	51.9%	3.8%	5.8%	42.3%	51.9%
	Academic	Count	15	11	24	50	6	8	36	50	3	2	45	50	4	9	37	50	10	6	34	50
		% within Academic Status	30.0%	22.0%	48.0%	100.0%	12.0%	16.0%	72.0%	100.0%	6.0%	4.0%	90.0%	100.0%	8.0%	18.0%	74.0%	100.0%	20.0%	12.0%	68.0%	100.0%
		% within Barrier	65.2%	55.0%	39.3%	48.1%	40.0%	53.3%	48.6%	48.1%	50.0%	28.6%	49.5%	48.1%	36.4%	64.3%	46.8%	48.1%	71.4%	50.0%	43.6%	48.1%
		% of Total	14.4%	10.6%	23.1%	48.1%	5.8%	7.7%	34.6%	48.1%	2.9%	1.9%	43.3%	48.1%	3.8%	8.7%	35.6%	48.1%	9.6%	5.8%	32.7%	48.1%
Total		Count	23	20	61	104	15	15	74	104	6	7	91	104	11	14	79	104	14	12	78	104
		% within Academic Status	22.1%	19.2%	58.7%	100.0%	14.4%	14.4%	71.2%	100.0%	5.8%	6.7%	87.5%	100.0%	10.6%	13.5%	76.0%	100.0%	13.5%	11.5%	75.0%	100.0%
		% within Barrier	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	22.1%	19.2%	58.7%	100.0%	14.4%	14.4%	71.2%	100.0%	5.8%	6.7%	87.5%	100.0%	10.6%	13.5%	76.0%	100.0%	13.5%	11.5%	75.0%	100.0%

			Adverse Effects			Total	Medicolegal Liability			Total	Cost is Prohibitive			Total	Pts Don't Want			Total	Pts Don't Understand			Total
			Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree	
Academic Status	Non-Academic	Count	27	15	12	54	28	17	9	54	17	13	24	54	26	22	6	54	14	21	19	54
		% within Academic Status	50.0%	27.8%	22.2%	100.0%	51.9%	31.5%	16.7%	100.0%	31.5%	24.1%	44.4%	100.0%	48.1%	40.7%	11.1%	100.0%	25.9%	38.9%	35.2%	100.0%
		% within Barrier	46.6%	53.6%	66.7%	51.9%	50.0%	48.6%	69.2%	51.9%	53.1%	56.5%	49.0%	51.9%	54.2%	48.9%	54.5%	51.9%	43.8%	51.2%	61.3%	51.9%
		% of Total	26.0%	14.4%	11.5%	51.9%	26.9%	16.3%	8.7%	51.9%	16.3%	12.5%	23.1%	51.9%	25.0%	21.2%	5.8%	51.9%	13.5%	20.2%	18.3%	51.9%
	Academic	Count	31	13	6	50	28	18	4	50	15	10	25	50	22	23	5	50	18	20	12	50
		% within Academic Status	62.0%	26.0%	12.0%	100.0%	56.0%	36.0%	8.0%	100.0%	30.0%	20.0%	50.0%	100.0%	44.0%	46.0%	10.0%	100.0%	36.0%	40.0%	24.0%	100.0%
		% within Barrier	53.4%	46.4%	33.3%	48.1%	50.0%	51.4%	30.8%	48.1%	46.9%	43.5%	51.0%	48.1%	45.8%	51.1%	45.5%	48.1%	56.3%	48.8%	38.7%	48.1%
		% of Total	29.8%	12.5%	5.8%	48.1%	26.9%	17.3%	3.8%	48.1%	14.4%	9.6%	24.0%	48.1%	21.2%	22.1%	4.8%	48.1%	17.3%	19.2%	11.5%	48.1%
Total		Count	58	28	18	104	56	35	13	104	32	23	49	104	48	45	11	104	32	41	31	104
		% within Academic Status	55.8%	26.9%	17.3%	100.0%	53.8%	33.7%	12.5%	100.0%	30.8%	22.1%	47.1%	100.0%	46.2%	43.3%	10.6%	100.0%	30.8%	39.4%	29.8%	100.0%
		% within Barrier	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	55.8%	26.9%	17.3%	100.0%	53.8%	33.7%	12.5%	100.0%	30.8%	22.1%	47.1%	100.0%	46.2%	43.3%	10.6%	100.0%	30.8%	39.4%	29.8%	100.0%

			Believe Vacc is Ineffective			Total	Lack of Protocol			Total	Pts are Up-to-Date			Total
			Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree	
Academic Status	Non-Academic	Count	51	3	0	54	12	5	37	54	35	13	6	54
		% within Academic Status	94.4%	5.6%	0.0%	100.0%	22.2%	9.3%	68.5%	100.0%	64.8%	24.1%	11.1%	100.0%
		% within Barrier	52.0%	50.0%	0.0%	51.9%	48.0%	35.7%	56.9%	51.9%	48.6%	52.0%	85.7%	51.9%
		% of Total	49.0%	2.9%	0.0%	51.9%	11.5%	4.8%	35.6%	51.9%	33.7%	12.5%	5.8%	51.9%
	Academic	Count	47	3	0	50	13	9	28	50	37	12	1	50
		% within Academic Status	94.0%	6.0%	0.0%	100.0%	26.0%	18.0%	56.0%	100.0%	74.0%	24.0%	2.0%	100.0%
		% within Barrier	48.0%	50.0%	0.0%	48.1%	52.0%	64.3%	43.1%	48.1%	51.4%	48.0%	14.3%	48.1%
		% of Total	45.2%	2.9%	0.0%	48.1%	12.5%	8.7%	26.9%	48.1%	35.6%	11.5%	1.0%	48.1%
Total		Count	98	6	0	104	25	14	65	104	72	25	7	104
		% within Academic Status	94.2%	5.8%	0.0%	100.0%	24.0%	13.5%	62.5%	100.0%	69.2%	24.0%	6.7%	100.0%
		% within Barrier	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	94.2%	5.8%	0.0%	100.0%	24.0%	13.5%	62.5%	100.0%	69.2%	24.0%	6.7%	100.0%

Figure 39: Chi-Square analysis: Academic v. Barriers to ED Vaccination

Academic v.	Test	Value	df	Asymp. Sig. (2-sided)
Job of Primary Care	Pearson Chi-Square	4.954	2	0.084
	Likelihood Ratio	5.003	2	0.082
	Linear-by-Linear Assoc	4.862	1	0.027
	N of Valid Cases	104		
Physician Time Constraint	Pearson Chi-Square	0.568	2	0.753
	Likelihood Ratio	0.571	2	0.752
	Linear-by-Linear Assoc	0.191	1	0.662
	N of Valid Cases	104		
Nurse Time Constraint	Pearson Chi-Square	1.145	2	0.564
	Likelihood Ratio	1.185	2	0.553
	Linear-by-Linear Assoc	0.186	1	0.667
	N of Valid Cases	104		
Need Resources to Store	Pearson Chi-Square	2.127	2	0.345
	Likelihood Ratio	2.15	2	0.341
	Linear-by-Linear Assoc	0.008	1	0.928
	N of Valid Cases	104		
Pts Unable to Provide Hx	Pearson Chi-Square	3.705	2	0.157
	Likelihood Ratio	3.788	2	0.15
	Linear-by-Linear Assoc	3.455	1	0.063
	N of Valid Cases	104		
Adverse Effects	Pearson Chi-Square	2.268	2	0.322
	Likelihood Ratio	2.304	2	0.316
	Linear-by-Linear Assoc	2.179	1	0.14
	N of Valid Cases	104		

Academic v.	Test	Value	df	Asymp. Sig. (2-sided)
Medicolegal Liability	Pearson Chi-Square	1.8	2	0.406
	Likelihood Ratio	1.848	2	0.397
	Linear-by-Linear Assoc	0.857	1	0.354
	N of Valid Cases	104		
Cost is Prohibitive	Pearson Chi-Square	0.383	2	0.826
	Likelihood Ratio	0.384	2	0.825
	Linear-by-Linear Assoc	0.169	1	0.681
	N of Valid Cases	104		
Pts Don't Want	Pearson Chi-Square	0.293	2	0.864
	Likelihood Ratio	0.293	2	0.864
	Linear-by-Linear Assoc	0.054	1	0.817
	N of Valid Cases	104		
Pts Don't Understand Need	Pearson Chi-Square	1.954	2	0.376
	Likelihood Ratio	1.966	2	0.374
	Linear-by-Linear Assoc	1.919	1	0.166
	N of Valid Cases	104		
Lack of Protocol	Pearson Chi-Square	2.279	2	0.32
	Likelihood Ratio	2.295	2	0.317
	Linear-by-Linear Assoc	0.952	1	0.329
	N of Valid Cases	104		
Pts Are Up-to-Date	Pearson Chi-Square	3.518	2	0.172
	Likelihood Ratio	3.904	2	0.142
	Linear-by-Linear Assoc	2.333	1	0.127
	N of Valid Cases	104		

Academic v.	Test	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Believe Vaccine is Ineffective	Pearson Chi-Square	0.009	1	0.923		
	Continuity Correction	0	1	1		
	Likelihood Ratio	0.009	1	0.923		
	Fisher's Exact Test				1	0.623
	Linear-by-Linear Assoc	0.009	1	0.923		
	N of Valid Cases	104				

Figure 40: Cross tabulation: Admin of Influenza v. Support for ED Vacc

			Support		Total
			No	Yes	
Influenza Vaccine	Do Not Administer	Count	62	25	87
		% within Influenza	71.3%	28.7%	100.0%
		% within Support	92.5%	67.6%	83.7%
		% of Total	59.6%	24.0%	83.7%
	Administer	Count	5	12	17
		% within Influenza	29.4%	70.6%	100.0%
		% within Support	7.5%	32.4%	16.3%
		% of Total	4.8%	11.5%	16.3%
Total		Count	67	37	104
		% within Influenza	64.4%	35.6%	100.0%
		% within Support	100.0%	100.0%	100.0%
		% of Total	64.4%	35.6%	100.0%

Figure 41: Chi-Square analysis: Admin of Influenza v. Support for ED Vacc

Test	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	10.9	1	0.001		
Continuity Correction	9.12	1	0.003		
Likelihood Ratio	10.4	1	0.001		
Fisher's Exact Test				0.002	0.002
Linear-by-Linear Assoc	10.8	1	0.001		
N of Valid Cases	104				

Figure 42: Cross tabulation: Admin of Influenza v. Barriers to ED Vacc

			Job of Primary Care			Total	Physician Time Constraint			Total	Nurse Time Constraint			Total	Need Resources to Store			Total	Pts Unable to Provide Hx			Total
			Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree	
Influenza Vaccine	Do Not Administer	Count	14	18	55	87	10	14	63	87	2	7	78	87	7	12	68	87	11	9	67	87
		% within Influenza	16.1%	20.7%	63.2%	100.0%	11.5%	16.1%	72.4%	100.0%	2.3%	8.0%	89.7%	100.0%	8.0%	13.8%	78.2%	100.0%	12.6%	10.3%	77.0%	100.0%
		% within Barrier	60.9%	90.0%	90.2%	83.7%	66.7%	93.3%	85.1%	83.7%	33.3%	100.0%	85.7%	83.7%	63.6%	85.7%	86.1%	83.7%	78.6%	75.0%	85.9%	83.7%
		% of Total	13.5%	17.3%	52.9%	83.7%	9.6%	13.5%	60.6%	83.7%	1.9%	6.7%	75.0%	83.7%	6.7%	11.5%	65.4%	83.7%	10.6%	8.7%	64.4%	83.7%
	Administer	Count	9	2	6	17	5	1	11	17	4	0	13	17	4	2	11	17	3	3	11	17
		% within Influenza	52.9%	11.8%	35.3%	100.0%	29.4%	5.9%	64.7%	100.0%	23.5%	0.0%	76.5%	100.0%	23.5%	11.8%	64.7%	100.0%	17.6%	17.6%	64.7%	100.0%
		% within Barrier	39.1%	10.0%	9.8%	16.3%	33.3%	6.7%	14.9%	16.3%	66.7%	0.0%	14.3%	16.3%	36.4%	14.3%	13.9%	16.3%	21.4%	25.0%	14.1%	16.3%
		% of Total	8.7%	1.9%	5.8%	16.3%	4.8%	1.0%	10.6%	16.3%	3.8%	0.0%	12.5%	16.3%	3.8%	1.9%	10.6%	16.3%	2.9%	2.9%	10.6%	16.3%
Total		Count	23	20	61	104	15	15	74	104	6	7	91	104	11	14	79	104	14	12	78	104
		% within Influenza	22.1%	19.2%	58.7%	100.0%	14.4%	14.4%	71.2%	100.0%	5.8%	6.7%	87.5%	100.0%	10.6%	13.5%	76.0%	100.0%	13.5%	11.5%	75.0%	100.0%
		% within Barrier	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	22.1%	19.2%	58.7%	100.0%	14.4%	14.4%	71.2%	100.0%	5.8%	6.7%	87.5%	100.0%	10.6%	13.5%	76.0%	100.0%	13.5%	11.5%	75.0%	100.0%

			Adverse Effects			Total	Medicolegal Liability			Total	Cost is Prohibitive			Total	Pts Don't Want			Total	Pts Don't Understand			Total
			Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree	
Influenza Vaccine	Do Not Administer	Count	49	22	16	87	50	24	13	87	24	19	44	87	37	40	10	87	23	38	26	87
		% within Influenza	56.3%	25.3%	18.4%	100.0%	57.5%	27.6%	14.9%	100.0%	27.6%	21.8%	50.6%	100.0%	42.5%	46.0%	11.5%	100.0%	26.4%	43.7%	29.9%	100.0%
		% within Barrier	84.5%	78.6%	88.9%	83.7%	89.3%	68.6%	100.0%	83.7%	75.0%	82.6%	89.8%	83.7%	77.1%	88.9%	90.9%	83.7%	71.9%	92.7%	83.9%	83.7%
		% of Total	47.1%	21.2%	15.4%	83.7%	48.1%	23.1%	12.5%	83.7%	23.1%	18.3%	42.3%	83.7%	35.6%	38.5%	9.6%	83.7%	22.1%	36.5%	25.0%	83.7%
	Administer	Count	9	6	2	17	6	11	0	17	8	4	5	17	11	5	1	17	9	3	5	17
		% within Influenza	52.9%	35.3%	11.8%	100.0%	35.3%	64.7%	0.0%	100.0%	47.1%	23.5%	29.4%	100.0%	64.7%	29.4%	5.9%	100.0%	52.9%	17.6%	29.4%	100.0%
		% within Barrier	15.5%	21.4%	11.1%	16.3%	10.7%	31.4%	0.0%	16.3%	25.0%	17.4%	10.2%	16.3%	22.9%	11.1%	9.1%	16.3%	28.1%	7.3%	16.1%	16.3%
		% of Total	8.7%	5.8%	1.9%	16.3%	5.8%	10.6%	0.0%	16.3%	7.7%	3.8%	4.8%	16.3%	10.6%	4.8%	1.0%	16.3%	8.7%	2.9%	4.8%	16.3%
Total		Count	58	28	18	104	56	35	13	104	32	23	49	104	48	45	11	104	32	41	31	104
		% within Influenza	55.8%	26.9%	17.3%	100.0%	53.8%	33.7%	12.5%	100.0%	30.8%	22.1%	47.1%	100.0%	46.2%	43.3%	10.6%	100.0%	30.8%	39.4%	29.8%	100.0%
		% within Barrier	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	55.8%	26.9%	17.3%	100.0%	53.8%	33.7%	12.5%	100.0%	30.8%	22.1%	47.1%	100.0%	46.2%	43.3%	10.6%	100.0%	30.8%	39.4%	29.8%	100.0%

			Believe Vacc is Ineffective			Total	Lack of Protocol			Total	Pts are Up-to-Date			Total
			Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree	
Influenza Vaccine	Do Not Administer	Count	81	6	0	87	19	12	56	87	57	23	7	87
		% within Influenza	93.1%	6.9%	0.0%	100.0%	21.8%	13.8%	64.4%	100.0%	65.5%	26.4%	8.0%	100.0%
		% within Barrier	82.7%	100.0%	0.0%	83.7%	76.0%	85.7%	86.2%	83.7%	79.2%	92.0%	100.0%	83.7%
		% of Total	77.9%	5.8%	0.0%	83.7%	18.3%	11.5%	53.8%	83.7%	54.8%	22.1%	6.7%	83.7%
	Administer	Count	17	0	0	17	6	2	9	17	15	2	0	17
		% within Influenza	100.0%	0.0%	0.0%	100.0%	35.3%	11.8%	52.9%	100.0%	88.2%	11.8%	0.0%	100.0%
		% within Barrier	17.3%	0.0%	0.0%	16.3%	24.0%	14.3%	13.8%	16.3%	20.8%	8.0%	0.0%	16.3%
		% of Total	16.3%	0.0%	0.0%	16.3%	5.8%	1.9%	8.7%	16.3%	14.4%	1.9%	0.0%	16.3%
Total		Count	98	6	0	104	25	14	65	104	72	25	7	104
		% within Influenza	94.2%	5.8%	0.0%	100.0%	24.0%	13.5%	62.5%	100.0%	69.2%	24.0%	6.7%	100.0%
		% within Barrier	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	94.2%	5.8%	0.0%	100.0%	24.0%	13.5%	62.5%	100.0%	69.2%	24.0%	6.7%	100.0%

Figure 43: Chi-Square analysis: Admin of Influenza v. Barriers to ED Vacc

Influenza v.	Test	Value	df	Asymp. Sig. (2-sided)
Job of Primary Care	Pearson Chi-Square	11.21	2	0.004
	Likelihood Ratio	9.625	2	0.008
	Linear-by-Linear Assoc	8.765	1	0.003
	N of Valid Cases	104		
Physician Time Constraint	Pearson Chi-Square	4.312	2	0.116
	Likelihood Ratio	3.98	2	0.137
	Linear-by-Linear Assoc	1.732	1	0.188
	N of Valid Cases	104		
Nurse Time Constraint	Pearson Chi-Square	12.76	2	0.002
	Likelihood Ratio	10.36	2	0.006
	Linear-by-Linear Assoc	6.302	1	0.012
	N of Valid Cases	104		
Need Resources to Store	Pearson Chi-Square	3.606	2	0.165
	Likelihood Ratio	2.966	2	0.227
	Linear-by-Linear Assoc	2.694	1	0.101
	N of Valid Cases	104		
Pts Unable to Provide Hx	Pearson Chi-Square	1.209	2	0.546
	Likelihood Ratio	1.128	2	0.569
	Linear-by-Linear Assoc	0.834	1	0.361
	N of Valid Cases	104		
Adverse Effects	Pearson Chi-Square	0.919	2	0.632
	Likelihood Ratio	0.919	2	0.632
	Linear-by-Linear Assoc	0.025	1	0.873
	N of Valid Cases	104		

Influenza v.	Test	Value	df	Asymp. Sig. (2-sided)
Medicolegal Liability	Pearson Chi-Square	9.662	2	0.008
	Likelihood Ratio	10.93	2	0.004
	Linear-by-Linear Assoc	0.15	1	0.699
	N of Valid Cases	104		
Cost is Prohibitive	Pearson Chi-Square	3.123	2	0.21
	Likelihood Ratio	3.098	2	0.213
	Linear-by-Linear Assoc	3.092	1	0.079
	N of Valid Cases	104		
Pts Don't Want	Pearson Chi-Square	2.841	2	0.242
	Likelihood Ratio	2.865	2	0.239
	Linear-by-Linear Assoc	2.468	1	0.116
	N of Valid Cases	104		
Pts Don’t Understand Need	Pearson Chi-Square	5.692	2	0.058
	Likelihood Ratio	5.755	2	0.056
	Linear-by-Linear Assoc	1.692	1	0.193
	N of Valid Cases	104		
Lack of Protocol	Pearson Chi-Square	1.412	2	0.494
	Likelihood Ratio	1.318	2	0.517
	Linear-by-Linear Assoc	1.215	1	0.27
	N of Valid Cases	104		
Pts Are Up-to-Date	Pearson Chi-Square	3.702	2	0.157
	Likelihood Ratio	5.007	2	0.082
	Linear-by-Linear Assoc	3.613	1	0.057
	N of Valid Cases	104		

Influenza v.	Test	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Believe Vaccine is Ineffective	Pearson Chi-Square	1.244	1	0.265		
	Continuity Correction	0.299	1	0.585		
	Likelihood Ratio	2.212	1	0.137		
	Fisher's Exact Test				0.586	0.333
	Linear-by-Linear Assoc	1.232	1	0.267		
	N of Valid Cases	104				

Figure 44: Cross tabulation: Admin of Pneumo v. Support for ED Vacc

			Support		Total
			No	Yes	
Pneumococcal Vaccine	Do Not Administer	Count	65	33	98
		% within Pneumo	66.3%	33.7%	100.0%
		% within Support	97.0%	89.2%	94.2%
		% of Total	62.5%	31.7%	94.2%
	Administer	Count	2	4	6
		% within Pneumo	33.3%	66.7%	100.0%
		% within Support	3.0%	10.8%	5.8%
		% of Total	1.9%	3.8%	5.8%
Total		Count	67	37	104
		% within Pneumo	64.4%	35.6%	100.0%
		% within Support	100.0%	100.0%	100.0%
		% of Total	64.4%	35.6%	100.0%

Figure 45: Chi-Square analysis: Admin of Pneumo v. Support for ED Vacc

Test	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.685	1	0.101		
Continuity Correction	1.439	1	0.23		
Likelihood Ratio	2.545	1	0.111		
Fisher's Exact Test				0.183	0.117
Linear-by-Linear Assoc	2.659	1	0.103		
N of Valid Cases	104				

Figure 46: Cross tabulation: Admin of Pneumo v. Barriers to ED Vacc

			Job of Primary Care			Total	Physician Time Constraint			Total	Nurse Time Constraint			Total	Need Resources to Store			Total	Pts Unable to Provide Hx			Total
			Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree	
Pneumococcal Vaccine	Do Not Administer	Count	20	19	59	98	13	14	71	98	4	7	87	98	8	12	78	98	13	12	73	98
		% within Pneumo	20.4%	19.4%	60.2%	100.0%	13.3%	14.3%	72.4%	100.0%	4.1%	7.1%	88.8%	100.0%	8.2%	12.2%	79.6%	100.0%	13.3%	12.2%	74.5%	100.0%
		% within Barrier	87.0%	95.0%	96.7%	94.2%	86.7%	93.3%	95.9%	94.2%	66.7%	100.0%	95.6%	94.2%	72.7%	85.7%	98.7%	94.2%	92.9%	100.0%	93.6%	94.2%
		% of Total	19.2%	18.3%	56.7%	94.2%	12.5%	13.5%	68.3%	94.2%	3.8%	6.7%	83.7%	94.2%	7.7%	11.5%	75.0%	94.2%	12.5%	11.5%	70.2%	94.2%
	Administer	Count	3	1	2	6	2	1	3	6	2	0	4	6	3	2	1	6	1	0	5	6
		% within Pneumo	50.0%	16.7%	33.3%	100.0%	33.3%	16.7%	50.0%	100.0%	33.3%	0.0%	66.7%	100.0%	50.0%	33.3%	16.7%	100.0%	16.7%	0.0%	83.3%	100.0%
		% within Barrier	13.0%	5.0%	3.3%	5.8%	13.3%	6.7%	4.1%	5.8%	33.3%	0.0%	4.4%	5.8%	27.3%	14.3%	1.3%	5.8%	7.1%	0.0%	6.4%	5.8%
		% of Total	2.9%	1.0%	1.9%	5.8%	1.9%	1.0%	2.9%	5.8%	1.9%	0.0%	3.8%	5.8%	2.9%	1.9%	1.0%	5.8%	1.0%	0.0%	4.8%	5.8%
Total		Count	23	20	61	104	15	15	74	104	6	7	91	104	11	14	79	104	14	12	78	104
		% within Pneumo	22.1%	19.2%	58.7%	100.0%	14.4%	14.4%	71.2%	100.0%	5.8%	6.7%	87.5%	100.0%	10.6%	13.5%	76.0%	100.0%	13.5%	11.5%	75.0%	100.0%
		% within Barrier	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	22.1%	19.2%	58.7%	100.0%	14.4%	14.4%	71.2%	100.0%	5.8%	6.7%	87.5%	100.0%	10.6%	13.5%	76.0%	100.0%	13.5%	11.5%	75.0%	100.0%

			Adverse Effects			Total	Medicolegal Liability			Total	Cost is Prohibitive			Total	Pts Don't Want			Total	Pts Don't Understand			Total
			Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree	
Pneumococcal Vaccine	Do Not Administer	Count	55	25	18	98	54	31	13	98	28	21	49	98	45	44	9	98	29	40	29	98
		% within Pneumo	56.1%	25.5%	18.4%	100.0%	55.1%	31.6%	13.3%	100.0%	28.6%	21.4%	50.0%	100.0%	45.9%	44.9%	9.2%	100.0%	29.6%	40.8%	29.6%	100.0%
		% within Barrier	94.8%	89.3%	100.0%	94.2%	96.4%	88.6%	100.0%	94.2%	87.5%	91.3%	100.0%	94.2%	93.8%	97.8%	81.8%	94.2%	90.6%	97.6%	93.5%	94.2%
		% of Total	52.9%	24.0%	17.3%	94.2%	51.9%	29.8%	12.5%	94.2%	26.9%	20.2%	47.1%	94.2%	43.3%	42.3%	8.7%	94.2%	27.9%	38.5%	27.9%	94.2%
	Administer	Count	3	3	0	6	2	4	0	6	4	2	0	6	3	1	2	6	3	1	2	6
		% within Pneumo	50.0%	50.0%	0.0%	100.0%	33.3%	66.7%	0.0%	100.0%	66.7%	33.3%	0.0%	100.0%	50.0%	16.7%	33.3%	100.0%	50.0%	16.7%	33.3%	100.0%
		% within Barrier	5.2%	10.7%	0.0%	5.8%	3.6%	11.4%	0.0%	5.8%	12.5%	8.7%	0.0%	5.8%	6.3%	2.2%	18.2%	5.8%	9.4%	2.4%	6.5%	5.8%
		% of Total	2.9%	2.9%	0.0%	5.8%	1.9%	3.8%	0.0%	5.8%	3.8%	1.9%	0.0%	5.8%	2.9%	1.0%	1.9%	5.8%	2.9%	1.0%	1.9%	5.8%
Total		Count	58	28	18	104	56	35	13	104	32	23	49	104	48	45	11	104	32	41	31	104
		% within Pneumo	55.8%	26.9%	17.3%	100.0%	53.8%	33.7%	12.5%	100.0%	30.8%	22.1%	47.1%	100.0%	46.2%	43.3%	10.6%	100.0%	30.8%	39.4%	29.8%	100.0%
		% within Barrier	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	55.8%	26.9%	17.3%	100.0%	53.8%	33.7%	12.5%	100.0%	30.8%	22.1%	47.1%	100.0%	46.2%	43.3%	10.6%	100.0%	30.8%	39.4%	29.8%	100.0%

			Believe Vacc is Ineffective			Total	Lack of Protocol			Total	Pts are Up-to-Date			Total
			Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree	
Pneumococcal Vaccine	Do Not Administer	Count	92	6	0	98	22	14	62	98	67	24	7	98
		% within Pneumo	93.9%	6.1%	0.0%	100.0%	22.4%	14.3%	63.3%	100.0%	68.4%	24.5%	7.1%	100.0%
		% within Barrier	93.9%	100.0%	0.0%	94.2%	88.0%	100.0%	95.4%	94.2%	93.1%	96.0%	100.0%	94.2%
		% of Total	88.5%	5.8%	0.0%	94.2%	21.2%	13.5%	59.6%	94.2%	64.4%	23.1%	6.7%	94.2%
	Administer	Count	6	0	0	6	3	0	3	6	5	1	0	6
		% within Pneumo	100.0%	0.0%	0.0%	100.0%	50.0%	0.0%	50.0%	100.0%	83.3%	16.7%	0.0%	100.0%
		% within Barrier	6.1%	0.0%	0.0%	5.8%	12.0%	0.0%	4.6%	5.8%	6.9%	4.0%	0.0%	5.8%
		% of Total	5.8%	0.0%	0.0%	5.8%	2.9%	0.0%	2.9%	5.8%	4.8%	1.0%	0.0%	5.8%
Total		Count	98	6	0	104	25	14	65	104	72	25	7	104
		% within Pneumo	94.2%	5.8%	0.0%	100.0%	24.0%	13.5%	62.5%	100.0%	69.2%	24.0%	6.7%	100.0%
		% within Barrier	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	94.2%	5.8%	0.0%	100.0%	24.0%	13.5%	62.5%	100.0%	69.2%	24.0%	6.7%	100.0%

Figure 47: Chi-Square analysis: Admin of Pneumo v. Barriers to ED Vacc

Pneumo v.	Test	Value	df	Asymp. Sig. (2-sided)
Job of Primary Care	Pearson Chi-Square	2.956	2	0.228
	Likelihood Ratio	2.522	2	0.283
	Linear-by-Linear Assoc	2.648	1	0.104
	N of Valid Cases	104		
Physician Time Constraint	Pearson Chi-Square	2.001	2	0.368
	Likelihood Ratio	1.641	2	0.44
	Linear-by-Linear Assoc	1.896	1	0.169
	N of Valid Cases	104		
Nurse Time Constraint	Pearson Chi-Square	9.13	2	0.01
	Likelihood Ratio	5.422	2	0.066
	Linear-by-Linear Assoc	5.58	1	0.018
	N of Valid Cases	104		
Need Resources to Store	Pearson Chi-Square	9.13	2	0.01
	Likelihood Ratio	5.422	2	0.066
	Linear-by-Linear Assoc	5.58	1	0.018
	N of Valid Cases	104		
Pts Unable to Provide Hx	Pearson Chi-Square	0.842	2	0.656
	Likelihood Ratio	1.529	2	0.466
	Linear-by-Linear Assoc	0.033	1	0.856
	N of Valid Cases	104		
Adverse Effects	Pearson Chi-Square	2.4	2	0.301
	Likelihood Ratio	3.198	2	0.202
	Linear-by-Linear Assoc	0.144	1	0.704
	N of Valid Cases	104		

Pneumo v.	Test	Value	df	Asymp. Sig. (2-sided)
Medicolegal Liability	Pearson Chi-Square	3.355	2	0.187
	Likelihood Ratio	3.745	2	0.154
	Linear-by-Linear Assoc	0.082	1	0.774
	N of Valid Cases	104		
Cost is Prohibitive	Pearson Chi-Square	6.029	2	0.049
	Likelihood Ratio	8.175	2	0.017
	Linear-by-Linear Assoc	5.778	1	0.016
	N of Valid Cases	104		
Pts Don't Want	Pearson Chi-Square	4.179	2	0.124
	Likelihood Ratio	3.413	2	0.182
	Linear-by-Linear Assoc	0.512	1	0.474
	N of Valid Cases	104		
Pts Don't Understand Need	Pearson Chi-Square	1.628	2	0.443
	Likelihood Ratio	1.732	2	0.421
	Linear-by-Linear Assoc	0.257	1	0.612
	N of Valid Cases	104		
Lack of Protocol	Pearson Chi-Square	2.802	2	0.246
	Likelihood Ratio	3.218	2	0.2
	Linear-by-Linear Assoc	1.3	1	0.254
	N of Valid Cases	104		
Pts Are Up-to-Date	Pearson Chi-Square	0.755	2	0.685
	Likelihood Ratio	1.165	2	0.559
	Linear-by-Linear Assoc	0.742	1	0.389
	N of Valid Cases	104		

Pneumo v.	Test	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Believe Vaccine is Ineffective	Pearson Chi-Square	0.39	1	0.532		
	Continuity Correction	0	1	1		
	Likelihood Ratio	0.735	1	0.391		
	Fisher's Exact Test				1	0.694
	Linear-by-Linear Assoc	0.386	1	0.534		
	N of Valid Cases	104				

Figure 48: Cross tabulation: Support for ED Vacc v. Barriers to ED Vacc

			Job of Primary Care			Total	Physician Time Constraint			Total	Nurse Time Constraint			Total	Need Resources to Store			Total	Pts Unable to Provide Hx			Total
			Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree	
Support	Do Not Support	Count	5	15	47	67	6	7	54	67	0	2	65	67	5	6	56	67	6	8	53	67
		% within Support	7.5%	22.4%	70.1%	100.0%	9.0%	10.4%	80.6%	100.0%	0.0%	3.0%	97.0%	100.0%	7.5%	9.0%	83.6%	100.0%	9.0%	11.9%	79.1%	100.0%
		% within Barrier	21.7%	75.0%	77.0%	64.4%	40.0%	46.7%	73.0%	64.4%	0.0%	28.6%	71.4%	64.4%	45.5%	42.9%	70.9%	64.4%	42.9%	66.7%	67.9%	64.4%
		% of Total	4.8%	14.4%	45.2%	64.4%	5.8%	6.7%	51.9%	64.4%	0.0%	1.9%	62.5%	64.4%	4.8%	5.8%	53.8%	64.4%	5.8%	7.7%	51.0%	64.4%
	Support	Count	18	5	14	37	9	8	20	37	6	5	26	37	6	8	23	37	8	4	25	37
		% within Support	48.6%	13.5%	37.8%	100.0%	24.3%	21.6%	54.1%	100.0%	16.2%	13.5%	70.3%	100.0%	16.2%	21.6%	62.2%	100.0%	21.6%	10.8%	67.6%	100.0%
		% within Barrier	78.3%	25.0%	23.0%	35.6%	60.0%	53.3%	27.0%	35.6%	100.0%	71.4%	28.6%	35.6%	54.5%	57.1%	29.1%	35.6%	57.1%	33.3%	32.1%	35.6%
		% of Total	17.3%	4.8%	13.5%	35.6%	8.7%	7.7%	19.2%	35.6%	5.8%	4.8%	25.0%	35.6%	5.8%	7.7%	22.1%	35.6%	7.7%	3.8%	24.0%	35.6%
Total		Count	23	20	61	104	15	15	74	104	6	7	91	104	11	14	79	104	14	12	78	104
		% within Support	22.1%	19.2%	58.7%	100.0%	14.4%	14.4%	71.2%	100.0%	5.8%	6.7%	87.5%	100.0%	10.6%	13.5%	76.0%	100.0%	13.5%	11.5%	75.0%	100.0%
		% within Barrier	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	22.1%	19.2%	58.7%	100.0%	14.4%	14.4%	71.2%	100.0%	5.8%	6.7%	87.5%	100.0%	10.6%	13.5%	76.0%	100.0%	13.5%	11.5%	75.0%	100.0%

			Adverse Effects			Total	Medicolegal Liability			Total	Cost is Prohibitive			Total	Pts Don't Want			Total	Pts Don't Understand Need			Total
			Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree	
Support	Do Not Support	Count	32	20	15	67	32	22	13	67	18	15	34	67	26	33	8	67	15	32	20	67
		% within Support	47.8%	29.9%	22.4%	100.0%	47.8%	32.8%	19.4%	100.0%	26.9%	22.4%	50.7%	100.0%	38.8%	49.3%	11.9%	100.0%	22.4%	47.8%	29.9%	100.0%
		% within Barrier	55.2%	71.4%	83.3%	64.4%	57.1%	62.9%	100.0%	64.4%	56.3%	65.2%	69.4%	64.4%	54.2%	73.3%	72.7%	64.4%	46.9%	78.0%	64.5%	64.4%
		% of Total	30.8%	19.2%	14.4%	64.4%	30.8%	21.2%	12.5%	64.4%	17.3%	14.4%	32.7%	64.4%	25.0%	31.7%	7.7%	64.4%	14.4%	30.8%	19.2%	64.4%
	Support	Count	26	8	3	37	24	13	0	37	14	8	15	37	22	12	3	37	17	9	11	37
		% within Support	70.3%	21.6%	8.1%	100.0%	64.9%	35.1%	0.0%	100.0%	37.8%	21.6%	40.5%	100.0%	59.5%	32.4%	8.1%	100.0%	45.9%	24.3%	29.7%	100.0%
		% within Barrier	44.8%	28.6%	16.7%	35.6%	42.9%	37.1%	0.0%	35.6%	43.8%	34.8%	30.6%	35.6%	45.8%	26.7%	27.3%	35.6%	53.1%	22.0%	35.5%	35.6%
		% of Total	25.0%	7.7%	2.9%	35.6%	23.1%	12.5%	0.0%	35.6%	13.5%	7.7%	14.4%	35.6%	21.2%	11.5%	2.9%	35.6%	16.3%	8.7%	10.6%	35.6%
Total		Count	58	28	18	104	56	35	13	104	32	23	49	104	48	45	11	104	32	41	31	104
		% within Support	55.8%	26.9%	17.3%	100.0%	53.8%	33.7%	12.5%	100.0%	30.8%	22.1%	47.1%	100.0%	46.2%	43.3%	10.6%	100.0%	30.8%	39.4%	29.8%	100.0%
		% within Barrier	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	55.8%	26.9%	17.3%	100.0%	53.8%	33.7%	12.5%	100.0%	30.8%	22.1%	47.1%	100.0%	46.2%	43.3%	10.6%	100.0%	30.8%	39.4%	29.8%	100.0%

			Believe Vacc is Ineffective			Total	Lack of Protocol			Total	Pts are Up-to-Date			Total
			Disagree	Neutral	Agree		Disagree	Neutral	Agree		Disagree	Neutral	Agree	
Support	Do Not Support	Count	62	5	0	67	15	11	41	67	45	16	6	67
		% within Support	92.5%	7.5%	0.0%	100.0%	22.4%	16.4%	61.2%	100.0%	67.2%	23.9%	9.0%	100.0%
		% within Barrier	63.3%	83.3%	0.0%	64.4%	60.0%	78.6%	63.1%	64.4%	62.5%	64.0%	85.7%	64.4%
		% of Total	59.6%	4.8%	0.0%	64.4%	14.4%	10.6%	39.4%	64.4%	43.3%	15.4%	5.8%	64.4%
	Support	Count	36	1	0	37	10	3	24	37	27	9	1	37
		% within Support	97.3%	2.7%	0.0%	100.0%	27.0%	8.1%	64.9%	100.0%	73.0%	24.3%	2.7%	100.0%
		% within Barrier	36.7%	16.7%	0.0%	35.6%	40.0%	21.4%	36.9%	35.6%	37.5%	36.0%	14.3%	35.6%
		% of Total	34.6%	1.0%	0.0%	35.6%	9.6%	2.9%	23.1%	35.6%	26.0%	8.7%	1.0%	35.6%
Total		Count	98	6	0	104	25	14	65	104	72	25	7	104
		% within Support	94.2%	5.8%	0.0%	100.0%	24.0%	13.5%	62.5%	100.0%	69.2%	24.0%	6.7%	100.0%
		% within Barrier	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	94.2%	5.8%	0.0%	100.0%	24.0%	13.5%	62.5%	100.0%	69.2%	24.0%	6.7%	100.0%

Figure 49: Chi-Square analysis: Support for ED Vacc v. Barriers to ED Vacc

Support v.	Test	Value	df	Asymp. Sig. (2-sided)
Job of Primary Care	Pearson Chi-Square	23.5	2	0
	Likelihood Ratio	23.1	2	0
	Linear-by-Linear Assoc	18.92	1	0
	N of Valid Cases	104		
Physician Time Constraint	Pearson Chi-Square	8.327	2	0.016
	Likelihood Ratio	8.116	2	0.017
	Linear-by-Linear Assoc	7.767	1	0.005
	N of Valid Cases	104		
Nurse Time Constraint	Pearson Chi-Square	16.74	2	0
	Likelihood Ratio	18.14	2	0
	Linear-by-Linear Assoc	16.46	1	0
	N of Valid Cases	104		
Need Resources to Store	Pearson Chi-Square	6.007	2	0.05
	Likelihood Ratio	5.816	2	0.055
	Linear-by-Linear Assoc	4.909	1	0.027
	N of Valid Cases	104		
Pts Unable to Provide Hx	Pearson Chi-Square	3.29	2	0.193
	Likelihood Ratio	3.147	2	0.207
	Linear-by-Linear Assoc	2.733	1	0.098
	N of Valid Cases	104		
Adverse Effects	Pearson Chi-Square	5.573	2	0.062
	Likelihood Ratio	5.89	2	0.053
	Linear-by-Linear Assoc	5.482	1	0.019
	N of Valid Cases	104		

Support v.	Test	Value	df	Asymp. Sig. (2-sided)
Medicolegal Liability	Pearson Chi-Square	8.512	2	0.014
	Likelihood Ratio	12.73	2	0.002
	Linear-by-Linear Assoc	6.388	1	0.011
	N of Valid Cases	104		
Cost is Prohibitive	Pearson Chi-Square	1.466	2	0.48
	Likelihood Ratio	1.452	2	0.484
	Linear-by-Linear Assoc	1.408	1	0.235
	N of Valid Cases	104		
Pts Don't Want	Pearson Chi-Square	4.093	2	0.129
	Likelihood Ratio	4.105	2	0.128
	Linear-by-Linear Assoc	3.211	1	0.073
	N of Valid Cases	104		
Pts Don't Understand Need	Pearson Chi-Square	7.621	2	0.022
	Likelihood Ratio	7.68	2	0.021
	Linear-by-Linear Assoc	2.185	1	0.139
	N of Valid Cases	104		
Lack of Protocol	Pearson Chi-Square	1.488	2	0.475
	Likelihood Ratio	1.587	2	0.452
	Linear-by-Linear Assoc	0.003	1	0.956
	N of Valid Cases	104		
Pts Are Up-to-Date	Pearson Chi-Square	1.503	2	0.472
	Likelihood Ratio	1.719	2	0.423
	Linear-by-Linear Assoc	0.931	1	0.335
	N of Valid Cases	104		

Support v.	Test	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Believe Vaccine is Ineffective	Pearson Chi-Square	0.993	1	0.319		
	Continuity Correction	0.311	1	0.577		
	Likelihood Ratio	1.114	1	0.291		
	Fisher's Exact Test				0.418	0.301
	Linear-by-Linear Assoc	0.984	1	0.321		
	N of Valid Cases	104				

Figure 50: Comments provided by ED directors.

Comments
"We have discussed in past and had resistance from community physicians that we would be interfering in their provision of care - probably some concern about continuity and smooth transmission of record of vaccination, but clearly also a business concern about lost patient visits in office."
"Just don't have the resources for immunization, DV, falls, diabetes, COPD, etc. screening."

"We can do all the things society wants like immunizations, HIV screening, asthma education, smoking cessation, domestic violence screening: Where does it end, we need appropriate resources and staff and space and we can take on more but when every day is a crisis, routine, non-emergent things will have to wait."
"ED immunizations would lead to over-immunization of the public because most patients honestly do not know what their immunization status is."
"I am very hesitant about adding ANYTHING to ED Physicians who are already overburdened."
"Number one reason. It will increase total volume significantly, during immunization season. No mechanism in the ED just to give immunizations in triage. Not enough triage staff to do their job at present let alone the additional responsibility of immunizing our community."
"Just like many other functions that the state has dumped on the ED, this is not one that should be assumed."
"My concern is the time it would take away from true emergency patients. It's not just giving the vaccine but also the teaching and Q&A that would cause increase LOS."
"Cost effectiveness of using EDs as a vaccination center from a societal standpoint not yet done Unclear whether this activity would be reimbursed as emergency care and thus provide the funding to ensure that this would remain a budget neutral item for the hospital Mistake to focus on the EDs to try and solve primary care shortages (the real cause of the problem) rather than improve access to primary care as it increases the cost of health care Shortage of ED space as, in time of fear of epidemics, many patients may decide to use the ED for vaccinations exacerbating crowding."
"Patients and providers do not expect vaccination screening in the ED any more than they would expect cholesterol checks or PSA screening."
"The ED does not need to replace the PCP."
"Would not support routine vaccine administration in ED except in serious public health emergency. This is a function best left to public health departments and PCP's. ED lack the capacity to care for current levels of emergency patients without adding routine preventive care."
"If we can give Tdap--we should all be able to provide flu & pneu vaxs."
"Improper use of scarce/busy ED resources - do not want to train the population to use ED for non-emergent care. Patient co-pays."
"EDs cannot be all things to all people, and are increasingly dumping grounds for everything everyone else does not want to or cannot do. Although I strongly agree with immunization, burdening the ER with this primarily "primary care" activity is simply not a good idea, we simply to not have the time or the resources."
"An idea that has been proposed in the past. However, not an effective use of resources for EDs built for high acuity. Would be best served in urgi care centers."
"There exist only certain type of patients that would benefit from ED immunization, mainly those without PCP's or good access. The PCP's do not want us immunizing their patients."
"It is not always so easy to obtain the vaccinations in the ED."
"Converting ED's into office practice structures will only confound are already overcrowded, over-utilized, underfunded operations. Let us do emergency care and don't make us into a newer model of primary care access!"
"Important question with interesting implications."
"The ED should not be the location for performance of primary care functions."
"My opposition is strictly based on lack of available resources to add this to the existing work."
"We are screening for everything from domestic violence to street drug abuse. Our resources are limited and additional immunizations are likely to push us toward longer lengths of stays in the ED and more patients leaving without being seen."

"ED care is the most expensive way of delivering care. This is a public health measure."
"I have supported this concept for more than 25 years."
"Don't feel we need to do in our small community with a medical home/EMR connection coming shortly."
"ED's are overcrowded already. We have enough trouble ensuring tetanus status is UTD."
"Many patients do not know whether they have been immunized against pneumococcus, and yet they have a relationship with a PCP. It is not clear that providing immunizations to these folks would make sense in the ED."
"It should not fall on already overstressed Emergency Departments to make up the many failures of other components of the healthcare system. I can take out an appendix too; it just isn't effective/efficient practice."
"We would have to add nursing FTE's which we can't do and it would slow our flow which would adversely affect care."
"We are piloting a program with our clinical pharmacist this spring."
"Overburdened, overcrowded EDs should not bear the brunt of this public health challenge. We are losing the meaning of the word emergency in emergency dept."
"I am just concerned that the safety net of the ED is constantly expanding."
"Not the role of the ED."
"The largest barrier are that our patients are resistant to routine immunizations."