



Vaccine

journal homepage: www.elsevier.com/locate/vaccine

Pharmacists as providers: Targeting pneumococcal vaccinations to high risk populations

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ARTICLE INFO

Article history:

Received 29 April 2011

Received in revised form 21 July 2011

Accepted 8 August 2011

Available online 22 August 2011

Keywords:

Pneumococcal vaccine

Influenza vaccine

Coverage, Pharmacy

Pharmacist

ABSTRACT

Background: Older adults and persons with chronic conditions are at increased risk for pneumococcal disease. Severe pneumococcal disease represents a substantial humanistic and economic burden to society. Although pneumococcal vaccination (PPSV) can decrease risk for serious consequences, vaccination rates are suboptimal. As more people seek annual influenza vaccinations at community pharmacies, pharmacists have the ability to identify at-risk patients and provide PPSV.

Objectives: The objective of this study was to evaluate the impact of pharmacists educating at-risk patients on the importance of receiving a pneumococcal vaccination.

Methods: Using de-identified claims from a large, national pharmacy chain, all patients who had received an influenza vaccination between August 1, 2010 and November 14, 2010 and who were eligible for PPSV were identified for the analysis. Based on the Advisory Committee on Immunization Practices recommendations, at-risk patients were identified as over 65 years of age or as aged 2–64 with a comorbid conditions. A benchmark medical and pharmacy claims database of commercial and Medicare health plan members was used to derive a PPSV vaccination rate typical of traditional care delivery to compare to pharmacy-based vaccination. Period incidence of PPSV was calculated and compared.

Results: Among the 1.3 million at-risk patients who were vaccinated by a pharmacist during the study period, 65,598 (4.88%) also received a pneumococcal vaccine. This vaccination rate was significantly higher than the benchmark rate of 2.90% (34,917/1,204,104; $p < .001$) representing traditional care. Patients aged 60–70 years had the highest vaccination rate (6.60%; 26,430/400,454) of any age group.

Conclusions: Pharmacists were successful at identifying at-risk patients and providing additional immunization services. Concurrent immunization of PPSV with influenza vaccination by pharmacists has potential to improve PPSV coverage. These results support the expanding role of community pharmacists in the provision of wellness and prevention services.

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1. Introduction

In 2009 in the United States, invasive pneumococcal disease (IPD) is estimated to be responsible for over 44,000 cases of pneumonia, leading to over 5000 deaths [1]. Severe pneumococcal disease not only causes pneumonia but also can lead to meningitis and septicemia [2,3]. Risk of pneumonia is especially high for

two groups: (a) persons over age 65 years and (b) persons ages 2–64 years with chronic conditions [3]. Among these at-risk patients, the incidence of IPD is 40 per 100,000 with a mortality rate of about 1 in 20 [4]. Furthermore, the annual direct and indirect costs of IPD are estimated at \$3.7 billion and \$1.8 billion, respectively [5].

Research has demonstrated that pneumococcal polysaccharide vaccine (PPSV) is effective in preventing IPD [2,6–8], has a low rate of adverse events [9], and is cost-effective [10–12]. With increased rates of antibiotic microbial resistance, improving PPSV coverage is the most effective strategy to prevent pneumonia-related morbidity and mortality [13]. However, vaccination rates are suboptimal. The Healthy People 2020 initiative has set two goals for PPSV coverage in the United States based on age and presence of chronic conditions [14]. For persons older than age 65 years, the target coverage rate is 90%, from a baseline of 60% in 2008 [14]. For at-risk persons aged 2–65 years, the target rate is 60%, from the 2008

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baseline of 17% [14]. Vaccination or immunization coverage is the percentage of persons in a population who have received the recommended scheduled dose of vaccine [15].

The Advisory Committee on Immunization Practices (ACIP) reported that barriers for improving pneumococcal immunization were missed opportunities for vaccination (e.g., physician not suggesting PPSV during a routine office visit), limited settings for vaccine administration, fear of adverse events, and lack of awareness of benefits of PPSV [16]. A study by Klabunde et al. found that 47% of patients who were at risk for pneumococcal disease but had not received a PPSV cited, “the belief that the service was not needed or not knowing that it was needed” as the primary reason for not being vaccinated [17]. During the past several years, the Boards of Pharmacy in most states have changed their regulations to allow pharmacists to administer both influenza and pneumococcal vaccinations [18]. Subsequently, the provision of PPSV by pharmacies has increased the number of settings for vaccine administration [18,19].

As recommended by the ACIP [20], simultaneous administration of PPSV with seasonal influenza vaccine could reduce identified barriers to vaccination and improve PPSV coverage [21]. As more people seek influenza vaccinations at community pharmacies, pharmacists have the ability to identify at-risk patients, educate them on benefits of PPSV, and provide concurrent vaccinations. Therefore, the objective of this study was to evaluate the impact of pharmacists educating at-risk patients on the importance of receiving a pneumococcal vaccination. The study hypothesis was that PPSV coverage would be greater for patients who were identified as at-risk for IPD by pharmacists during influenza vaccination compared to patients in traditional care.

2. Methods

When patients received influenza immunizations at a pharmacy, the pharmacist asked patients about their risk of pneumococcal disease (e.g., age, smoking status, co-morbid conditions). Pharmacists recommended PPSV if any risk was identified and the patient had not previously been vaccinated. For every immunization administered, a physician notification letter is generated and either given to the patient or sent to their primary care physician.

Pharmacy claims data, which contain vaccination records from Walgreens' Enterprise Data Warehouse (EDW) between November 15, 2009 and November 14, 2010, were included in the analysis. Influenza pneumococcal vaccinations were defined as pharmacy fills for the relevant vaccinations. To focus on PPSV education concurrent with an influenza vaccination, a sample was derived of all patients who had been immunized for influenza between August 1, 2010 and November 14, 2010. This sample was further limited to patients who had evidence of at least two non-influenza prescriptions to identify them as regular Walgreens customers with sufficient data to infer whether they had a chronic condition. Finally, because revaccination with PPSV is not recommended within 5 years, and only four years of EDW data was available, patients with evidence of a previous PPSV claims were excluded.

As outlined by ACIP, at-risk patients were identified in pharmacy claims data as aged 65 and older or as aged 2–64 with a comorbid conditions. Comorbid conditions were defined as conditions identified in the ACIP recommendations for PPSV, which included pulmonary disease, cardiovascular disease, liver disease, anatomic asplenia, diabetes, and immune compromising conditions (e.g., HIV, leukemia, malignancy). Although smoking status was also considered at-risk per ACIP guidelines, this variable was not available in pharmacy claims data.

To derive a comparison PPSV vaccination rate typical of traditional care delivery, Walgreens contracted with Solucia Consulting to identify PPSV vaccinations within Solucia's national medical and pharmacy claims database of commercial and Medicare health plan members. Due to medical claims lag, 2010 data were not available, and a blended average PPSV rate was calculated based on 2008 and 2009 influenza seasons. The same inclusion and exclusion criteria that were used to identify at-risk members in the study sample were used to identify the benchmark sample. The hypothesis that the PPSV vaccination rate would be higher in pharmacy-based versus traditional care was tested using the two-proportion z-test.

3. Results

Between August 1, 2010 and November 14, 2010, 2,095,748 patients received influenza immunizations at Walgreens, of which 1,343,751 persons met the ACIP recommendation for PPSV. Of

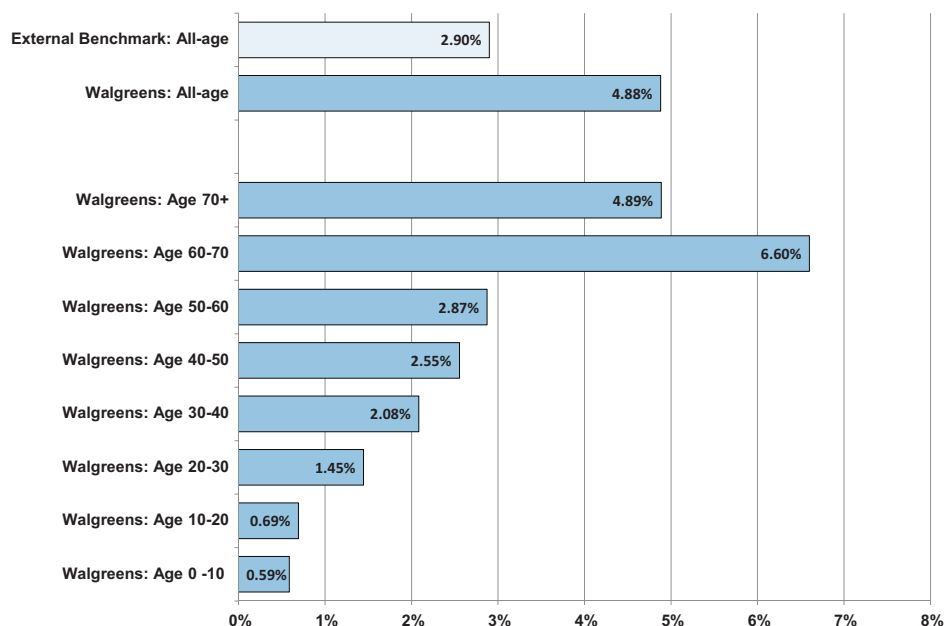


Fig. 1. PPSV Vaccination Rates.

these persons at increased risk for pneumococcal disease, 921,624 patients (69%) were at-risk because they were age 65 and older. The remaining 422,127 patients (31%) were at risk because they had one of the ACIP comorbid conditions and were aged 2–64. Using similar criteria, 1,204,104 patients were found to be at-risk for pneumococcal disease in the benchmark group. This study group was comprised of more women (58%, $n = 776,581$) than men (42%, $n = 567,170$). Nearly half of the study group was over age 70 years ($n = 642,222$). Average age of the study group was 69 years ($N = 1,343,751$). The benchmark group had a similar age and gender profile (μ age = 68 years; 55% female, 663,248/1,204,104).

Among the 1.3 million at-risk patients, 65,598 (4.88%) received a pneumococcal vaccine (see Fig. 1). This vaccination rate was significantly ($p < .001$) higher than the PPSV benchmark rate of 2.90% (34,917/1,204,104). In the study group, PPSV rates varied by age group but not by gender. Patients aged 60–70 years had the highest vaccination rate (6.60%, 26,430/400,454) of any age group.

4. Discussion

The rate of PPSV coverage was greater in the pharmacy patient group than the benchmark group representing traditional care. Concurrent immunization of PPSV with influenza vaccination by pharmacists has potential to improve PPSV coverage. Pharmacists were especially effective at reaching patients aged 60–70 years, who are likely to be at-risk not only due to age but also due to comorbid conditions. Further studies could be useful to elucidate how to reach younger at-risk persons.

No published studies were found that compared the provision of PPSV in a community pharmacy compared to traditional care. However, related research inferred that pharmacist-led immunizations could improve coverage. For example, Sokos et al. [22] found increased PPSV coverage after implementation of pharmacist-led PPSV screening program in an inpatient setting. Likewise, the University of Wisconsin Hospital increased dual coverage of PPSV and influenza vaccinations by 33 percentage points after implementation of pharmacy-based screening program [23]. Although not focused on PPSV, Loughlin et al. [24] reported that influenza coverage increased by 40 percentage points after implementation of a pharmacist-led vaccination program for cardiovascular patients. Furthermore, community pharmacies have been an effective setting for screening for other preventive services [25]. The combined evidence from the present study and the published literature suggests that pharmacies are an appropriate setting for PPSV and can be effective at improving immunization coverage.

The primary limitations of the current study were its observational design and the reliance on pharmacy claims for assessment of coverage rates. First, as with any non-randomized study, causality cannot be inferred. Second, the oldest day of EDW data available is May 01, 2006. Because pneumonia vaccinations are generally considered one-time only procedures, patients may have received their vaccination at Walgreens prior to May 2006 and thus rates represent period incidence rather than prevalence of PPSV vaccination coverage. Furthermore, patients may have previously received their PPSV vaccination elsewhere even though they obtained an influenza vaccination at Walgreens. Inferring health conditions from pharmacy claims has several limitations including misclassification and under-reporting. Generally, the influence of these limitations would cause an underestimate of the PPSV vaccination rate. Thus, the present results are a conservative estimate of the potential impact of pharmacy-based immunization.

The results of this study suggest that pharmacists are successful at identifying at-risk patients and providing additional immunization services. The ability to reach patients who are 60–70 years old is especially salient given the high morbidity, mortality, and

associated costs of IPD in this group [26,27]. With more of the baby boomer generation reaching 65 each year, resources to meet immunization demand in this cohort will increase [3]. Furthermore, older patients are more likely to have multiple comorbid conditions, which necessitate an integrated, coordinated care approach [28]. Collaboration of pharmacists with primary care providers and health systems for preventive services introduces an important model in the era of healthcare reform [29–31]. As an effective setting to engage older patients who have multiple health conditions, pharmacies can help achieve the U.S. Department of Health and Human Services' Healthy People goals for vaccine coverage. This study supports the expanding role of community pharmacists in the provision of wellness and prevention services.

Acknowledgements

The authors thank Patricia Murphy and Tamim Ahmed for their roles in research design and analytics support, Heather Kirkham for her assistance with the preparation of this manuscript, and Youbeil Lou and Zhongwen Huang for their contribution to data analysis.

References

- [1] Centers for Disease Control and Prevention. Active bacterial core surveillance report, emerging infections program network, *Streptococcus pneumoniae*; 2010. Available from: <http://www.cdc.gov/abcs/reports-findings/survreports/spneu09.html>.
- [2] Willis BC, Ndiaye SM, Hopkins DP, Shefer A. Improving influenza, pneumococcal polysaccharide, and hepatitis B vaccination coverage among adults aged <65 years at high risk: a report on recommendations of the Task Force on Community Preventive Services. *MMWR Recomm Rep* 2005;54:1–11.
- [3] Rehm SJ, Farley MM, File Jr TM, Hall WJ, Hopkins R, Levine OS, et al. Higher pneumococcal disease vaccination rates needed to protect more at-risk US adults. *Postgrad Med* 2009;121(6):101–5.
- [4] Lynch JP, Zhanel GG. *Streptococcus pneumoniae*: epidemiology, risk factors, and strategies for prevention. *Semin Respir Crit Care Med* 2009;30(2):189–209.
- [5] Weycker D, Strutton D, Edelsberg J, Sato R, Jackson LA. Clinical and economic burden of pneumococcal disease in older US adults. *Vaccine* 2010;28(31):4955–60.
- [6] Koivuola I, Sten M, Leinonen M, Makela PH. Clinical efficacy of pneumococcal vaccine in the elderly: a randomized, single-blind population-based trial. *Am J Prev Med* 1997;103(October 1 (4)):281–90.
- [7] Nichol KL, Baken L, Nelson A. Relation between influenza vaccination and outpatient visits, hospitalization, and mortality in elderly persons with chronic lung disease. *Ann Intern Med* 1999;130(5):397.
- [8] Kawakami K, Ohkusa Y, Kuroki R, Tanaka T, Koyama K, Harada Y, et al. Effectiveness of pneumococcal polysaccharide vaccine against pneumonia and cost analysis for the elderly who receive seasonal influenza vaccine in Japan. *Vaccine* 2010;28(October 8 (43)):7063–9.
- [9] Zhou W, Pool V, Iskander JK, English-Bullard R, Ball R, Wise RP, et al. Surveillance for safety after immunization: Vaccine Adverse Event Reporting System (VAERS) United States, 1991–2001. *MMWR Surveill Summ* 2003;52(1):1–24.
- [10] Sisk JE, Moskowitz AJ, Whang W, Lin JD, Fedson DS, McBean AM, et al. Cost-effectiveness of vaccination against pneumococcal bacteremia among elderly people. *JAMA* 1997;278(October 22 (16)):1333–9.
- [11] Huang SS, Johnson KM, Ray GT, Wroe P, Lieu TA, Moore MR, et al. Healthcare utilization and cost of pneumococcal disease in the United States. *Vaccine* 2011;29(April 18 (18)):3398–412.
- [12] Smith KJ, Zimmerman RK, Lin CJ, Nowalk MP, Ko FS, McEllistrem MC, et al. Alternative strategies for adult pneumococcal polysaccharide vaccination: a cost-effectiveness analysis. *Vaccine* 2008;26(March 10 (11)):1420–31.
- [13] Whitney CG, Farley MM, Hadler J, Harrison LH, Lexau C, Reingold A, et al. Increasing prevalence of multidrug-resistant *Streptococcus pneumoniae* in the United States. *N Engl J Med* 2000;343(26):1917–24.
- [14] U.S. Department of Health and Human Services. Healthy People 2020. U.S. Department of Health and Human Services 2011 April 1 [cited 2011 April 27]. Available from: <http://www.healthypeople.gov/2020/topicsobjectives2020/default.aspx>.
- [15] WHO Statistical Information System (WHOSIS). World Health Organization 2011 [cited 2011 April 10]. Available from: <http://www.who.int/whosis/indicators/2007Immunized/en/index.html>.
- [16] Centers for Disease Control and Prevention. Prevention of pneumococcal disease: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 1997; 46 (No. RR-8).
- [17] Klabunde CN, Meissner HI, Wooten KG, Breen N, Singleton JA. Comparing colorectal cancer screening and immunization status in older Americans. *Am J Prev Med* 2007;33(1):1–8.
- [18] Grabenstein JD. Pharmacists as vaccine advocates: roles in community pharmacies, nursing homes, and hospitals. *Vaccine* 1998;16(18):1705–10.

- [19] Westrick SC, Watcharadamrongkun S, Mount JK, Breland ML. Community pharmacy involvement in vaccine distribution and administration. *Vaccine* 2009;27(May 11 (21)):2858–63.
- [20] Kroger AT, Sumaya CV, Pickering LK, Atkinson WL. General recommendations on immunization: Recommendations of the Advisory Committee on Immunization Practices (ACIP). Centers for Disease Control and Prevention 2011 January 28 [cited 2011 April 27];60(RR02):1–60. Available from: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6002a1.htm>.
- [21] Slobodkin D, Kitlas J, Zielske P. Opportunities not missed – systematic influenza and pneumococcal immunization in a public inner-city emergency department. *Vaccine* 1998;16(November (19)):1795–802.
- [22] Sokos DR, Skledar SJ, Erwin KA, Nowalk MP, Zimmerman RK, Fox DE, et al. Designing and implementing a hospital-based vaccine standing orders program. *Am J Health Syst Pharm* 2007;64(May 15 (10)):1096–102.
- [23] Rees S, Stevens L, Drayton J, Engledow N, Sanders J. Improving inpatient pneumococcal and influenza vaccination rates. *J Nurs Care Qual* 2011, doi:10.1097/NCQ.0b013e31821b6bb.
- [24] Loughlin SM, Mortazavi A, Garey KW, Rice GK, Birtcher KK. Pharmacist-managed vaccination program increased influenza vaccination rates in cardiovascular patients enrolled in a secondary prevention lipid clinic. *Pharmacotherapy* 2007;27(5):729–33.
- [25] Yuksel N, Majumdar SR, Biggs C, Tsuyuki RT. Community pharmacist-initiated screening program for osteoporosis: randomized controlled trial. *Osteoporos Int* 2010;21(3):391–8.
- [26] Kaplan V, Angus DC, Griffin MF, Clermont G, Watson RS, Linde-Zwirble WT. Hospitalized community-acquired pneumonia in the elderly. Age- and sex-related patterns of care and outcome in the United States. *Am J Respir Crit Care Med* 2002;165(March 15 (6)):766–72.
- [27] Vila-Corcoles A, Ochoa-Gondar O, Rodriguez-Blanco T, Raga-Luria X, Gomez-Bertomeu F. Epidemiology of community-acquired pneumonia in older adults: a population-based study. *Respir Med* 2009;103(February 1 (2)):309–16.
- [28] Bodenheimer T. Coordinating care – a perilous journey through the health care system. *N Engl J Med* 2008;358(10):1064–71.
- [29] American Society of Health-System Pharmacists. ASHP statement on the pharmacist's role in primary care. *Am J Health-Syst Pharm* 1999;56:1665–7.
- [30] Cutler DM, Everett W. Thinking outside the pillbox: medication adherence as a priority for health care reform. *N Engl J Med* 2010;362(17):1553–5.
- [31] Scott MA, Hitch B, Ray L, Colvin G. Integration of pharmacists into a patient-centered medical home. *J Am Pharm Assoc* 2011;51(2):161–6.