



# Assessment of Vaccination Rates among Smokers and Non-Smokers at a Student-Run Free Clinic

Carissa Harnish-Cruz, MD<sup>1</sup>; Jeremy Silver, MS, MD<sup>1</sup>; Susan Veldheer, DEd, RD<sup>1,2,3</sup>; Seong Ho Jeong, MD<sup>1</sup>; Alexis Reedy-Cooper, MD, MPH<sup>1,2</sup>

<sup>1</sup>Pennsylvania State University College of Medicine, Hershey, Pennsylvania, USA

<sup>2</sup>Department of Family and Community Medicine, Milton S. Hershey Medical Center, Hershey, Pennsylvania, USA

<sup>3</sup>Department of Public Health Sciences, Pennsylvania State University College of Medicine, Hershey, Pennsylvania, USA

**Corresponding Author:** Carissa Harnish-Cruz, MD; email: carissa.harnish@gmail.com

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## Abstract

**Background:** While student-run free clinics (SRFCs) increasingly serve as part of the safety net for the uninsured and underinsured, it is unknown whether SRFCs consistently follow immunization guidelines in patients that smoke. This study characterized the preventative care in our clinic by evaluating the rate of adult immunizations and referrals of patients that smoke to cessation treatment.

**Methods:** We conducted a retrospective chart review of patients seen in 2016 at the LionCare Free Clinic. Data extracted included tobacco smoking status, desire to quit, smoking cessation treatment referrals, influenza and pneumococcal vaccination status, and demographics. Chi-square tests and Fisher Exact analysis were used to examine differences in influenza and pneumococcal vaccination rates in smokers versus non-smokers. We assessed the rate of interested smokers who received a referral to cessation therapy.

**Results:** In 2016, 498 patients were evaluated, of whom 67% were smokers. Among smokers, 21% reported receiving the influenza vaccination compared to 20% of non-smokers ( $p=0.85$ ). Seven percent of patients who smoke received the pneumococcal vaccine compared to 5% of non-smokers. Of the total patients who were vaccinated, a small percentage received the vaccines in the clinic. Although 66% of smokers reported interest in quitting during the first clinic visit, only 3% were referred to a smoking cessation program.

**Conclusion:** SRFCs face challenges in providing preventative health care for the underserved population. Despite guidelines recommending smokers receive the pneumococcal vaccine before age 65, few patients received it. Quality improvement interventions are needed to improve preventative health services to this vulnerable population.

## Introduction

Student-run free clinics (SRFCs) form part of the safety net for the uninsured and underinsured populations in the United States, by providing acute and primary care for these populations. There is some evidence SRFCs can provide high-quality care and meet goals for preventative health services through quality improvement strategies.<sup>1</sup> It is unknown how many of these clinics are consistently meeting standards for evidence-based preventative health strategies in

the populations they serve.

Disease prevention through immunization is an important strategy for reducing morbidity and mortality in the United States. The Advisory Committee of Immunization Practices (ACIP) of the Centers for Disease Control and Prevention sets guidelines regarding immunizations for the population.<sup>2</sup> Influenza immunization is currently recommended by ACIP every year for everyone older than six months of age. It is estimated that only 43% of non-institutionalized adults aged 18 and older received the influenza vaccine during the

2016-2017 vaccination period, but the Healthy People 2020 goal is 70% of the population annually.<sup>2,3</sup> The pneumococcal polysaccharide vaccine (PPSV23) is recommended once for high-risk patients ages 19-64, including current smokers.<sup>4</sup> In 2016, only 24.5% of those with indications for the PPSV23 before age 65 had received it.<sup>2</sup> Influenza and pneumococcal vaccines decrease disease burden, by reducing the risk of community-acquired pneumonia [Number Needed to Treat (NNT)=21] as well as reducing the likelihood of experiencing a chronic obstructive pulmonary disease (COPD) exacerbation (NNT=8) in patients with COPD.<sup>5</sup>

SRFCs have a responsibility to ensure their providers follow evidence-based treatment guidelines and their patients receive appropriate immunizations. One study of a SRFC in New Jersey assessed vaccination rates in a small population and found 21 out of 119 (18%) and 1 out of 7 (14%) patients received influenza and pneumococcal vaccinations, respectively. These rates fall well below national vaccination rates.<sup>6</sup>

Referral by clinics to smoking cessation programming is an essential preventative health strategy provided by SRFC. The population utilizing the clinic's services are often uninsured and of lower economic and education status, and are approximately twice as likely to engage in cigarette smoking than the average United States population (14%).<sup>7</sup> The United States Preventive Services Task Force recommends "clinicians ask all adults about tobacco use, advise them to stop using tobacco, and provide behavioral interventions and pharmacotherapy for cessation."<sup>8,9</sup> The study at the SRFC in New Jersey found that 94% of their patients that smoke received smoking cessation counseling within the clinic visits, but the extent of counseling and follow-up for these patients is unknown.<sup>6</sup>

This study examined the degree to which a SRFC in Harrisburg, Pennsylvania provided preventative care according to evidence-based guidelines for influenza and pneumococcal vaccination and smoking cessation treatment.

## Methods

### Setting

LionCare Free Clinic is a partnership between

Pennsylvania State University College of Medicine (PSUCOM)/Pennsylvania State Health in Hershey, Pennsylvania and Bethesda Mission in Harrisburg, Pennsylvania. PSUCOM provides funding for many of the clinical operations, while Bethesda Mission provides nurses, schedules appointments, and triages patients in addition to housing the clinic. The clinic volunteers are mostly first or second-year medical and physician assistant students. Attending physicians and residents volunteer as preceptors for the students. Immunizations are free to patients and are available during clinic visits due to the monetary support of community members. In addition to standard care, the SRFC also offers a referral-based smoking cessation program at the same site.

### Patient population

A retrospective chart review was conducted of patients seen from January 1 to December 31, 2016, at the LionCare Free Clinic at Bethesda Mission. A majority of the patient population lives at the shelter, Bethesda Mission, which shelters homeless, predominantly male individuals.

### Data extraction

De-identified data was extracted from the patient paper charts and was entered into the secure Research Electronic Data Capture (REDCap) database.<sup>10</sup> Patient-reported demographic information was recorded including age, gender, race and ethnicity. Although smoking status was consistently documented in the paper charts, other high-risk conditions that serve as additional indications for the pneumococcal vaccine were not sufficiently documented to be included in the retrospective review. All chart review was done by two reviewers and a sample of the paper charts were reviewed by both to ensure consistent interpretation and reduce error.

Current smoking status was self-reported by the patient during the patient visit and documented in the chart. Information collected included how many packs per day they were smoking and whether they were interested in quitting. When the patients presented to the clinic, students were prompted by a standard template utilized in the clinic with the following questions: "Is the patient a current smoker?", "How many

**Table 1.** Demographics of the population based on smoking versus non-smoking status.

Demographics	Smokers (n=336)	Non-Smokers (n=131)	P-value*	Totals† (n=498)
Gender (%)				
Male	251 (75)	66 (50)	<0.001	346
Female	85 (25)	65 (50)		152
Age (SD)				
Mean	40 (14.5)	39 (14.6)	0.237	40 (14.5)
Education (%)				
HS graduate or less	232 (69)	73 (55)	0.039	329
Some college/Associate Degree	82 (25)	37 (28)		124
College graduate	12 (3)	16 (12)		29
Race/Ethnicity (%)				
White	139 (42)	38 (28)	<0.001	197
Black	136 (41)	42 (30)		185
Hispanic	33 (10)	30 (22)		65
Other	15 (5)	14 (10)		31
Unknown	7 (2)	14 (10)		20

SD: standard deviation; HS: high school

\*P-value is calculated between smoking and non-smoking patients.

†Some patients (n=31) declined to answer questions regarding their smoking status and are not included in the smoker or non-smoker categories.

packs per day does the patient smoke?” and “Is the patient interested in smoking cessation?” The referral to smoking cessation treatment was documented on a separate form kept in the patient’s chart. The patients were typically referred to a student-led smoking cessation treatment program held at the Bethesda Mission. Class participants received free, over the counter, Food and Drug Administration approved nicotine replacement therapy such as nicotine lozenges, gum, and patches. Some patients were referred to other local programs if they indicated the one held at Bethesda Mission was not an ideal or convenient location to attend classes.

The students also documented prior vaccination status during the first patient visit, including whether the patients self-reported receiving the influenza vaccine in the last year or the pneumococcal vaccine as an adult. If the patient subsequently received influenza or pneumococcal vaccines during the clinic visit, it was documented on a separate form by the person who administered the vaccine.

*Statistical analysis and ethics*

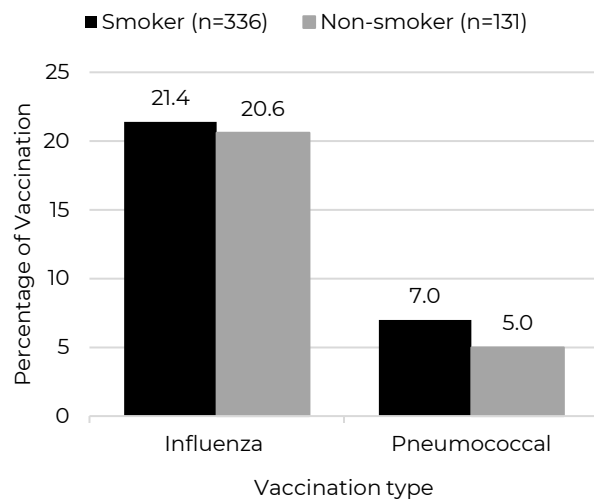
Descriptive statistics were calculated as appro-

priate for gender, age, race, and the highest level of education achieved, and the number who received either an influenza or pneumococcal vaccine. Participants were stratified by smoking status into two groups, smokers versus non-smokers. Chi-squared tests or Fisher’s Exact tests were used to compare differences in variables of interest between the groups. Among smokers, the percent of patients interested in quitting smoking was calculated as well as the number of interested smokers who were referred to a smoking cessation treatment program. All statistical analysis was done using JMP Pro statistical analysis software version 10 (SAS Institute, Cary, North Carolina). This study was reviewed and approved by the PSUCOM Institutional Review Board.

**Results**

There were 498 unique patients evaluated at LionCare Free Clinic during the study period. The demographic information regarding this population is summarized in Table 1. The patients were predominantly male, and the population had a mean age of 40 years old. There were no patients over the age of 65. Of the 498 patients, 346 (75%)

**Figure 1.** Rate of influenza and pneumococcal vaccinations by smoking status



were male and 251 (75%) were current cigarette smokers. Although 85 (56%) female patients reported current smoking status, it was considerably less common compared to male patients. Several patients, including 29 males and two females, declined to answer questions regarding current smoking habits and were not included in the smoking or non-smoking categories in Table 1. In general, smokers, as compared to non-smokers, achieved a lower level of educational achievement. Educational status was self-reported, and 16 patients declined to answer the question.

Of the 336 patients who smoke, 305 (91%) quantified their smoking history (in packs per day), and 274 (82%) answered a question regarding their interest in quitting smoking. Of the 305 patients who quantified their smoking history, 191 (63%) reported smoking a half pack of cigarettes or fewer per day. Of the 274 patients who answered a question regarding interested in quitting smoking, 182 (66%) reported interest in quitting smoking. Of the 182 patients interested in quitting, only 6 (3.0%) were then referred to a smoking cessation program. The rate of referral to smoking cessation classes remained low even when patients who smoke indicated interest in quitting on subsequent visits to the clinic.

The number of patients who received an influenza or pneumococcal vaccine at the clinic, re-

gardless of smoking status, was 16 (3.2%) for influenza vaccinations and 2 (0.4%) for pneumococcal vaccinations. It is not clear from the medical record the indication for pneumococcal vaccines in the two patients. Approximately 99 (21%) patients self-reported receiving an influenza vaccination in the last year at a clinic other than LionCare Free Clinic. There was no difference between the rate of reported influenza vaccination among smokers and non-smokers (Figure 1). Of the total population, 30 (6.4%) self-reported receiving a pneumococcal vaccine at a clinic other than LionCare Free Clinic. There was no significant difference between the rate of reported pneumococcal vaccination among smokers versus non-smokers (Figure 1).

## Discussion

Numerous challenges exist when providing preventative health care to underserved populations at SRFCs, which are likely not unique to LionCare Free Clinic. The challenges contribute to the low rates of smoking cessation referral and immunization in the patient population evaluated at the SRFC. There was no evidence of increased vaccination rates in the smoking population despite the additional indications for the pneumococcal vaccination.

The transient nature of the underserved population at the clinic represents a major challenge to providing preventative health services at most SRFCs. Most patients present without medical records and minimal knowledge of past medical history. They may be unaware of their immunization status or the recommended schedule of immunization. Many patients were only seen once at the clinic and presented with acute concerns. If acutely ill at the time of the visit, they may not have been ideal candidates for vaccination at that time. Additionally, some patients were not evaluated before or during the flu season when the influenza vaccine was available. Therefore, they were ineligible to receive the influenza vaccine at the SRFC during the study year.

A prior study identified several factors influencing adult decision-making regarding vaccinations, including physician's recommendation, knowledge of indications, cost, and concern

about becoming ill from vaccines.<sup>11</sup> The predominating factors differed depending on race and ethnicity and education level. Patients who have never completed high school more likely believed receiving vaccinations would make them sick. This belief may have been an influencing factor for the low immunization rate in our population. Although cost would typically be a deterrent for this population, cost is not considered to be a factor as the patients received vaccines free of charge.<sup>11</sup>

Smoking rates in the United States general population are currently 14% but rates are much higher among those who make less than \$35,000 per year (21%) and those with a GED (37%) or less than twelfth-grade education (23%).<sup>7</sup> The rate of male cigarette smokers (79%) at the clinic was higher than can be accounted for by the socioeconomic status alone.<sup>7</sup> In a prior study, the stress of homelessness, perceived lack of importance, and unavailability of cessation resources proved to be the most significant barriers to smoking cessation in the homeless population.<sup>12</sup> These factors likely influenced our study population as well, despite two-thirds of the smoking population having reported a desire to quit. The patients may not have been interested in the smoking cessation class available at the shelter.

The low rates of immunization and smoking cessation referral may result from the inexperience of the student volunteers. The clinic serves as a stopgap to address the patients' immediate healthcare needs rather than serving as long-term primary care. The visits primarily focus on the chief concern of the patient and other needs may be forgotten. Students in their preclinical years are still learning how to take a medical history and may miss opportunities to counsel regarding preventative health interventions. They are unlikely to be highly knowledgeable regarding immunization indications and schedules, preventing them from making immunization recommendations.

Greater efforts need to be made to identify and educate patients that smoke regarding pneumococcal immunizations and encourage them to quit smoking. We have planned several interventions to educate both students and patients about the need for immunizations. One of these includes providing a pamphlet about vaccination

schedules and indications during the clinic orientation to student volunteers. By providing this information before the patient encounters, student volunteers will hopefully be prepared to address immunization needs during the visit. The SRFC can continue to ensure attending physicians know about the immunizations and other preventative measures available at the clinic to enhance the physicians' abilities to educate student volunteers and counsel patients regarding preventative health. An additional intervention targets the patients by providing a handout regarding the immunizations available at the clinic. In a prior study, patients who received a low literacy (lower than fifth-grade reading level) brochure regarding the pneumococcal vaccination were five times more likely to receive the vaccine than the control group.<sup>13</sup> Additionally, providing patients with brochures and a short video of standardized patients modeling conversations regarding vaccination with their physicians increased vaccination rates even further.<sup>14</sup> The added benefit of a video should be considered when trying to increase vaccination at the SRFC.

Some factors influencing the low rate of smoking cessation referral may be time constraints on acute care appointments or lack of awareness of the smoking cessation program. Strategies to engage more patients in smoking cessation should focus on the established 5 A's framework by the Agency for Healthcare Research and Quality- ask, advise, assess, assist, and arrange.<sup>15</sup> While volunteers routinely ask about smoking behaviors and urge them to quit, additional training could focus on motivational interviewing to assess readiness to quit.<sup>16</sup> To provide more time to address smoking cessation at the SRFC, the clinic could provide focused appointments directed towards assisting patients with smoking cessation counseling and pharmacotherapy in addition to referring them to the smoking cessation programming. Student volunteers could also discuss smoking cessation with groups of patients as they wait for their acute concern visits. All student and physician volunteers need to be aware of the smoking cessation programming to advertise it to the patients.

This study is the first attempt at quality improvement based on clinical data at the LionCare Free Clinic and is not without limitations. As a re-

rospective study, not all information desired was readily available for every patient. Some of the data were incomplete for patients, and it is difficult to determine the effect this had on our findings. Information regarding demographics, cigarette smoking, and prior immunizations was self-reported and occasionally incomplete. Despite these limitations, this study makes evident the need to improve vaccination efforts in the underserved population, regardless of smoking status.

Providing preventative health services at a student-run free clinic faces unique challenges as a result of the characteristics of the population and the inexperience of the student volunteers. Future quality improvement should focus on improving immunization rates via enhanced student and patient education and providing support for smoking cessation programming. Studying immunization rates and smoking cessation referral rates across several SRFCs would improve understanding regarding the challenges in providing preventative health at other SRFCs.

#### Disclosures

The authors have no conflicts of interest to disclose.

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