Published in final edited form as:

AIDS Care. 2018 February ; 30(2): 146–149. doi:10.1080/09540121.2017.1390542.

A Virtual Clinic Improves Pneumococcal Vaccination Coverage Among Patients Living with HIV at a Veterans Affairs Medical Center

Charles M. Burns, MD¹, Richard E. Banks, AS², Brigid M. Wilson, PhD², Rebecca R. Carter, BA³, Robin L. P. Jump, MD, PhD^{2,4}, and Federico Perez, MD^{2,4}

¹Department of Medicine, University Hospitals Cleveland Medical Center, Cleveland, Ohio

²Geriatric Research, Education and Clinical Center at the Louis Stokes Cleveland Department of Veterans Affairs Medical Center (LSCVAMC) Cleveland, Ohio

³Department of Epidemiology and Biostatistics, Case Western Reserve University School of Medicine, Cleveland, Ohio

⁴Division of Infectious Diseases and HIV Medicine, Department of Medicine at Case Western Reserve University School of Medicine, Cleveland, Ohio

Abstract

People living with the human immunodeficiency virus (HIV) should receive pneumococcal vaccinations as part of their routine health maintenance. Our goal was to create a “virtual clinic” to help increase rates of pneumococcal vaccination among people living with HIV without adding substantially to the workload of primary providers. We used administrative data from our Veterans Affairs (VA) medical center to identify a cohort of veterans living with HIV who were not current with either the 13-valent pneumococcal conjugate vaccine (PCV13), the 23-valent pneumococcal polysaccharide vaccine (PPSV23) or both. We enrolled these individuals (n = 99) into a virtual clinic, notified providers via the electronic medical record and mailed letters to the veterans recommending they receive a pneumococcal vaccine. We also wrote orders for the appropriate pneumococcal vaccine that expired after 90 days. Among the virtual clinic cohort, 38% (38/99) of patients received the recommended vaccine within 180 days. Concurrent with our intervention, the Veterans Health Administration deployed a system-wide pneumococcal vaccine clinical reminder that incorporated recent PCV13 recommendations. To discern any effect of the virtual clinic

***Corresponding Author:** Federico Perez MD; ID Section/GRECC, Louis Stokes Cleveland Department of Veterans Affairs Medical Center, 10701 East Blvd., Cleveland, OH 44106, USA; Telephone: +1 216-791-3800, ext. 6385; Fax: +1 216-229-2403; federico.perez@va.gov.

Charles M. Burns, University Hospitals Cleveland Medical Center, Department of Medicine 11100 Euclid Ave., Cleveland, Ohio 44106 USA; Telephone: +1 216-844-1000, charles.burns@uhhospitals.org

Richard Banks, GRECC 111C(W), LSCVAMC, 10701 East Blvd., Cleveland, Ohio 44106 USA; Telephone: +1 216-791-3800, Richard.Banks2@va.gov

Brigid M. Wilson, GRECC 111C(W), LSCVAMC, 10701 East Blvd., Cleveland, Ohio 44106 USA; Telephone: +1 216-791-3800, Brigid.Wilson@va.gov

Rebecca R. Carter, Department of Epidemiology & Biostatistics, Case Western Reserve University School of Medicine, 10900 Euclid Blvd., Cleveland, Ohio 44106-4945 USA; Telephone: +1 216-791-3800, rrc10@case.edu

Robin L. P. Jump M.D., Ph.D. GRECC 111C(W), Louis Stokes Cleveland VA Medical Center, 10701 East Blvd., Cleveland, Ohio 44106 USA; Telephone: +1 216-791-3800, ext 4788; Fax: +1 216-229-2403; robin.jump@va.gov

Disclosure Statement

All other authors report no conflicts of interest.

beyond that of the clinical reminder, we compared the rate of PCV13 vaccinations among all HIV-positive veterans at our institution to the equivalent population from 2 other VA medical centers in Ohio. With consideration of the VHA's system-wide clinical reminder, the proportion of HIV-positive patients who received PCV13 in the first 90 days following the virtual clinic intervention was greater at our facility compared to another Ohio VA medical center ($P < 0.05$). The virtual clinic improved the pneumococcal vaccine coverage among HIV-positive veterans. These outcomes suggest that even in conjunction with a system-wide clinical reminder, the virtual clinic strategy improves vaccination rates among a high-risk population.

Keywords

Human immunodeficiency virus; immunization; pneumococcal vaccines; 13-valent pneumococcal vaccines; 23-valent pneumococcal capsular polysaccharide vaccine; electronic health record

Introduction

Pneumococcal vaccines are important for people living with HIV (Cohen et al., 2010; Peñaranda et al., 2007). Beyond the barriers that negatively affect most adult vaccinations such as lack of awareness, misinformation, and costs, people living with HIV face additional barriers (Armstrong, Berlin, Schwartz, Propert, & Ubel, 2001; Bridges et al., 2015; Hurley et al., 2014; Johnson, Nichol, & Lipczynski, 2008). These include worsening of their HIV disease, immune compromised reducing vaccine efficacy, inadequate or unstable living arrangements (Aidala et al., 2015) as well as variation in insurance reimbursement or lack thereof (Aidala et al., 2015; Eaton, Kulczycki, Saag, Mugavero, & Raper, 2015; Harrison et al., 2016).

Previously, we used a "virtual clinic" to improve pneumococcal vaccinations among asplenic patients at our Veterans Affairs (VA) medical center (Jump et al., 2015). The virtual clinic identified individuals who were not current with their pneumococcal vaccination and supported vaccinating these individuals without substantially increasing the workload of the primary provider. Here, we describe implementation of the virtual clinic for patients with HIV, with the intent to increase the proportion of those current for the pneumococcal vaccines, PCV13 and PPSV23.

Methods

To identify veterans living with HIV, we queried our local Veterans Health Administration (VHA) database using the following International Classification of Diseases (ICD) codes: 042 and 795.71 for ICD-9; B20, B97.35, O98.7 and Z21 for ICD-10. Inclusion criteria were a diagnosis of HIV at least three months prior to the study intervention, a residential postal address in Ohio and at least one in-person visit to a VA clinic or hospital in our catchment area in the prior two years. The exclusion criteria were a diagnosis of active immune reconstitution inflammatory syndrome, transfer of care to a VA medical center outside of our catchment area, or hospice care. We used the VHA database as well as the electronic medical record to assess whether these individuals had previously received PCV13 and PPSV23, including the number and time intervals for PPSV23.

In May 2015, HIV-positive patients that were not current with either PCV13 or PPSV23 and met our inclusion criteria were enrolled into a virtual clinic, as previously described (Jump et al., 2015). Briefly, an infectious disease physician reviewed the medical record, notified providers via a note in the electronic medical record and mailed letters to patients recommending a pneumococcal vaccine. The note in the electronic medical record specified the vaccine recommended and designated the primary provider as a cosigner. The letters provided information on pneumococcal vaccines, recommended getting the vaccine and encouraged recipients to either make an appointment or discuss the vaccine with their primary provider at their next appointment. Additionally, we provided the appropriate vaccine information statements for PCV13 or PPSV23, and a list of regional VA clinics and their addresses (www.cdc.gov/vaccines/hcp/vis). For veterans who received HIV care outside of the VA, the infectious disease physician placed an order for the appropriate pneumococcal vaccine in the electronic medical record; these orders expired after 90 days.

The primary outcome was administration of the appropriate pneumococcal vaccination within 180 days of the virtual clinic intervention. For those who received the vaccine, we determined the clinic location. For those who did not receive a pneumococcal vaccine, we reviewed the electronic medical record for reasons why the vaccine may not have been given.

Concurrent with our virtual clinic intervention, in May 2015 the Veterans Health Administration updated a national clinical reminder about pneumococcal vaccines to include recent recommendations for PCV13. The updated clinical reminder, which replaced a locally implemented tool that addressed only PPSV23, did not require training or education prior to implementation by end-users. To assess the influence of the virtual clinic intervention beyond that of the clinical reminder, we compared rates of PCV13 vaccination among equivalent HIV-positive populations at two other VA medical centers in Ohio, querying the VHA database as described above. We used a test of proportions to compare PCV13 vaccination rates among unvaccinated patients across sites (R Version 3.1.1; Vienna, Austria; R Development Core Team, 2012).

The Institutional Review Board (IRB) approved the research protocol.

Results

A total of 255 veterans living with HIV were identified in the local VHA database. Of those, 150 (59%) were current for both PCV13 and PPSV23 vaccinations and 6 did not meet the inclusion criteria. The remaining individuals ($n = 99$) had either not received PCV13 or had received less than two doses of PPSV23 over five years. They were enrolled in the virtual clinic. Within the 180-day observation period, 38% (38/99) of the virtual clinic cohort received either PCV13 (28/38) or PPSV23 (10/38) (Figure 1). Most of these individuals (34/38; 89%) received their vaccine at a primary care appointment. For the 62% (61/99) of individuals who did not receive a pneumococcal vaccine during the 180-day observation period, 32 (32/61; 52%) did not have a medical visit scheduled during the study period and 29 (29/61; 48%) had a medical appointment but did not receive the recommended vaccination. Among these, 7 declined the vaccine, 1 received the incorrect pneumococcal

vaccine, 1 reported receiving the vaccine outside the VA, 1 vaccination was deferred by the provider, and 19 patients were not vaccinated for reasons not documented.

In the 180 days following the virtual clinic intervention, the proportion of HIV-positive veterans at our facility who received PCV13 increased from a baseline of 68% (174/255) to 80% (202/254). We compared the rates of PCV13 vaccination among patients with HIV at 2 other VA medical centers in Ohio (Figure 2). Facility B had a high proportion of their HIV-positive population vaccinated with PCV13 at baseline (80%; 149/187); this increased slightly during the observation period (81%; 149/184). Facility C began the observation period with 54% (100/184) of their HIV-positive population vaccinated with PCV13 at baseline. After 180 days, this increased to 63% (115/182). Overall, in the 180 days following the virtual clinic intervention and the concurrent deployment of an updated pneumococcal vaccine clinical reminder, improvement in the PCV13 vaccination rate at our institution was slightly higher compared to Facility C (12% and 9% respectively). Furthermore, in the first 90 days following the virtual clinic intervention, the proportion of unvaccinated patients in our facility who received PCV13 was significantly higher compared to Facility C (22/81 vs. 10/84, $P < 0.05$ using 2-sample test of proportions).

Discussion

At our VA medical center, the proportion of HIV-positive veterans who are current for pneumococcal vaccinations increased after the inception of the virtual clinic. This occurred even though the baseline rate of pneumococcal vaccination (93%) for our population exceeded the national immunization goals for high-risk individuals (60%) (Healthypeople.gov). Furthermore, the effect of the virtual clinic on pneumococcal vaccination was noticeable beyond that of the concurrently released national clinical reminder for pneumococcal vaccination.

Factors related to healthcare systems, healthcare workers and patient education all influence vaccinations. Standing orders generally improve vaccination rates, although these are influenced by practice-dependent factors such as access to an electronic medical record, teamwork and staff education levels (Albert, Nowalk, Yonas, Zimmerman, & Ahmed, 2012). Healthcare workers, due to competing priorities and insufficient time to choose the appropriate pneumococcal vaccine may also contribute to missed opportunities (Badertscher, Morell, Rosemann, & Tandjung, 2012; Bridges et al., 2015; Johnson et al., 2008). Providers' recommendations for vaccination, however, have a strong influence on vaccine acceptance (Armstrong et al., 2001; Winston, Wortley, & Lees, 2006).

Although limited to a relatively small cohort of individuals at a single VA medical center, the virtual clinic addressed several of these factors. It reduced the burden on primary providers to assess the electronic medical record for previous pneumococcal vaccinations and to parse the indications and timing for administration of PCV13 and PPSV23. We estimate that the time spent to implement the virtual clinic intervention was approximately 5-10 minutes per patient reviewed, exclusive of the time needed to develop protocols to query the database.

The virtual clinic also attempted to inform and educate patients through the letters sent to patients. Despite this, 62% (61/99) of the patients in the virtual clinic did not receive the recommended pneumococcal vaccine within the 180-day observation period. Of those, 32 patients did not have medical visits, suggesting that passive education as patient letters may be insufficient to motivate patients to obtain vaccination. These findings underscore the continued need for primary providers to serve as active proponents for vaccination.

The results of this study suggest that a virtual clinic is a feasible strategy to improve pneumococcal vaccination rates in patients with HIV, even when there is a high proportion individuals who are vaccinated at baseline. This approach may enhance appropriate vaccination coverage among other groups of patients at high-risk for pneumococcal disease.

Acknowledgments

Funding

This work was supported by an educational grant from Pfizer (RJ, FP). This work was also supported in part by funds from the Geriatric Research Education and Clinical Centers (GRECC) in Veterans Integrated Service Network (VISN) 10 (FP, RB, BW, RJ) and from the National Institutes of Health (NIH), through the Clinical and Translational Science Collaborative of Cleveland (UL1TR000439) from the National Center for Advancing Translational Sciences (NCATS) component of the NIH and NIH Roadmap for Medical Research (FP). The content is solely the responsibility of the authors and does not necessarily represent the official views of the U.S. Department of Veterans Affairs, the NIH or the United States Government.

RLPJ and FP have grant support from Pfizer.

References

- Aidala AA, Wilson MG, Shubert V, Gogolishvili D, Globerman J, Rueda S, Rourke SB. Housing Status, Medical Care, and Health Outcomes Among People Living With HIV/AIDS: A Systematic Review. *American Journal of Public Health*. 2015; 106(1):e1–e23. <https://doi.org/10.2105/AJPH.2015.302905>. [PubMed: 26562123]
- Albert SM, Nowalk MP, Yonas MA, Zimmerman RK, Ahmed F. Standing orders for influenza and pneumococcal polysaccharide vaccination: Correlates identified in a national survey of U.S. Primary care physicians. *BMC Family Practice*. 2012; 13:22. <https://doi.org/10.1186/1471-2296-13-22>. [PubMed: 22433118]
- Armstrong K, Berlin M, Schwartz JS, Probert K, Ubel PA. Barriers to influenza immunization in a low-income urban population. *American Journal of Preventive Medicine*. 2001; 20(1):21–25. [https://doi.org/10.1016/S0749-3797\(00\)00263-4](https://doi.org/10.1016/S0749-3797(00)00263-4).
- Badertscher N, Morell S, Rosemann T, Tandjung R. General practitioners' experiences, attitudes, and opinions regarding the pneumococcal vaccination for adults: a qualitative study. *International Journal of General Medicine*. 2012; 5:967–974. <https://doi.org/10.2147/IJGM.S38472>. [PubMed: 23204861]
- Bridges CB, Hurley LP, Williams WW, Ramakrishnan A, Dean AK, Groom AV. Meeting the Challenges of Immunizing Adults. *American Journal of Preventive Medicine*. 2015; 49(6):S455–S464. <https://doi.org/10.1016/j.amepre.2015.08.014>. [PubMed: 26382294]
- Cohen AL, Harrison LH, Farley MM, Reingold AL, Hadler J, Schaffner W, Active Bacterial Core Surveillance Team. Prevention of invasive pneumococcal disease among HIV-infected adults in the era of childhood pneumococcal immunization. *AIDS (London, England)*. 2010; 24(14):2253–2262. <https://doi.org/10.1097/QAD.0b013e32833d46fd>.
- Eaton EF, Kulczycki A, Saag M, Mugavero M, Raper JL. Immunization Costs and Programmatic Barriers at an Urban HIV Clinic. *Clinical Infectious Diseases*. 2015; 61(11):1726–1731. <https://doi.org/10.1093/cid/civ637>. [PubMed: 26224001]

- Harrison, N., Poepl, W., Herkner, H., Tillhof, KD., Grabmeier-Pfistershammer, K., Rieger, A., Lagler, H. Predictors for and coverage of influenza vaccination among HIV-positive patients: a cross-sectional survey. *HIV Medicine*. 2016. <https://doi.org/10.1111/hiv.12483>
- Healthy People. Immunization and Infectious Diseases. 2020. Retrieved July 11, 2015, from <http://www.healthypeople.gov/2020/topics-objectives/topic/immunization-and-infectious-diseases/objectives#4658>
- Hurley LP, Bridges CB, Harpaz R, Allison MA, O'Leary ST, Crane LA, Kempe A. U.S. Physicians' Perspective of Adult Vaccine Delivery. *Annals of Internal Medicine*. 2014; 160(3):161. <https://doi.org/10.7326/M13-2332>. [PubMed: 24658693]
- Johnson DR, Nichol KL, Lipczynski K. Barriers to Adult Immunization. *The American Journal of Medicine*. 2008; 121(7):S28–S35. <https://doi.org/10.1016/j.amjmed.2008.05.005>.
- Jump RL, Banks R, Wilson B, Montpetite MM, Carter R, Phillips S, Perez F. A Virtual Clinic Improves Pneumococcal Vaccination for Asplenic Veterans at High Risk for Pneumococcal Disease. *Open Forum Infectious Diseases*. 2015; 2(4) <https://doi.org/10.1093/ofid/ofv165>.
- Peñaranda M, Falco V, Payeras A, Jordano Q, Curran A, Pareja A, Riera M. Effectiveness of Polysaccharide Pneumococcal Vaccine in HIV-Infected Patients: a Case-Control Study. *Clinical Infectious Diseases*. 2007; 45(7):e82–e87. <https://doi.org/10.1086/520977>. [PubMed: 17806042]
- R Development Core Team. R: A language and environment for statistical computing (Version 3.0.2). Vienna, Austria: R Foundation for Statistical Computing; 2013. Retrieved from URL <http://www.R-project.org/>
- Vaccine Information Statement | Pneumococcal Conjugate | VIS | CDC. (n.d.). Retrieved July 10, 2015, from <http://www.cdc.gov/vaccines/hcp/vis/vis-statements/pcv13.html>
- Vaccine Information Statement | Pneumococcal Polysaccharide | VIS | CDC. (n.d.). Retrieved July 11, 2015, from <http://www.cdc.gov/vaccines/hcp/vis/vis-statements/ppv.html>
- Winston CA, Wortley PM, Lees KA. Factors associated with vaccination of medicare beneficiaries in five U.S. communities: Results from the racial and ethnic adult disparities in immunization initiative survey, 2003. *Journal of the American Geriatrics Society*. 2006; 54(2):303–310. <https://doi.org/10.1111/j.1532-5415.2005.00585.x>. [PubMed: 16460383]

Figure 1. Implementation and outcomes of a virtual clinic to improve pneumococcal vaccination in patients with HIV at a VA medical center

The primary outcome was vaccination with the recommended pneumococcal vaccine within the 180-day observation period.

Figure 2. Vaccination rates with PCV13 in patients with HIV following inception of a virtual clinic

Cumulative hazard plot showing the proportion of HIV-positive veterans who were current for PCV13 vaccination from 1/15 through 3/16 at 3 regional VA medical centers. The arrow indicates deployment of a national clinical reminder about pneumococcal vaccines that included recent PCV13 recommendations. The shaded area indicates the 180-day observation period following the virtual clinic intervention at our VA (Facility A; dashed line). The solid and dotted lines show data from Facility B and C, respectively. These are both VA medical centers in Ohio with clinics that care for HIV-positive veterans staffed by infectious disease physicians.