Clinicians’ and Pharmacists’ Reported Implementation of Vaccination Practices for Adults

Chelsea S. Lutz, MPH1,2, David K. Kim, MD1, Carla L. Black, PhD, MPH1, Sarah W. Ball, ScD, MPH3, Rebecca G. Devlin, MA3, Anup Srivastav, BVScandAH, MPVM, PhD4, Amy Parker Fiebelkorn, MSN, MPH1, and Carolyn B. Bridges, MD1,5

1Immunization Services Division, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia
2Oak Ridge Institute for Science and Education, U.S. Department of Energy, Washington, District of Columbia
3Abt Associates, Cambridge, Massachusetts
4Leidos Inc., Atlanta, Georgia
5Berry Technology Solutions, Inc., Peachtree City, Georgia

Abstract

Introduction—Despite the proven effectiveness of immunization in preventing morbidity and mortality, adult vaccines remain underutilized. The objective of this study was to describe clinicians’ and pharmacists’ self-reported implementation of the Standards for Adult Immunization Practice (“the Standards”; i.e., routine assessment, recommendation, and administration/referral for needed vaccines, and documentation of administered vaccines, including in immunization information systems).

Methods—Two Internet panel surveys (one among clinicians and one among pharmacists) were conducted during February–March 2017 and asked respondents about their practice’s implementation of the Standards. T-tests assessed associations between clinician medical specialty, vaccine type, and each component of the Standards (March–August 2017).

Results—Implementation of the Standards varied substantially by vaccine and provider type. For example, >80.0% of providers, including obstetrician/gynecologists and subspecialists, assessed...
for and recommended influenza vaccine. However, 24.3% of obstetrician/gynecologists and 48.9% of subspecialists did not stock influenza vaccine for administration. Although zoster vaccine was recommended by >89.0% of primary care providers, <58.0% stocked the vaccine; by contrast, 91.6% of pharmacists stocked zoster vaccine. Vaccine needs assessments, recommendations, and stocking/referrals also varied by provider type for pneumococcal; tetanus, diphtheria, acellular pertussis; tetanus diphtheria; human papillomavirus; and hepatitis B vaccines.

Conclusions—This report highlights gaps in access to vaccines recommended for adults across the spectrum of provider specialties. Greater implementation of the Standards by all providers could improve adult vaccination rates in the U.S. by reducing missed opportunities to recommend vaccinations and either vaccinate or refer patients to vaccine providers.

INTRODUCTION

Despite the proven effectiveness of immunization in preventing morbidity and mortality, adult vaccinations remain underutilized. Vaccination coverage rates for U.S. adults are low, leaving millions without the benefits that vaccines afford by preventing illness and complications from many serious infectious diseases. As the proportion of U.S. adults aged 65 years and older increases, the public health impact of illness, hospitalization, disability, and death from vaccine-preventable diseases will likely increase.

The Advisory Committee on Immunization Practices (ACIP) makes recommendations for the use of vaccines in the U.S. The National Coalition for Adult Immunization developed standards for implementing ACIP recommendations for adults in 1990. In response to changes in the adult immunization practice environment, such as increases in the number of vaccinations provided by pharmacists and community vaccinators, the National Vaccine Advisory Committee updated the Standards for Adult Immunization Practice (“the Standards”) in 2014. The Standards call on all providers to assess vaccination status at every clinical encounter, recommend needed vaccines, offer and administer vaccines or refer patients elsewhere for vaccination, and document administered vaccinations in an immunization information system (IIS), where available.

Although previous studies have reported on assessment, recommendation, and administration practices for adult vaccination among primary care physicians, the present study also included obstetricians/gynecologists (OB/GYNs), subspecialists, and pharmacists, and assessed multiple vaccine types. This study describes clinicians’ and pharmacists’ self-reported implementation of the Standards for adult patients seen at their practices for influenza, 13-valent pneumococcal conjugate (PCV13); 23-valent pneumococcal polysaccharide (PPSV23); herpes zoster (zoster); tetanus, diphtheria, acellular pertussis (Tdap); tetanus and diphtheria toxoids (Td); human papillomavirus (HPV); and hepatitis B vaccinations.

METHODS

Study Sample

Two Internet panel surveys were conducted among clinicians and pharmacists in the U.S. using the current membership roster of Medscape, a medical website managed by WebMD
Health Professional Network. The Medscape membership roster comprises the largest active healthcare provider audience in the U.S., including 675,000 physicians, 183,260 physician assistants and nurse practitioners, and 153,040 pharmacists. These surveys were developed jointly by Centers for Disease Control and Prevention (CDC) subject matter experts and Abt Associates. They were conducted during February–March 2017 and asked respondents about their practices’ assessment, recommendation, administration/referral, and documentation practices for recommended adult vaccines. Although clinician and pharmacist surveys assessed the same measures, surveys were administered separately because the wording differed slightly in some questions to account for differences in workflow between the two professions. Participants (physicians, physician assistants, or nurse practitioners in primary care internal medicine [IM], family medicine [FM], OB/GYN, or other direct patient care subspecialty [e.g., cardiology, nephrology], and pharmacists) were recruited via e-mail invitation using opt-in, nonprobability (convenience) sampling. Quotas were put in place to obtain a minimum number of respondents from each specialty and profession and reminder messages were sent to nonresponding members in subgroups that were difficult to fill (i.e., OB/GYN and subspecialist physician assistants).

Medscape members who accepted the survey invitation were taken to the survey website, which was optimized for a mobile platform. Upon accessing the web survey, members answered a series of questions concerning occupation, training status, and in- or outpatient practice setting to determine eligibility. Only clinicians and pharmacists who had completed all education and training and worked in an outpatient setting were eligible to participate. This methodology did not allow calculation of response rates because the opt-in mechanism did not enumerate the denominator at each stage of sampling.

### Measures

Respondents were asked if they or any staff in their practice routinely conducted assessments, recommended, or gave referrals for any of the following adult vaccines: influenza, PCV13, PPSV23, zoster, Tdap, Td, HPV, and hepatitis B (Table 1). Respondents were also asked if anyone in their practice routinely administered vaccines to adult patients; those who responded yes were asked which vaccines were stocked and if any administered doses were documented in an IIS. “Stock” was used as a proxy for “administer.” Comparison of responses for IM, FM, OB/GYN, and subspecialist providers regarding their practice’s assessment, recommendation, stocking, and referral practices for each vaccine type were reported; pharmacist responses were also reported. As routine documentation in an IIS was not expected to vary between vaccine types, respondents were not asked about documentation practices for specific vaccines, and only overall rates are reported.

Human subjects coordinators within Abt Associates’ IRB determined that this project was non-research and did not require additional review by CDC’s IRB.

### Statistical Analysis

Analyses were conducted from March to August 2017. To produce estimates more reflective of the national clinician and pharmacist populations, each sample was balance-weighted using a raking calibration procedure that aligned the responding sample to national
benchmarks for respondents’ age, sex, race/ethnicity, occupation, work setting, and Census region.\textsuperscript{15,16} The raking procedure was used to minimize coverage, selection, and nonresponse bias; the calibrated weights also adjusted for disproportional distribution of respondents by demographic and geographic characteristics. All survey estimates were computed using these final weights. Control totals were obtained from the U.S. Bureau of Labor Statistics Occupational Employment and Wage Estimates\textsuperscript{17} and the Current Population Survey.\textsuperscript{18}

Point estimates and 95\% CIs were conducted using SAS, version 9.3 and SUDAAN, version 11.0 to evaluate the proportion of respondents who self-reported implementation of each Standard at their practice. \textit{T}-tests were used to assess associations between clinician medical specialty and each component of the Standards, with significance defined as \( p<0.05 \). Statistical measures were calculated under the assumption of random sampling and should only be interpreted as guides to assessing the associations from this nonprobability sample.

\section*{RESULTS}

In total, 1,768 clinicians and 261 pharmacists completed their respective surveys. After excluding 54 (3.1\%) clinician respondents that did not meet inclusion criteria, 1,714 clinicians and 261 pharmacists were included for analysis. Among clinicians, 25.5\% were IM practitioners, 30.7\% FM, 23.6\% OB/GYN, and 20.2\% subspecialists (Table 2). Additional practice characteristics are reported in Table 2. For one or more vaccines, 97.0\% of clinicians reported their practice conducted vaccine assessments, 94.7\% recommended vaccines, 83.5\% administered vaccines, 79.7\% referred patients, and 53.4\% documented administered vaccines in an IIS (Table 3). Among pharmacists, for one or more vaccines, 97.4\% reported their practice conducted vaccine assessments, 87.3\% recommended, 93.3\% administered vaccines, 70.0\% referred, and 53.2\% documented administered vaccines in an IIS.

More FM respondents reported their practice assessed for HPV (68.9\%) and Tdap (94.4\%) vaccination status compared with IM respondents (60.9\% and 87.7\%, respectively; Table 4). More IM respondents reported that their practice assessed patient vaccination status for all vaccine types, except HPV and hepatitis B, compared with OB/GYN respondents; more OB/GYN respondents (88.9\%) reported assessing for HPV vaccine than IM respondents (60.9\%). Compared with subspecialist respondents, more IM respondents assessed vaccination status for all vaccine types. Pharmacist assessments ranged from 19.4\% for HPV to 93.9\% for influenza vaccine.

Regardless of provider type, the most commonly recommended vaccine was influenza (Table 4). A greater proportion of FM respondents (77.6\%) reported that their practice recommended HPV vaccine compared with IM respondents (68.6\%). More IM respondents reported recommending hepatitis B, zoster, pneumococcal, and Td vaccines compared with OB/GYN respondents; more OB/GYN (91.2\%) than IM (68.6\%) respondents reported recommending HPV vaccine. A greater proportion of IM than subspecialist respondents reported their practice recommended each vaccine type. Recommendations among pharmacists ranged from 38.7\% for HPV to 86.7\% for influenza vaccine.
A greater proportion of FM than IM respondents reported stocking PCV13, Tdap, HPV, and hepatitis B vaccines (Table 4). IM respondents were more likely to report that their practice stocked each vaccine type compared with OB/GYN respondents, with the exception of HPV vaccine, which OB/GYNs stocked more often (71.4% vs 51.6%). Compared with subspecialist respondents, a greater proportion of IM respondents reported stocking all vaccine types. The proportion of pharmacists who reported their practice stocked vaccines ranged from 29.0% for Td to 92.6% for influenza vaccine.

A greater proportion of FM (55.2%) than IM respondents (43.6%) reported referring patients for zoster vaccine (Table 4). More OB/GYNs reported that their practice referred patients for vaccination for all vaccine types except HPV and hepatitis B compared with IM respondents. A greater proportion of IM than subspecialist respondents reported their practice referred patients for all vaccine types except hepatitis B. Less than 50% of pharmacists reported their practice referred patients for all vaccine types.

Most clinicians reported referring patients to a pharmacy (56.1%) or health department (50.5%); most pharmacists reported referring patients to a medical provider (53.7%) or a health department (45.9%; Table 3).

Among clinicians who reported that their practice did not stock the respective vaccines, a greater proportion of FM than IM respondents reported referring for PCV13 (80.3% vs 58.8%), zoster (85.3% vs 72.2%), and HPV (71.4% vs 56.5%) vaccines (Table 4). A greater proportion of OB/GYNs than IM respondents reported referring for Td (52.9% vs 29.6%), Tdap (80.6% vs 59.2%), HPV (73.6% vs 56.5%). More subspecialists than IM respondents reported that their practice referred patients for Td (43.1% vs 29.6%), whereas more IM than subspecialty respondents reported that their practice referred patients for hepatitis B (71.9% vs 52.4%) and HPV (56.5% vs 44.1%) vaccines. Among pharmacists, the proportion who reported referring patients elsewhere if their practice did not stock the vaccine ranged from 40.0% for Td to 69.2% for influenza vaccines.

**DISCUSSION**

This survey assessed implementation of the Standards for Adult Immunization Practice for vaccines routinely recommended for adults across a range of provider types. Although influenza vaccination was widely available across providers, access to other vaccines was more limited. Furthermore, despite the importance of vaccination assessments in ensuring adults have the opportunity to be fully vaccinated, reported implementation of this critical step in the immunization process varied considerably by provider and vaccine type.

IM respondents reported high rates of assessing, recommending, and stocking for most vaccine types. Higher stocking rates likely explain low referral rates among this group. However, the results indicate that among practices that do not stock PCV13, zoster, Tdap, Td, or HPV vaccines, IM practices reported referring adult patients to another location for vaccination less often than other providers. Although provider recommendation is consistently cited as a primary factor in determining whether adults choose to be vaccinated, failing to refer patients to a vaccination service provider when the vaccine is not
stocked may undermine the impact of provider recommendations. Although one study found that 79% of physicians reported willingness to refer certain patients to alternative sites for influenza vaccination, the data show that reported rates of routine referrals were generally lower for several vaccines, even among practices that did not stock those vaccines.

Rates of stocking zoster vaccine were particularly low among FM and IM practices (less than 60.0%), even though more than 89.0% of FM and IM respondents reported recommending zoster. Concerns regarding payments for zoster vaccination may partially explain low stocking rates among these providers. The live zoster vaccine, recommended by ACIP for adults aged 60 years and older, is covered under Medicare Part D, a pharmaceutical benefit that provides coverage for vaccines not covered under Part B (which covers influenza and pneumococcal vaccines, hepatitis B vaccine for high-risk patients, and Td for wound management). In addition to the barrier posed to provider billing, patients with Medicare Part D may have substantial out-of-pocket costs and choose to forego vaccination. In contrast to primary care providers, more than 90.0% of pharmacists, whose practices routinely bill Medicare Part D, reported stocking zoster vaccine. It remains to be seen whether patterns for recommending and stocking of a new inactivated subunit zoster vaccine, licensed in October 2017 and recommended by ACIP for adults aged 50 years and older, will differ from the live zoster vaccine.

The results demonstrate that OB/GYN practices were less likely to assess and stock influenza and Tdap vaccines than IM practices. OB/GYNs often assume the role of primary care provider for women of childbearing age, especially pregnant women, for whom influenza and Tdap vaccination are recommended. The estimates for stocking influenza vaccine are consistent with previous reports, whereas the estimates for Tdap stocking/administration among OB/GYNs are comparable with some reports, but higher than others. Provider recommendation accompanied by an offer of vaccine is strongly associated with vaccination coverage in pregnant women. This report suggests a high proportion of OB/GYNs are recommending influenza and Tdap vaccines, yet the percentage of pregnant women who report receiving a recommendation from their provider is much lower. OB/GYNs often report that inadequate insurance payment, cost of stocking vaccines, and lack of patient interest impact their practice’s ability to offer immunizations. These barriers may result in OB/GYN and other specialty practices not stocking vaccines, and highlights the importance of strong referral networks for their patients and encouraging IIS use to determine whether their patients received recommended vaccines.

Subspecialists were least likely to report assessing, recommending, and stocking all vaccine types studied, which is consistent with limited literature. Two studies found that the most common reason for not stocking influenza vaccine among subspecialists was providers’ perceptions that patients would receive the vaccine elsewhere. Even though subspecialty practices may not have the capacity to stock some or most vaccines for adults, patient visits to these providers represent an important opportunity to promote vaccination. Many adults do not have a primary care physician; one study found that more than one quarter of adults relied on a subspecialist for primary care services. Therefore, improving assessments, recommendations, and referrals among subspecialists in particular could help increase adult vaccination coverage, especially among vulnerable adults with chronic medical conditions.
As pharmacists have expanded their adult immunization services, opportunities remain to also expand their implementation of the Standards. Pharmacists are in a unique position to assess vaccination needs, as they are able to identify high-risk patients based on readily available data (e.g., medication prescriptions). Although pharmacists reported high rates of assessment, recommendation, and stocking of influenza, PCV13, PPSV23, and zoster vaccines, they were less likely to implement the Standards for other vaccine types. Pharmacies are convenient and accessible, with expanded hours of operation, and most physicians agree it is helpful for pharmacists to have a role in vaccinating adults. Thus, collaborations between clinicians and pharmacists are important for increasing vaccination coverage. Ensuring effective communication regarding patients’ vaccination, including recording vaccinations in the IIS, is critical to the success of such partnerships. However, both clinicians and pharmacists in this analysis reported suboptimal use of IIS (Table 3), which is consistent with previously reported use of IIS among FM and IM providers. Higher rates have been reported for pharmacists, but these represent the number of states in which pharmacists report to the IIS at all, not the total proportion of pharmacists that do so. Reporting vaccine doses administered to an IIS helps consolidate patient vaccination records, alleviates communication barriers, and allows providers to make more accurate assessments of patient vaccination needs. Other forms of communication between providers, such as including vaccine administration in the medical record and faxing vaccination records to patients’ primary care providers when administered elsewhere, are also important.

Most providers in practices not stocking a particular vaccine reported referring patients to other vaccination service providers. Providers often cite concern regarding payment structure and vaccine affordability as the main barriers to stocking vaccines and providing vaccination services. One study found that more than one third of primary care physicians reported not recommending vaccines to adult patients because they thought the patient’s insurance would not cover vaccination or the patient could be vaccinated more affordably elsewhere. Pharmacies have well-established payment and billing systems, but states’ laws differ regarding which vaccines pharmacists can provide with or without a physician order. Health departments can also be an important access point for vaccinations for adults, but public health funding is limited for adult vaccinations. In addition to these barriers, patients may be subject to provisions in their insurance plans that stipulate coverage only be provided for vaccines given by certain providers; vaccinations given by providers out of their insurance network may not be reimbursed or result in prohibitive out-of-pocket costs for patients.

Limitations

There are limitations to the reported findings. Respondents were asked about implementation of the Standards for the practice where he or she worked—not individual behaviors. Respondents may be unaware of behaviors of others in their practice. The survey also relied on self-report, which may have resulted in an overestimation of implementation of the Standards, as national coverage for adult vaccines does not reflect the high proportion of providers reporting adherence. A nonprobability-based sample was recruited from a list of healthcare providers rather than randomly selected participants, but statistical
measures were calculated under the assumption of random sampling. Estimates of sampling error from nonrandom samples are usually not considered valid. Therefore, the statistical measures of association presented here should be interpreted only as guides to assessing the associations from these nonprobability samples. In addition, the sample of pharmacists is low compared with other national surveys. The representativeness of survey respondents could not be assessed, and results presented may not be generalizable to all U.S. providers in outpatient care settings, despite weight adjustments. Stock was used as a proxy for administer, as it was assumed practices would not stock vaccines that they do not intend to administer. Lastly, documentation practices were not compared across vaccines. However, it is possible that documentation practices may differ for vaccinations given during office visits versus other encounters, such as vaccination-only clinics.

CONCLUSIONS

This analysis highlights gaps in access to routinely recommended adult vaccines across the spectrum of provider specialties and the need to ensure communication among providers regarding vaccinations provided and vaccination needs of their adult patients. It also highlights the need to maintain the capacity of health departments and pharmacies to provide vaccinations for adult patients whose medical provider does not stock one or more recommended vaccines. Improvements to vaccination coverage among adults may be achieved by increasing provider implementation of the Standards.

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Table 1
Internet Panel Survey Question Descriptions, U.S., 2017

| Standard | Description |
|----------|-------------|
| Assess   | “Indicate whether you or other staff routinely perform any of the following vaccination assessment activities for adult patients at the main outpatient practice where you work.” Respondents were presented with 8 options. If respondents selected “no” or “unsure” for all 8 options, they were then asked “at the main outpatient practice where you work, do you or other staff routinely conduct any activities to assess whether adult patients’ vaccinations are up to date?” Respondents were coded as “no” for the Standard “assess” if they also answered “no” to this question. For vaccine-specific assessment, respondents were asked “does the main outpatient practice where you work routinely assess the vaccination status of adult patients for the following vaccines?” Respondents were asked to give a response for each individual vaccine. |
| Recommend | “At the main outpatient practice where you work, do you or other staff recommend any vaccines to adult patients, whether your practice stocks vaccines or not?” For vaccine-specific recommendation, respondents were asked “at the main outpatient practice where you work, do you or other staff recommend the following vaccines for adult patients seen at your practice?” Respondents were asked to give a response for each individual vaccine listed in the table. |
| Administer | “At the main outpatient practice where you work, do you or other staff administer one or more vaccines to adult patients?” Respondents were only asked to give a response overall, not for individual vaccines. |
| Stock     | “At the main outpatient practice where you work, which of the following vaccines are stocked?” Respondents were asked to give a response for each individual vaccine listed in the table. |
| Refer     | “At the main outpatient practice where you work, do you or other staff refer adult patients to another provider or location for vaccination?” For vaccine-specific referrals, respondents were asked “at the main outpatient practice where you work, for which vaccines do you or other staff refer adult patients to another provider or location?” Respondents were asked to give a response for each individual vaccine listed in the table. |
| Document  | “Does the main outpatient practice where you work submit vaccination records for adult patients to the state/city vaccine registry?” Respondents were only asked to give a response overall, not for individual vaccines. |
### Table 2

Practice Characteristics Reported by Clinicians\(^a\) and Pharmacists,\(^b\) U.S., Internet Panel Survey, 2017

| Characteristics                  | n   | Weighted % |
|----------------------------------|-----|------------|
| **Clinicians (n=1,714)**         |     |            |
| Medical specialty                |     |            |
| IM                               | 370 | 25.5       |
| FM                               | 479 | 30.7       |
| OB/GYN                           | 445 | 23.6       |
| Other specialty care             | 408 | 20.2       |
| **Practice setting**             |     |            |
| Private practice office          | 808 | 47.6       |
| Office practice owned by a hospital | 633 | 36.4       |
| Urgent care clinic               | 42  | 2.5        |
| Community health center          | 105 | 6.2        |
| Public health clinic             | 26  | 1.4        |
| VA clinic                        | 29  | 1.9        |
| Other                            | 71  | 4.1        |
| **Number of specialties**        |     |            |
| Single-specialty practice        | 1,143 | 63.6     |
| Multi-specialty practice         | 571  | 36.4       |
| **Practice size**                |     |            |
| Small (1–2 physicians)           | 522  | 29.5       |
| Medium (3–5 physicians)          | 471  | 27.9       |
| Large (≥6 physicians)            | 683  | 42.6       |
| **U.S. Census region**           |     |            |
| Northeast                        | 453  | 19.9       |
| Midwest                          | 330  | 22.6       |
| South                            | 599  | 37.8       |
| West                             | 332  | 19.6       |
| **Pharmacists (n=261)**          |     |            |
| Pharmacy setting                 |     |            |
| Chain drug store                 | 102  | 40.5       |
| Independent community pharmacy   | 56   | 22.0       |
| Supermarket                      | 56   | 20.3       |
| Mass merchant\(^c\)              | 31   | 11.2       |
| Other                            | 16   | 6.0        |
| **Pharmacy size**                |     |            |
| Small (1–2 pharmacists)          | 105  | 39.5       |
| Medium (3-5 pharmacists)         | 140  | 54.7       |
| Characteristics               | n  | Weighted % |
|------------------------------|----|------------|
| Large (≥ 6 pharmacists)      | 16 | 5.9        |
| U.S. Census region           |    |            |
| Northeast                    | 59 | 16.2       |
| Midwest                      | 58 | 24.0       |
| South                        | 91 | 39.9       |
| West                         | 53 | 19.9       |

aClinicians include physicians, nurse practitioners, and physician assistants. Data for clinicians were obtained from the 2017 National Survey of Healthcare Providers Regarding Vaccination Practices for Adults, conducted for the Centers for Disease Control and Prevention by Abt Associates.

bData for pharmacists were obtained from the 2017 National Survey of Pharmacists Regarding Vaccination Practices for Adults, conducted for the Centers for Disease Control and Prevention by Abt Associates.

cMass merchant is a retail store that includes a wide variety of merchandise in addition to the pharmacy.

FM, family medicine; IM, internal medicine; OB/GYN, obstetrics and gynecology; VA, Veterans Affairs.
### Table 3
Reported Implementation of Standards of Adult Immunization Practice by Clinicians and Pharmacists, U.S., Internet Panel Survey, 2017

| Standard                     | Clinicians | Pharmacists |
|------------------------------|------------|-------------|
|                              | n          | Weighted %  | n      | Weighted %  |
| Standards implemented for any vaccine |            |             |        |             |
| Assess                       | 1,657      | 97.0        | 253    | 97.4        |
| Recommend                    | 1,620      | 94.7        | 227    | 87.3        |
| Administer                   | 1,392      | 83.5        | 243    | 93.3        |
| Refer                        | 1,397      | 79.7        | 180    | 70.0        |
| Document                     | 804        | 53.4        | 98     | 53.2        |
| Assess for specific vaccines |            |             |        |             |
| Influenza                    | 1,589      | 93.5        | 243    | 93.9        |
| PCV13                        | 1,118      | 69.1        | 220    | 83.9        |
| PPSV23                       | 1,161      | 72.2        | 222    | 85.1        |
| Zoster                       | 1,153      | 70.4        | 226    | 88.0        |
| Tdap                         | 1,294      | 78.5        | 156    | 61.8        |
| Td                           | 1,063      | 65.2        | 74     | 28.9        |
| HPV                          | 1,054      | 62.8        | 50     | 19.4        |
| Hepatitis B                  | 1,146      | 69.1        | 88     | 34.7        |
| Recommend specific vaccines  |            |             |        |             |
| Influenza                    | 1,591      | 93.3        | 226    | 86.7        |
| PCV13                        | 1,155      | 70.5        | 209    | 80.4        |
| PPSV23                       | 1,225      | 75.2        | 212    | 81.0        |
| Zoster                       | 1,309      | 79.0        | 223    | 85.9        |
| Tdap                         | 1,337      | 80.9        | 183    | 72.5        |
| Td                           | 1,023      | 62.4        | 109    | 43.1        |
| HPV                          | 1,163      | 69.8        | 97     | 38.7        |
| Hepatitis B                  | 1,219      | 73.7        | 121    | 48.0        |
| Stock specific vaccines      |            |             |        |             |
| Influenza                    | 1,329      | 80.3        | 241    | 92.6        |
| PCV13                        | 809        | 51.8        | 230    | 88.8        |
| PPSV23                       | 852        | 54.4        | 231    | 88.8        |
| Zoster                       | 620        | 38.7        | 238    | 91.6        |
| Tdap                         | 1,091      | 66.7        | 206    | 78.2        |
| Td                           | 789        | 50.7        | 74     | 29.0        |
| HPV                          | 881        | 54.3        | 91     | 35.3        |
| Hepatitis B                  | 844        | 54.4        | 136    | 51.4        |
| Refer adults for specific vaccines |        |             |        |             |
| Influenza                    | 587        | 31.1        | 46     | 17.1        |
| Standard       | Clinicians | Pharmacists |
|---------------|------------|-------------|
|               | n          | Weighted %  | n          | Weighted %  |
| PCV13         | 680        | 37.5        | 41         | 16.6        |
| PPSV23        | 694        | 37.5        | 44         | 17.6        |
| Zoster        | 985        | 56.5        | 41         | 15.9        |
| Tdap          | 564        | 31.5        | 173        | 64.8        |
| Td            | 533        | 28.7        | 87         | 35.2        |
| HPV           | 604        | 33.1        | 113        | 45.7        |
| Hepatitis B   | 687        | 37.9        | 93         | 38.6        |

Places referred for vaccination

|                      | n          | Weighted %  | n          | Weighted %  |
|----------------------|------------|-------------|------------|-------------|
| Health department    | 867        | 50.5        | 115        | 45.9        |
| Pharmacy/another pharmacy | 971      | 56.1        | 76         | 30.0        |
| Another HCP/medical provider | 719     | 36.4        | 134        | 53.7        |
| Travel clinic        | 590        | 36.5        | 60         | 22.2        |
| Outpatient clinic within pharmacy | N/A   | N/A         | 42         | 17.6        |
| Other                | 26         | 1.2         | 2          | 0.6         |

Note: Respondents who reported “unsure” were excluded.

a Clinicians include physicians, nurse practitioners, and physician assistants. Data for clinicians were obtained from the 2017 National Survey of Healthcare Providers Regarding Vaccination Practices for Adults, conducted for the Centers for Disease Control and Prevention by Abt Associates.

b Data for pharmacists were obtained from the 2017 National Survey of Pharmacists Regarding Vaccination Practices for Adults, conducted for the Centers for Disease Control and Prevention by Abt Associates.

HCP, healthcare provider; hepatitis B, hepatitis B vaccine; influenza, seasonal influenza vaccine; HPV, human papillomavirus vaccine; N/A, not applicable; PCV13, 13-valent pneumococcal conjugate vaccine; PPSV23, 23-valent pneumococcal polysaccharide vaccine; Td, tetanus and diphtheria toxoids; Tdap, tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis; zoster, herpes zoster vaccine.
| Table 4 Vaccination Practices Among Clinicians and Pharmacists for Select Vaccines, U.S., Internet Panel Survey, 2017 |
|----------------------------------|----------|
| **Influenza** | **PCV13** | **PPSV 23** | **Zoster** | **Td/app** | **Td** | **HPV** | **Hepatitis B** |
| **Standard** | d | p<0.001 | p<0.001 | p<0.001 | p<0.001 | p<0.001 | p<0.001 |
| **Amenities** | | | | | | | |
| **Clinicians** | | | | | | | |
| IM | | | | | | | |
| OB/GYN | | | | | | | |
| Other specialty | | | | | | | |
| Pharmacists | | | | | | | |
| Reimbursement | | | | | | | |
| Stock | | | | | | | |

**Notes:**
- d = difference is significant at p<0.001.
- The 95% confidence interval (CI) for each estimate is given in parentheses.

**Abbreviations:**
- IM = Internal Medicine
- OB/GYN = Obstetrics and Gynecology
- Other specialty = Other specialties
- Pharmacies = Pharmacists
- Reimbursement = Reimbursement
- Stock = Stock

**Data Source:**
- Data from an Internet Panel Survey conducted by the authors.

**References:**
- Lutz et al., Am J Prev Med. Author manuscript; available in PMC 2019 September 01.
| Vaccine | PCV13 | PPSV23 | Zoster | Tdap | Tet | HPV | Hepatitis B |
|---------|-------|--------|--------|------|-----|-----|-------------|
| Ref.    |       |        |        |      |     |     |             |
| Clinicians |     |        |        |      |     |     |             |
| IM      | 369   | 18.6   | (14.5, 23.5) | 369   | 25.2 | (20.5, 30.5) | 370   | 21.8 | (17.4, 26.9) | 370   | 41.6 | (36.1, 49.3) | 370   | 21.5 | (17.2, 26.5) | 370   | 16.8 | (13.6, 21.5) | 369   | 33.3 | (28.2, 38.9) | 369   | 26.4 | (22.1, 32.1) |
| FM      | 478   | 21.4   | (17.5, 26.0) | 478   | 26.6 | (22.3, 31.5) | 478   | 33.4 | (29.4, 28.5) | 478   | 58.2 | (50.1, 66.2) | 478   | 35.5 | (30.5, 40.5) | 478   | 20.5 | (16.6, 25.5) | 478   | 19.3 | (15.6, 23.7) | 479   | 29.9 | (24.5, 35.7) |
| OBGYN   | 463   | 37.1   | (31.8, 42.8) | 463   | 58.3 | (52.7, 63.8) | 463   | 61.8 | (56.2, 67.1) | 463   | 69.9 | (64.7, 74.7) | 441   | 46.8 | (41.2, 52.6) | 412   | 45.2 | (39.6, 50.9) | 444   | 30.7 | (25.7, 36.7) | 444   | 26.2 | (22.0, 31.0) |
| Other specialty | 468 | 39.1 | (34.4, 43.9) | 468 | 40.3 | (35.9, 44.6) | 467 | 40.2 | (35.7, 44.9) | 467 | 50.4 | (43.9, 56.9) | 466 | 43.5 | (37.2, 50.0) | 486 | 37.2 | (32.4, 42.4) | 486 | 36.7 | (31.9, 41.5) |
| Pharmacist | 260 | 70.4 | (61.0, 79.8) | 260 | 58.8 | (48.1, 68.7) | 260 | 66.6 | (52.8, 78.4) | 260 | 74.5 | (62.1, 82.7) | 260 | 81.2 | (68.3, 79.2) | 260 | 81.9 | (68.7, 79.2) | 260 | 71.9 | (61.9, 80.1) |
| FM | 32 | 80.2 | (74.8, 85.6) | 107 | 66.0 | (52.6, 78.1) | 102 | 73.0 | (62.1, 83.7) | 102 | 83.3 | (74.0, 90.9) | 60 | 74.1 | (60.3, 85.1) | 136 | 70.0 | (66.5, 73.5) | 151 | 71.4 | (61.1, 81.8) | 115 | 80.4 | (71.4, 87.4) |
| OBGYN | 106 | 84.0 | (75.0, 94.1) | 359 | 64.1 | (57.0, 71.0) | 359 | 69.2 | (62.5, 75.6) | 357 | 79.8 | (76.9, 84.1) | 154 | 80.6 | (72.8, 86.5) | 328 | 52.9 | (43.5, 63.0) | 118 | 73.6 | (62.8, 82.1) | 300 | 77.1 | (67.5, 87.1) |
| Other specialty | 208 | 70.4 | (61.9, 78.8) | 307 | 55.3 | (48.2, 62.8) | 294 | 61.5 | (53.8, 69.3) | 294 | 69.6 | (62.0, 77.6) | 316 | 58.7 | (51.5, 66.2) | 325 | 58.1 | (50.2, 66.5) | 329 | 58.4 | (50.2, 66.5) | 329 | 58.4 | (50.2, 66.5) |
| Pharmacists | 19 | 69.2 | (48.9, 89.6) | 14 | 48.9 | (27.5, 70.6) | 29 | 47.7 | (24.5, 71.0) | 29 | 65.0 | (43.3, 86.7) | 54 | 64.7 | (48.4, 78.9) | 164 | 48.0 | (31.9, 64.6) | 166 | 59.1 | (31.6, 70.5) | 122 | 60.2 | (39.8, 79.4) |

Note: Boldface indicates statistical significance (p < 0.05 by t-test comparing to the reference group). \( \text{Ass} = \text{Respondents were asked: Does the main outpatient practice where you work routinely assess the vaccination status of adult patients for the following vaccines?} \)
\( \text{Respondents were asked to give a response for each individual vaccine (yes/no/unsure).} \) Respondents who selected unsure were excluded. \( \text{Recommend} = \text{Respondents were asked: At the main outpatient practice where you work, do you or other staff recommend the following vaccines for adult patients seen at your practice?} \) Respondents were asked to give a response for each individual vaccine (yes/no/unsure). Respondents who selected unsure were excluded. Stock = \( \text{Respondents were asked: At the main outpatient practice where you work, of which the following vaccines are stocked?} \) Respondents were asked to give a response for each individual vaccine (yes/no/unsure). Respondents who selected unsure were excluded. \( \text{Refer} = \text{Respondents were asked: At the main outpatient practice where you work, for which vaccines do you or other staff refer adult patients to another provider or location?} \) Respondents were asked to give a response for each individual vaccine (yes/no/unsure). Respondents who selected unsure were excluded. \( \text{Refer, do not stock} = \text{This analysis only reports responses among respondents who reported not stocking respective vaccines for the previous question (denominator varies by vaccine type).} \)

| Abbreviation | Description |
|--------------|-------------|
| PCV13        | Pneumococcal conjugate vaccine type 13 |
| PPSV23       | Pneumococcal polysaccharide vaccine type 23 |
| Zoster       | Zoster vaccine |
| Tdap         | Tetanus-diptheria-acellular pertussis vaccine |
| Tet          | Tetanus vaccine |
| HPV          | Human papilloma virus vaccine |
| Hepatitis B  | Hepatitis B vaccine |

\( a \) Clinicians include physicians, nurse practitioners, and physician assistants. Data for clinicians were obtained from the 2017 National Survey of Healthcare Providers Regarding Vaccination Practices for Adults, conducted for the Centers for Disease Control and Prevention by Abt Associates.

\( b \) Data for pharmacists were obtained from the 2017 National Survey of Pharmacists Regarding Vaccination Practices for Adults, conducted for the Centers for Disease Control and Prevention by Abt Associates.

\( c \) Unweighted data.

\( d \) Reference group used for pairwise significance testing among clinician specialties.

\( e \) Estimate may be unreliable due to small sample size (n < 30) or relative SE (SEestimates) > 0.3.
FM, family medicine; hepatitis B, hepatitis B vaccine; HPV, human papillomavirus vaccine; IM, internal medicine; influenza, seasonal influenza vaccine; PCV13, 13-valent pneumococcal conjugate vaccine; PPSV23, 23-valent pneumococcal polysaccharide vaccine; TD, tetanus and diphtheria toxoids; Tdap, tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis; zoster, herpes zoster vaccine.