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

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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

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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.¹ 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.¹ 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.²

The Advisory Committee on Immunization Practices (ACIP) makes recommendations for the use of vaccines in the U.S.^{3,4} The National Coalition for Adult Immunization developed standards for implementing ACIP recommendations for adults in 1990.⁵ 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 2014.⁶ 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,^{7–14} 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.^{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 Estimates¹⁷ and the Current Population Survey.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. *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.

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,^{19–22} 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,²³ 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).^{24,25} 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.²⁶ 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.²⁷

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.^{28,29} The estimates for stocking influenza vaccine are consistent with previous reports,^{30–32} whereas the estimates for Tdap stocking/administration among OB/GYNs are comparable with some reports,³⁰ but higher than others.³² Provider recommendation accompanied by an offer of vaccine is strongly associated with vaccination coverage in pregnant women.^{33–39} 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.^{33,34} 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.^{32,40,41} 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.^{42,43} 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.⁴⁴ 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,^{45–48} 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).⁴⁹ 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.^{7,9} Thus, collaborations between clinicians and pharmacists are important for increasing vaccination coverage.⁴⁸ 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.⁵⁰ Higher rates have been reported for pharmacists,^{51,52} 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.^{7,11,12,20,40,41,53–55} 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.¹¹ Pharmacies have well-established payment and billing systems, but states' laws differ regarding which vaccines pharmacists can provide with or without a physician order.⁵⁶ Health departments can also be an important access point for vaccinations for adults, but public health funding is limited for adult vaccinations.⁵⁷ 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.^{26,58}

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.^{1,59} 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.⁶⁰ 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.^{61,62} 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 2Practice Characteristics Reported by Clinicians^a and Pharmacists,^b U.S., Internet Panel Survey, 2017

Characteristics	<i>n</i>	Weighted %
Clinicians (<i>n</i> =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 (<i>n</i> =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	<i>n</i>	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^a and Pharmacists,^b U.S., Internet Panel Survey, 2017

Standard	Clinicians		Pharmacists	
	<i>n</i>	Weighted %	<i>n</i>	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	
	<i>n</i>	Weighted %	<i>n</i>	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				
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.

^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.

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^a and Pharmacists^b for Select Vaccines, U.S., Internet Panel Survey, 2017

Standard	n ^c	Influenza		PCV13		PPSV23		Zoster		Tdap		Td		HPV		Hepatitis B	
		% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	
Assess																	
Clinicians																	
IM ^d	370	98.6 (96.6, 99.5)	369	88.5 (84.4, 91.6)	369	90.4 (86.6, 93.1)	369	84.6 (80.2, 88.2)	370	87.7 (83.6, 90.8)	367	80.1 (75.3, 84.2)	368	60.9 (55.3, 66.3)	369	74.5 (69.4, 79.0)	
FM	479	99.2 (98.0, 99.7)	477	90.9 (87.6, 93.4)	476	93.8 (91.2, 95.7)	478	86.8 (82.9, 90.0)	478	94.4 (91.7, 96.3)	478	82.2 (77.8, 85.9)	478	68.9 (63.8, 73.5)	478	77.9 (73.3, 81.8)	
OB/GYN	445	92.2 (88.2, 95.0)	444	32.5 (27.5, 38.0)	442	37.2 (31.8, 42.8)	444	49.1 (43.4, 54.7)	444	81.3 (76.2, 85.5)	444	48.7 (43.1, 54.4)	444	88.9 (84.7, 92.1)	444	68.5 (62.9, 73.6)	
Other specialty	407	80.0 (74.7, 84.5)	406	54.4 (48.5, 60.2)	406	57.2 (51.3, 63.0)	406	52.9 (46.9, 58.8)	403	38.8 (33.1, 44.8)	405	39.4 (33.7, 45.3)	403	24.7 (20.0, 30.1)	406	49.5 (43.6, 55.4)	
Pharmacists	261	93.9 (91.0, 96.8)	261	83.9 (78.9, 88.8)	261	85.1 (80.5, 89.8)	261	88.0 (84.0, 91.9)	257	61.8 (55.5, 68.2)	257	28.9 (22.9, 34.8)	257	19.4 (14.3, 24.5)	258	34.7 (28.5, 41.0)	
Recommend																	
Clinicians																	
IM ^d	370	95.2 (92.3, 97.1)	370	85.8 (81.6, 89.1)	369	90.1 (86.3, 92.9)	370	89.5 (85.7, 92.4)	369	87.6 (83.5, 90.8)	370	76.6 (71.6, 81.0)	368	68.6 (63.3, 73.5)	369	83.3 (78.9, 87.0)	
FM	479	97.1 (94.8, 98.4)	477	90.6 (87.1, 93.2)	478	91.9 (88.8, 94.2)	479	91.5 (88.0, 94.0)	478	94.4 (91.7, 96.3)	478	78.8 (74.2, 82.7)	475	77.6 (72.9, 81.8)	478	85.9 (82.0, 89.0)	
OB/GYN	445	93.3 (89.7, 95.7)	438	37.3 (32.1, 42.9)	438	46.2 (40.6, 52.0)	442	63.6 (58.0, 68.8)	441	84.6 (80.0, 88.4)	440	43.4 (37.9, 49.1)	444	91.2 (87.0, 94.1)	443	69.5 (63.8, 74.6)	
Other specialty	408	85.3 (80.4, 89.2)	406	59.3 (53.4, 65.0)	407	64.9 (59.0, 70.3)	407	65.6 (59.7, 71.0)	406	47.5 (41.5, 53.4)	406	41.4 (35.6, 47.4)	407	34.6 (29.2, 40.4)	408	48.1 (42.2, 54.0)	
Pharmacists	261	86.7 (82.3, 91.2)	261	80.4 (75.2, 85.7)	261	81.0 (75.8, 86.3)	261	85.9 (81.3, 90.4)	260	72.5 (66.8, 78.3)	258	43.1 (36.7, 49.6)	260	38.7 (32.3, 45.1)	260	48.0 (41.5, 54.5)	
Stock																	
Clinicians																	
IM ^d	369	91.0 (87.1, 93.8)	368	72.4 (67.0, 77.1)	364	78.3 (73.2, 82.6)	368	57.1 (51.4, 62.7)	370	80.2 (75.5, 84.3)	367	71.0 (65.7, 75.9)	365	51.6 (45.9, 57.3)	366	71.0 (65.6, 75.8)	
FM	479	94.0 (91.0, 96.1)	478	79.2 (74.8, 83.0)	478	80.7 (76.2, 84.4)	479	51.1 (45.9, 56.2)	478	88.8 (85.0, 91.7)	475	73.6 (68.9, 77.9)	479	70.9 (66.0, 75.4)	479	78.9 (74.6, 82.7)	
OB/GYN	445	75.7 (70.3, 80.3)	440	15.6 (12.3, 19.8)	439	16.4 (12.9, 20.7)	440	17.9 (14.1, 22.5)	445	61.1 (55.3, 66.6)	439	23.4 (19.1, 28.4)	444	71.4 (65.8, 76.4)	443	31.6 (26.6, 37.1)	
Other specialty	407	51.1 (45.2, 57.0)	406	26.2 (21.2, 32.0)	407	28.9 (23.8, 34.7)	406	20.9 (16.4, 26.4)	407	22.8 (18.2, 8.2)	406	21.5 (17.0, 26.8)	404	12.2 (8.7, 16.7)	406	22.5 (17.7, 28.2)	
Pharmacists	261	92.6 (89.2, 95.9)	260	88.8 (84.7, 93.0)	261	88.8 (84.7, 92.8)	261	91.6 (88.1, 95.1)	261	78.2 (72.8, 83.7)	259	29.0 (23.1, 34.9)	259	35.3 (29.1, 41.5)	258	51.4 (44.9, 58.0)	

Standard	Influenza		PCV13		PPSV23		Zoster		Tdap		Td		HPV		Hepatitis B	
	n ^c	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
Refer																
Clinicians																
IM ^d	369	18.6 (14.5, 23.5)	369	25.2 (20.5, 30.5)	370	21.8 (17.4, 26.9)	370	43.6 (38.1, 49.3)	370	21.5 (17.2, 26.5)	370	16.8 (13.0, 21.5)	369	33.3 (28.2, 38.9)	369	26.8 (22.1, 32.1)
FM	478	21.4 (17.5, 26.0)	478	26.6 (22.3, 31.5)	478	23.4 (19.5, 28.5)	478	55.2 (50.1, 60.2)	478	20.5 (16.6, 23.7)	478	19.3 (15.6, 23.7)	479	28.9 (24.5, 33.7)	478	26.2 (22.0, 31.0)
OB/GYN	443	37.1 (31.7, 42.8)	443	58.3 (52.7, 63.8)	443	61.8 (56.2, 67.1)	443	69.9 (64.7, 74.7)	441	46.8 (41.2, 52.6)	442	45.2 (39.6, 50.9)	444	30.7 (25.7, 36.3)	444	59.7 (54.1, 65.1)
Other specialty	408	54.8 (48.7, 60.7)	408	45.7 (39.9, 51.6)	407	50.2 (44.3, 56.1)	406	59.7 (53.6, 65.5)	406	43.5 (37.7, 49.4)	407	39.0 (33.5, 44.9)	406	42.4 (36.7, 48.4)	408	44.9 (39.1, 50.8)
Pharmacists	260	17.1 (12.2, 22.0)	260	16.6 (11.6, 21.6)	260	17.6 (12.5, 22.6)	261	15.9 (11.1, 20.7)	260	24.7 (19.0, 30.4)	260	35.2 (28.9, 41.6)	261	45.7 (39.2, 52.2)	261	38.6 (32.2, 45.1)
Refer, practice does not stock																
Clinicians																
IM ^d	36	70.4 (51.9, 83.9)	107	58.8 (48.1, 68.7)	84	64.6 (52.9, 74.8)	160	72.2 (63.8, 79.2)	81	59.2 (46.8, 70.5)	114	29.6 (21.4, 39.2)	187	56.5 (48.7, 64.5)	114	71.9 (61.9, 80.1)
FM	32	83.7 (67.7, 92.6)	113	80.3 (71.5, 87.0)	102	73.0 (62.0, 81.7)	225	85.3 (79.0, 90.0)	60	74.1 (58.9, 85.1)	136	38.0 (28.8, 48.0)	151	71.4 (61.6, 79.6)	115	80.4 (71.4, 87.1)
OB/GYN	106	84.0 (75.0, 90.2)	359	64.1 (57.9, 69.9)	359	69.2 (63.2, 74.6)	357	79.8 (74.9, 84.0)	154	80.6 (72.8, 86.5)	328	52.9 (46.3, 59.4)	118	73.6 (62.8, 82.2)	300	77.1 (71.3, 82.1)
Other specialty	208	79.4 (72.1, 85.2)	307	55.1 (48.2, 61.8)	294	61.8 (54.7, 68.4)	333	68.6 (62.0, 74.6)	318	48.7 (42.0, 55.5)	325	43.1 (36.6, 49.8)	359	44.1 (37.9, 50.5)	329	52.4 (45.8, 58.9)
Pharmacists	19	69.2 (45.3, 93.0) ^e	29	48.9 (27.9, 70.0) ^e	29	47.7 (27.2, 68.2) ^e	23	65.0 (43.4, 86.6) ^e	54	64.7 (50.6, 78.9)	184	40.0 (32.3, 47.7)	168	59.1 (51.1, 67.1)	122	60.2 (50.9, 69.4)

Note: Boldface indicates statistical significance ($p < 0.05$ by t -test comparing to the reference group). Assess = 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 (yes/no/unsure). Respondents who selected unsure were excluded. Recommend = 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 = Respondents were asked: 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 (yes/no/unsure). Respondents who selected unsure were excluded. Refer = 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. Refer, do not stock = This analysis only reports responses among respondents who reported not stocking respective vaccines for the previous question (denominator varies by vaccine type).

^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.

^cUnweighted data.

^dReference group used for pairwise significance testing among clinician specialties.

^eEstimate may be unreliable due to small sample size ($n < 30$) or relative SE (SE/estimates) > 0.3 .

FM, family medicine; hepatitis B, hepatitis B vaccine; HPV, human papillomavirus vaccine; IM, intramuscular vaccine; 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.

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