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Use of Standing Orders for Vaccination Among Pediatricians

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Abstract

Background: Standing orders are an effective way to increase vaccination rates, yet little is known about how pediatricians use this strategy for childhood immunizations.

Objective: We assessed current use of, barriers to using, and factors associated with use of standing orders for vaccination among pediatricians.

Methods: Internet and mail survey from June-September 2017 among a nationally representative sample of pediatricians. Principal component analysis of barrier items identified two factors: Physician Responsibility and Concerns about Office Processes. Multivariable analysis including barrier scales and physician/practice characteristics was used to identify factors associated with use of standing orders.

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Contributors' Statement:

Dr. Cataldi drafted the initial manuscript, and reviewed and revised the manuscript.

Drs. O'Leary, Allison, Hurley, and Crane designed the data collection instruments, and reviewed and revised the manuscript.

Ms. Lindley conceptualized and designed the study, designed the data collection instruments, and reviewed and revised the manuscript.

Dr. Brtnikova designed the data collection instruments, collected data, and reviewed and revised the manuscript.

Ms. Beaty designed the data collection instruments, carried out the initial analyses, and reviewed and revised the manuscript.

Ms. McBurney designed the data collection instruments and collected data.

Dr. Kempe conceptualized and designed the study, coordinated and supervised data collection, and critically reviewed the manuscript for important intellectual content.

All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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Results: Response rate was 79% (372/471). 59% of respondents reported using standing orders. Most commonly identified barriers among non-users were concern patients may mistakenly receive the wrong vaccine (68%), concern patients prefer to speak with the physician about a vaccine before receiving it (62%), and belief that it is important for the physician to be the person who recommends a vaccine to patients (57%). These three items also made up the Physician Responsibility barrier factor. Respondents with higher Physician Responsibility scores were less likely to use standing orders (RR 0.59, 95% CI: 0.53-0.66 per point increase). System level decision-making about vaccines, suburban/rural location, and lower Concerns about Office Processes score were each associated with use of standing orders in bivariate but not multivariable analysis.

Conclusions: Among pediatricians, use of standing orders for vaccination is far from universal. Interventions to increase use of standing orders should address physicians' attitudinal barriers as well as organizational factors.

Table of Contents Summary:

Pediatricians identify several barriers to using standing orders including concerns about the importance of the physician's role in communication about and delivery of vaccinations.

Introduction

Standing orders for vaccination are defined as protocols allowing non-physician personnel (e.g. nurses, medical assistants) to vaccinate patients without direct involvement of a physician at the time of vaccination.[1] Systematic reviews reveal strong evidence that standing orders are an effective strategy for increasing immunization rates[2] and are cost-effective[3]. While there are fewer studies of standing orders in pediatric settings[4–8], the most recent systematic review conducted by the Community Preventive Services Task Force found that use of standing orders for childhood immunizations was associated with higher vaccination rates.[9] Based on this evidence, the Centers for Disease Control and Prevention (CDC)[10], the Advisory Committee on Immunization Practices (ACIP)[11], the Community Preventive Services Task Force[3,9], the National Vaccine Advisory Committee[12], and the American Academy of Pediatrics (AAP)[13] recommend use of standing orders to increase access to and reduce missed opportunities for vaccination among adults and children.

Studies show many adult immunization providers do not use standing orders for immunization, despite widespread recommendations for this evidence-based strategy. A nationally representative 2015 survey of obstetrician-gynecologists found that 66% of respondents used standing orders for influenza vaccine and 39% for tetanus, diphtheria and acellular pertussis (Tdap) vaccine.[14] A similar survey of primary care internists and family physicians conducted in 2000 found that 33% of respondents used standing orders for influenza or pneumococcal vaccines.[15]

Several facilitators and barriers to use of standing orders for adult immunization have been identified, however less is known about the pediatric context. In adult practice, including primary care and long-term care facilities, structural factors are both facilitators (facility ownership, payment sources) and barriers (clinical leadership structure, legal and payment

issues) to use of standing orders.[16,17] Additional barriers to use of standing orders for adult immunization include challenges determining indications for vaccination, concern about whether standing orders save time,[18] and patient/family concerns about whether a vaccination is recommended by their physician.[19] Some electronic medical records (EMRs) include features to incorporate standing orders for immunization, however little is known about how many practices or health systems use these features.

Standing orders are an evidence-based strategy to increase immunization uptake, therefore understanding their use is critical to improving immunization delivery in pediatric settings as well. Although pediatric immunization rates are generally higher than adult immunization rates, standing orders may be helpful for pediatric immunizations with lower uptake such as influenza and adolescent vaccines. A national assessment of pediatricians' use of standing orders is lacking. In this study, we sought to understand current practices and experiences related to use of standing orders among a nationally representative sample of pediatricians. Our objectives were to assess among pediatricians: 1) current use of standing orders for vaccination, 2) barriers to use of standing orders, and 3) factors associated with use of standing orders for vaccination.

Methods

Study Setting

We conducted an Internet and mail survey on several topics related to childhood vaccination in June-September 2017 among pediatricians in a sentinel network of members of the AAP who spent ≥50% of their time practicing primary care. The Colorado Multiple Institutional Review Board reviewed and approved the study as exempt research not requiring written informed consent.

Study Population

We developed this survey as part of the Vaccine Policy Collaborative Initiative, a collaboration with CDC to assess physician attitudes and practices related to vaccination. We developed a national network of pediatricians by recruiting from the AAP membership list and conducted quota sampling to develop a sentinel network of physicians. Using demographic data from the AAP membership list, quotas were established for a representative sample with respect to region (Northeast, South, Midwest, West), practice location (urban, suburban, rural) and practice setting (private practice, hospital/clinic, HMO).[20] A random sample of primary care physicians were selected from the AAP membership list and invited to participate as a sentinel physician for the survey network. After enough physicians had been recruited to meet described quota categories, additional respondents within those 'full' categories were excluded to maintain representativeness of the network. We have shown previously that sentinel network physicians were similar to physicians sampled randomly from the American Medical Association (AMA) physician database when comparing demographics, practice characteristics and attitudes about vaccination.[20]

Study Design

Survey items were developed by incorporating barriers to use of standing orders identified in published literature and expert opinion, including from key stakeholders at the AAP. In the survey, standing orders were defined as "a written or verbal policy that persons other than a medical provider, such as a nurse or medical assistant, may consent and vaccinate a person without speaking with the physician or advanced care provider first… [and in such cases] a vaccine may be given before or after a physician encounter, or in the absence of a physician encounter altogether." Response options for the item measuring use of standing orders were 'Yes, for all routinely recommended vaccines,' 'Yes, for some vaccines,' or 'No'. We did not assess use of standing orders in greater detail or for individual vaccinations (such as influenza). We used 4-point scales to assess barriers to the use of standing orders ('Major barrier' to 'Not at all a barrier'). A national advisory panel of pediatricians pre-tested the survey, then the survey was piloted among 41 other pediatricians and modified based on feedback. The survey instrument is available as a supplemental file.

Survey Administration

The survey was sent via Internet (link to web-based survey e-mailed to participants, Verint, Melville, NY, http://www.verint.com) or by mail, based on physician preference. Using methods from prior surveys, we sent the Internet group up to nine e-mail reminders followed by two reminders sent to non-respondents by postal mail.[21] We sent the mail group an initial mailing, followed by a reminder postcard and up to two additional reminders with replacement questionnaires. The mail protocol was patterned on Dillman's Tailored Design Method.[22]

Statistical Analysis

We combined Internet and mail survey responses for analyses because studies have demonstrated that respondent attitudes are similar when obtained by either method.[22–24] We compared respondents with non-respondents using Student's t-tests, Wilcoxon tests, chi-square, and Fisher's Exact tests as appropriate. We conducted a multivariable analysis with the dependent variable of using standing orders for any routinely recommended pediatric vaccination. For this analysis, using standing orders was defined as a response of 'Yes, for all routinely recommended vaccines,' or 'Yes, for some vaccines' for the survey item assessing use of standing orders. Independent variables assessed included physician and practice characteristics and responses to questions regarding barriers to use of standing orders.

Barriers items were coded as 0 (Not at all a barrier), 1 (Minor barrier), 2 (Somewhat of a barrier) and 3 (Major barrier). To reduce the number of barriers in the multivariable model, principal components analysis with VARIMAX rotation was performed. Two factors were retained using the criteria of eigenvalue≥1. Three barriers grouped on one factor, which we called "Physician Responsibility" (Cronbach's alpha=0.81, Table 1). Four barriers grouped on another factor, which we called "Concerns about Office Processes" (Cronbach's alpha=0.77). We generated mean scores of the items grouped on each factor and used these scores in the multivariable model. The barrier "In my state there are restrictions that limit the use of standing orders" was left out of the principal component analysis because it did not

clearly assess a personal concern or perception as the other barrier items did, and because we did not have the ability to verify whether responses reflected actual legal restrictions or physicians' perceptions of such restrictions.

Characteristics significant at $p \leq 0.25$ in bivariate analyses were tested in multivariable models using backwards elimination resulting in retention of factors that were significant at $p<0.05$ in the final model. Risk ratios (RR) were calculated because of the tendency of odds ratios to overestimate effect sizes when outcomes are common. Calculation of adjusted risk ratios was conducted using a log-poisson model with robust error estimation (SAS PROC GENMOD).

Based on published literature showing an association between organizational factors and use of standing orders,[16,17] we used Wilcoxon tests to compare scores for Physician Responsibility and Concerns about Office Processes factors between respondents whose practices make decisions about vaccines independently with respondents whose practices make decisions at a larger system level. All analyses were performed using SAS, version 9.4 (SAS Institute, Cary, North Carolina).

Results

Survey response and respondent characteristics

The response rate was 79% (372/471). Respondents did not differ significantly from non-respondents by gender, age, number of years in practice, practice setting, urban/rural location, region, or locus of decision-making about vaccines (independent versus larger system level) (Table 2).

Use of standing orders for vaccination

Fifty-nine percent of respondents reported using standing orders in their office including 36% who use standing orders for all routinely recommended vaccines and 23% who use standing orders for some vaccines.

Barriers to use of standing orders

The most commonly reported barriers to use of standing orders among pediatricians who did not use standing orders were concern that patients may mistakenly receive the wrong vaccine (68% identified as a 'Major barrier' or 'Somewhat of a barrier'), concern that patients may prefer to speak with the physician about a vaccine before receiving it (62%), and belief that it is important for the physician to be the person who recommends a vaccine to his/her patients (57%). These top three barriers remained the same among all respondents and were reported as a 'Major/Somewhat of a barrier' by 40%, 39%, and 34% respectively. Responses to additional barriers items are presented in Figure 1.

In bivariate analyses, several practice characteristics (census location and locus of decision-making about vaccines) and barriers items were associated with use of standing orders for any routinely recommended vaccines (Table 1). In the multivariable model, the only factor retained at $p<0.05$ was the mean score of items contributing to the Physician Responsibility barrier factor (RR 0.59 per point increase, 95% CI: 0.53-0.66).

Wilcoxon tests showed Physician Responsibility scores were higher among respondents whose practices make independent decisions about vaccines than among respondents whose practices make larger system level decisions (p=0.05). There was no association between decision-making level and Concerns about Office Processes scores (p=0.27).

Discussion

In this nationally representative survey of pediatricians, a majority of pediatricians report use of standing orders for at least some vaccines; however, 41% still do not use standing orders for any routinely administered vaccines. Among respondents who did not use standing orders, the most commonly reported barriers were concerns that patients may mistakenly receive the wrong vaccine, that patients may prefer to speak with a physician prior to receiving a vaccine, and that it is important for the physician to be the person who recommends a vaccine to their patients. In principal component analysis, these three barriers grouped on one Physician Responsibility factor, and the Physician Responsibility score was the only factor that remained associated with use of standing orders in the multivariable model.

Many survey respondents identified a concern that patients might receive the wrong vaccine and concerns about removing physicians from the conversation with patients about vaccines as barriers to use of standing orders, and these Physician Responsibility barriers were associated with decreased use of standing orders. In a study of patients attending obstetrics and gynecology clinics, most patients surveyed were comfortable with the idea of using standing orders for HPV vaccination.[25] In that survey, more patients supported the idea of using standing orders for HPV vaccination in adults (79%) than in adolescents (43%), suggesting that patient and parent attitudes about use of standing orders for childhood immunizations may differ from attitudes about adult vaccination. That survey also showed that acceptability of standing orders was greater if patients were first told that a provider strongly recommended the vaccine. Physicians' concerns that patients or parents want to speak with the physician before receiving a vaccine may be well-founded in some cases but could possibly be mitigated by having another staff member communicate the provider's strong recommendation for vaccination. Although some pediatricians surveyed indicated the concern that patients would prefer to speak with a physician as a barrier, our survey did not include parents and so could not directly assess parental acceptability of standing orders for immunization. Studies showing that standing orders are associated with increased immunization uptake in pediatric settings would imply that standing orders were acceptable to many parents in those studies since more children were vaccinated when standing orders were in place.[4–8] The acceptability of using standing orders for child and adolescent vaccines warrants additional study among parents and patients, noting that attitudes toward adult vaccination practices may not translate to the pediatric setting and that physicians' concerns about parental acceptability may not accurately reflect perceptions among parents.

Working in a practice where decisions about vaccines are made on a system level was associated with use of standing orders in bivariate analysis. This finding is consistent with studies of adult vaccination that have identified practice-level and organizational factors associated with use of standing orders.[16–18] Decision-making level was not associated

with use of standing orders in our multivariable model; however, pediatricians reporting more independent decision making about vaccines had higher Physician Responsibility barrier scores. Perhaps physicians who feel more personal responsibility about their role in vaccination are more likely to choose practice settings in which they have more independent decision making ability. Alternatively, knowing the level of decision-making about vaccines in the practice may influence the amount of personal responsibility that pediatricians feel about their role in vaccine delivery.

Physicians' concerns about patients receiving the wrong vaccine if they did not personally assess eligibility for vaccination was another item within the Physician Responsibility factor that was associated with decreased use of standing orders. While there is evidence for the use of standing orders to increase vaccination rates, published studies have not included systematic assessment of errors in vaccine administration under standing orders. Sixty-eight percent of pediatricians who did not use standing orders reported this concern about patients receiving the wrong vaccine as a 'Major barrier' or 'Somewhat of a barrier' compared to only 20% of pediatricians who do use standing orders. The significant difference in perceptions about this barrier suggests that pediatricians who do not use standing orders may overestimate the frequency of vaccination errors or that pediatricians who use standing orders have found ways to prevent such errors. Using the EMR to link standing orders for immunization with decision support tools regarding immunization eligibility may be one way to address physicians' concerns about the safety and accuracy of standing orders for immunization.

Very few respondents (7% overall, 10% of those who did not use standing orders) reported that their state having restrictions that limit the use of standing orders was a 'Major barrier' or 'Somewhat of a barrier' to their use in practice. One review of state laws found significant variability regarding which types of non-physician personnel are permitted to perform specific immunization delivery tasks (reviewing immunization status, prescribing vaccines, administering vaccines independently or under delegated authority).[26] In many cases, state law is silent on a particular task for a particular type of health care professional, making implementation of standing orders potentially challenging for practices. Incorporating a more detailed assessment of local legal and regulatory factors may add to the understanding of pediatricians' use of standing orders and associated barriers.

Pediatricians who did use standing orders reported relatively few barriers. The most common concern was that patients would prefer to speak with their physician about a vaccine before receiving it and this was identified as a 'Major/Somewhat of a barrier' by 24% of respondents. Two other items were identified as 'Major/Somewhat of a barrier' by 20% and the remaining items were less frequently endorsed as barriers. In contrast, seven items were identified as a 'Major/Somewhat of a barrier' by more than 20% of respondents who did not use standing orders, including three barriers endorsed by more than 50%. Further study, potentially using qualitative methods, is needed to understand the reasons for these differences in barriers and to identify strategies used to overcome perceived barriers.

Uptake of routine childhood immunizations is high compared to adolescent, adult, and maternal immunizations. Perhaps pediatricians do not view standing orders as necessary for

routine childhood vaccines and are less likely to use the strategy for that reason. With this hypothesis in mind, efforts to promote use of standing orders among pediatricians may be more successful by focusing on areas of low vaccine uptake such as influenza or adolescent immunizations.

This study had several limitations. While we found no difference between demographic and practice characteristics of respondents and non-respondents, they may have differed in their use of and barriers to use of standing orders. We did not ask pediatricians about the age distribution or number of patients in their practice, the proportion of their patients who were unvaccinated, or their EMR usage. We surveyed pediatricians for their reported use of standing orders but did not assess actual clinical practice. Neither use of other practice-level strategies to improve immunization (such as reminder/recall) nor differences in the use of standing orders for different specific vaccines were assessed. In addition, we did not verify specific local legal and regulatory factors related to standing orders for vaccination and so we were not able to robustly interpret responses to the barrier item “In my state there are restrictions that limit the use of standing orders.” Finally, we did not assess vaccination rates so we were unable to evaluate whether use of standing orders was associated with higher vaccination rates.

Standing orders are an evidence-based strategy to increase uptake of recommended immunizations, yet more than 40% of pediatricians surveyed do not use standing orders. More information is needed about the acceptability of standing orders for pediatric vaccinations among patients and parents, although studies demonstrating improvement in vaccination rates with use of standing orders in pediatric practices suggest acceptability is not a substantial barrier to success when standing orders are implemented. Future studies to better understand current practices and promote the use of standing orders should address physicians’ concerns related to their personal responsibility for vaccination as well as organizational factors.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations:

AAP	American Academy of Pediatrics

ACIP	Advisory Committee on Immunization Practices
CDC	Centers for Disease Control and Prevention
HPV	human papillomavirus
Tdap	tetanus, diphtheria and acellular pertussis

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What's Known on This Subject:

Standing orders are an evidence-based strategy to improve immunization uptake that allows non-physician personnel to vaccinate patients without physician involvement. Patterns of and barriers to use of standing orders have been described among adult immunization providers but not among pediatricians.

What This Study Adds:

59% of pediatricians use standing orders for immunizations. Respondents with concerns about physician responsibility for vaccination were less likely to use standing orders. Barriers to use of standing orders included concerns about removing physicians from vaccine communication and about efficiency and errors.

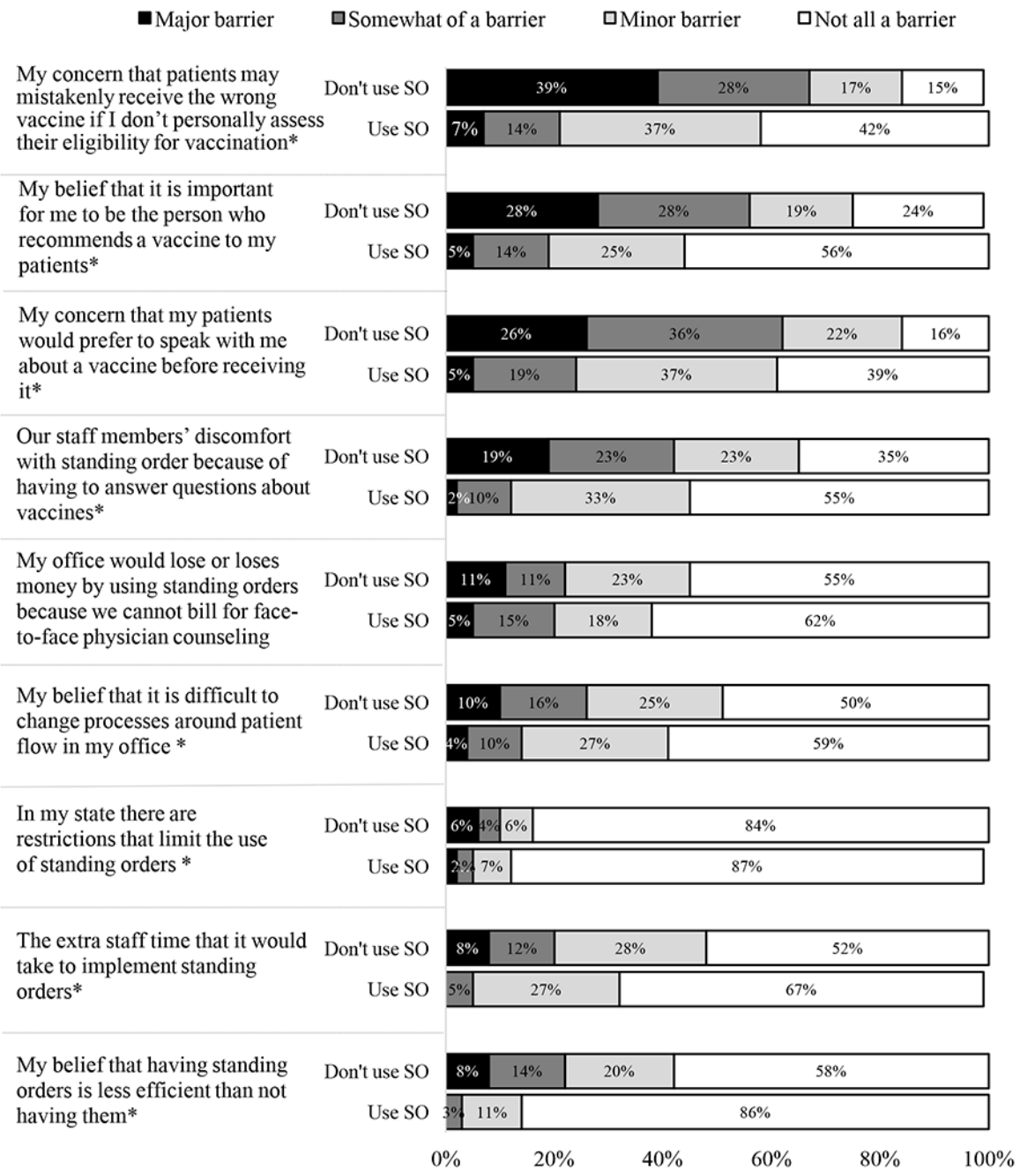

Figure 1:

Barriers to Use of Standing Orders (SO) by Respondent Use of Standing Orders for Vaccination (n=362)

*p<0.05 for comparison between Use standing orders and Don't use standing orders (Fisher's exact test). SO: standing orders. Total percentages may not equal 100% due to rounding.

Table 1:

Multivariable Model Predicting Use of Standing Orders for Any Routinely Recommended Vaccines

Variable	Do not use standing orders, % n=148 (41%)	Use standing orders, % n=214 (59%)	Bivariate p value	Multivariable Risk Ratio (RR), (95% CI)
Male gender	35	38	0.45	
Mean (sd) / Median age in years	52 (11) / 51	51 (10) / 51	0.36	
Census Location				
Urban	61	50	0.02	
Suburban/Rural	39	50		
How are decisions about purchasing and handling of vaccines made?	78	65	0.01	
Our practice makes independent decisions	22	35		
Decisions are made at a larger system level				
Number of providers in practice				
1-9	80	71	0.07	
10 or more	20	29		
Proportion of patients that are insured by Medicaid or CHIP	26	18		
0-9%	74	82	0.06	
>=10%				
Proportion of patients Hispanic				
0-24%	77	71	0.20	
≥25%	23	29		
Mean (sd) Physician Responsibility Score (range 0-3)	1.8 (0.9)	0.8 (0.7)	<.0001	0.59 (0.53-0.66) per point increase
My concern that my patients would prefer to speak with me about a vaccine before receiving it Major/Somewhat of a barrier	62	24	<.0001	
My belief that it is important for me to be the person who recommends a vaccine to my patients Major barrier/Somewhat of a barrier	57	19	<.0001	
My concern that patients may mistakenly receive the wrong vaccine if I don't personally assess their eligibility for vaccination Major barrier/Somewhat of a barrier	68	20	<.0001	
Mean (sd) Concerns about Office Processes Score (range 0-3)	0.9 (0.7)	0.5 (0.5)	<.0001	
Our staff members' discomfort with standing orders because of having to answer questions about vaccines Major barrier/Somewhat of a barrier	41	13	<.0001	

Variable	Do not use standing orders, % n=148 (41%)	Use standing orders, % n=214 (59%)	Bivariate p value	Multivariable Risk Ratio (RR), (95% CI)
The extra staff time that it would take to implement standing orders Major barrier/Somewhat of a barrier	19	6	<.0001	
My belief that having standing orders is less efficient than not having them Major barrier/Somewhat of a barrier	22	3	<.0001	
My belief that it is difficult to change processes around patient flow in my office Major barrier/Somewhat of a barrier	26	14	0.006	
In my state there are restrictions that limit the use of standing orders Major barrier/Somewhat of a barrier	10	6	0.14	

Table 2:

Comparison of Respondents and Non-respondents

Characteristic	Respondents (n = 372) %	Non-Respondents (n = 99) %	P Value
Provider Gender			
Male	37	33	0.55
Female	63	67	
Setting			
Private practice	80	77	0.71
Hospital or clinic	17	18	
HMO	3	5	
Census Location			
Urban	55	51	0.79 *
Suburban	44	48	
Rural	1	1	
Region			
Midwest	23	18	0.06
Northeast	22	14	
South	37	38	
West	19	29	
Decision-making			
Independent	70	68	0.63
Larger system level	30	32	
Mean (sd) / Median provider age in years	50.9 (10.4) / 51.0	50.7 (11.7) / 50.0	0.85 **
Mean (sd) / Median number of providers in practice	10.6 (25.5) / 6.0	15.1 (51.2) / 5.0	0.83 **

* Fisher's exact test

** Wilcoxon test.