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Characteristics of Physicians Who Dismiss Families for Refusing Vaccines

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Abstract

BACKGROUND AND OBJECTIVES: Physicians dismissing families who refuse vaccines from their practices is controversial. We assessed the following among pediatricians (Peds) and family physicians (FPs): (1) reported prevalence of parental refusal of 1 or more vaccines in the infant series; (2) physician response to refusal; and (3) the association between often/always dismissing families and provider/practice characteristics and state exemption laws.

METHODS: Nationally representative survey conducted June to October 2012. A multivariable analysis assessed association of often/always dismissing families with physician/practice characteristics, state philosophical exemption policy and degree of difficulty obtaining nonmedical exemptions.

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Dr O’Leary conceptualized and designed the study, contributed to the data collection instrument design, and drafted the initial and final manuscript; Drs Allison and Hurley and Ms Fisher and Ms Stokley assisted in study design and creation of the data collection instrument and reviewed and revised the manuscript; Drs Crane and Kempe conceptualized and designed the study designed the data collection instrument, and reviewed and revised the manuscript; Ms Beaty contributed to the study design, carried out the initial and further analyses, and reviewed and revised the manuscript; Dr Brtnikova and Ms Jimenez-Zambrano contributed to the study design and data collection instrument design, coordinated and supervised all data collection, and reviewed and revised the manuscript; and all authors approved the final manuscript as submitted.

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RESULTS: The response rate was 66% (534/815). Overall, 83% of physicians reported that in a typical month, 1% of parents refused 1 or more infant vaccines, and 20% reported that >5% of parents refused. Fifty-one percent reported always/often requiring parents to sign a form if they refused (Peds 64%, FP 29%, $P < .0001$); 21% of Peds and 4% of FPs reported always/often dismissing families if they refused 1 vaccine. Peds only were further analyzed because few FPs dismissed families. Peds who dismissed families were more likely to be in private practice (adjusted odds ratio [aOR] 4.90, 95% confidence interval [CI] 1.40–17.19), from the South (aOR 4.07, 95% CI 1.08–15.31), and reside in a state without a philosophical exemption law (aOR 3.70, 95% CI 1.74–7.85).

CONCLUSIONS: Almost all physicians encounter parents who refuse infant vaccines. One-fifth of Peds report dismissing families who refuse, but there is substantial variation in this practice. Given the frequency of dismissal, the impact of this practice on vaccine refusers and on pediatric practices should be studied.

Vaccine refusal is a growing concern in the United States.^{1–5} Recent outbreaks of vaccine-preventable diseases, such as measles and mumps, emphasize that even small proportions of parents refusing vaccines has important consequences. For example, in 2014, there were 23 outbreaks of measles in 27 states,⁶ with more cases than any year since 1994,⁷ most resulting from parents actively declining vaccination.⁸ However, there are no known evidence-based strategies for face-to-face communication that are effective at convincing hesitant parents to receive recommended vaccines,^{9,10} even though pediatricians (Peds) and family physicians (FPs) report spending significant time attempting to do so.¹¹ Some physicians have adopted the strategy of dismissing families for refusing to vaccinate their children, although the American Academy of Pediatrics (AAP) and the Centers for Disease Control and Prevention (CDC) discourage this strategy.^{12,13} The practice of dismissing families has also come under media scrutiny recently,^{14–19} primarily because of a high-profile measles outbreak that started at an amusement park in California.²⁰ Although many have argued against dismissal on ethical and practical grounds,^{21–27} dismissing families appears to be relatively common; a study from 2002 reported that 39% of Peds would dismiss families for refusing all vaccines.²⁸

However, since that time, there has been little examination of the practice of dismissing families for vaccine refusal. Because a state's vaccine exemption policy may reflect the level of societal acceptance of vaccine refusal, we hypothesized that these policies might have an effect on the practice of dismissing families if they refuse vaccines. Therefore, we developed a survey instrument to examine the following among Peds and FPs: (1) reported prevalence of parental refusal of 1 vaccine in the infant series, (2) physician response to refusal, and (3) the association between often/always dismissing families for refusing 1 vaccine and provider/practice characteristics and state exemption laws.

METHODS

We conducted a survey from June to November 2012 among Peds and FPs who were part of sentinel networks within each specialty. The human subjects review board at the University of Colorado Denver approved this study as exempt research.

Study Population

In collaboration with the CDC, we developed national networks of primary care physicians by recruiting from the AAP and the American Academy of Family Physicians (AAFP). Quota sampling was performed to ensure that network physicians were similar to AAP and AAFP memberships with respect to region, practice location, and practice setting.²⁹ To do this, we constructed sampling matrices by using demographic data from random samples from the AAP and AAFP membership. We then determined proportions of US Peds and FPs falling into each cell of a 3-dimensional matrix that crossed US region (Northeast, South, Midwest, or West),³⁰ practice location (urban inner city, suburban, or rural), and type of practice (private, managed care, or hospital/university/community health center). We applied proportions for each cell in the 36-cell matrix to a total sample size of 400 to create cell-sampling quotas. The sample size of 400 was chosen for a maximum estimated confidence interval (CI) of $\pm 5\%$ on estimates. After the random sample was selected, physicians were contacted by mail with an explanation of the study and a request to participate, and were asked if they preferred to participate by mail or e-mail. We excluded physicians practicing <50% primary care, not practicing in the United States, or in training. Survey responses from network physicians compared with those of physicians randomly sampled from American Medical Association physician databases had similar demographic characteristics, practice attributes, and attitudes about a range of vaccination issues.²⁹

Survey Design

We developed the survey collaboratively with CDC with input from AAP and AAFP. This survey was part of a larger survey that also explored physicians' attitudes and experiences regarding parental requests to spread out vaccines.³¹ For the portions of the survey related to refusal, respondents were provided the following statement: "The following questions are regarding parents who refuse a vaccine due to safety or other concerns. By refusal, we mean outright refusal without acknowledging that the vaccine will be considered at a later date." We used 4-point Likert scales for questions assessing physician practices (never, rarely, sometimes, often/always) and a 5-point scale to assess frequency of vaccine refusal. We pretested the survey within a national advisory panel of Peds and FP. The survey was then piloted among 24 Peds and 15 FPs nationally and further modified based on this feedback. The survey instrument is available on request.

Survey Administration

We surveyed physicians by Internet (Verint, Melville, NY; www.verint.com) or, if they preferred, by mail. We sent the Internet group an initial e-mail with up to 8 e-mail reminders, and we sent the mail group an initial mailing and up to 2 additional mailed reminders. We sent Internet survey nonrespondents a mail survey in case of problems with e-mail correspondence. Each physician had a unique study identifier, and on response was removed from further reminders. We patterned the mail protocol on the tailored design method of Dillman et al.³² By using this methodology, response rates within previous sentinel networks have ranged from 60% to 88%.^{11,33}

Statistical Analysis

Internet and mail surveys were pooled for analyses because studies have shown that physician attitudes are similar when obtained by either method.^{32,34,35} We compared respondents with nonrespondents by using *t* test and χ^2 analyses and compared Peds and FP responses by using χ^2 and Mantel-Haenszel χ^2 tests. We classified respondents based on their state's policies related to permitting philosophical exemptions to vaccination requirements (20 states) and the level of difficulty required to obtain a nonmedical exemption (applied to all states). Difficulty in obtaining exemptions was assessed by using methods similar to those described previously.^{5,36–38} States were categorized into “easy,” “medium,” or “difficult” in an identical fashion to those described in 2 reports by Omer et al.^{5,37} These categories were based on (1) if a parent could use a prepared form versus writing an original letter explaining the reasons for refusal, (2) if the form was easily available, (3) if the form needed to be notarized, and (4) if a letter from the parent was required, if the parent had to do additional research to complete the letter. Two states (Mississippi and West Virginia) do not allow religious or philosophical exemptions and were classified as difficult for the purposes of this analysis. This resulted in 13 states classified as easy, 19 states (and the District of Columbia) as medium, and 19 as difficult.

We conducted bivariate analyses examining the association of physicians' experiences and practices and the presence or absence of a state philosophical exemption law, with significant associations highlighted in the results.

We conducted a multivariable analysis with the dependent variable of a response of “often/always” to the query: “How frequently do you do the following in your current personal practice? Dismiss families from your practice if they refuse 1 or more vaccines in primary series for their child.” The multivariable analysis was performed among Peds respondents only as there were too few FP respondents with the primary outcome to support the model. Independent variables included gender, age, practice setting, practice location, practice region, presence or absence of a philosophical exemption, and degree of difficulty in obtaining an exemption (easy versus medium/difficult). We used a cutoff of $P < .25$ for inclusion of independent variables. Our multivariable models used a backward elimination procedure in which the least significant predictor in the model was eliminated sequentially. At each step, estimates were checked to make sure other variables were not affected by dropping the least significant variable. This resulted in retention of only those factors that were significant at $P < .05$ in the final model. Analyses were performed by using SAS software, version 9.4 (SAS Institute, Cary, NC).

RESULTS

The overall response rate was 66% (534/815), 70% (282/405) among Peds and 61% (252/410) among FPs. Table 1 compares responders and nonresponders and describes additional characteristics available only for responders. Among responders, 83 (9 Peds and 72 FPs, 16% overall) indicated that they did not administer vaccines to children <2 years old, and were removed from further analysis.

Prevalence of Vaccine Refusal

Among respondents, 83% reported at least some parents in a typical month refusing vaccines (Peds 88%, FPs 76%). Peds from states not allowing philosophical exemptions more often reported no parents refusing vaccines in a typical month than those in states allowing philosophical exemptions (17% vs 8%, $P = .03$). This difference was not found for FPs. Sixty-three percent reported 1% to 4% of parents refusing vaccines (Peds 68%, FPs 57%), 15% reported 5% to 9% (Peds 16%, FPs 13%), and 5% reported 10% (Peds 4%, FPs 7%, $P = .37$ for overall comparison between specialties). When asked to report the frequency of vaccine refusal compared with 12 months prior, 23% reported it had decreased (Peds 28%, FPs 15%), 66% reported that it was about the same (Peds 58%, FPs 78%), and 11% reported that it had increased (Peds 14%, FPs 7%, $P = .25$ for overall comparison between specialties).

Physician Practices Related to Vaccine Refusal

Physicians were asked to report their current personal practices to address vaccine refusal (Fig 1). The practices that physicians most often reported using often/always included requiring parents to sign a form if they refuse vaccination, addressing vaccine concerns at a prenatal visit, and advising parents who refuse certain vaccines that they should inform on-call or urgent care physicians about their child's vaccination status. Peds were significantly more likely than FPs to report using these practices. Overall, 14% of physicians reported often/always dismissing families for refusing 1 vaccine in the infant series (Peds 21%, FPs 4%, $P < .0001$). Other than the practice of dismissing families, there were no differences in practices related to vaccine refusal between physicians in states with philosophical exemption policies versus those without.

The Practice of Dismissing Families Related to Exemption Policies and Processes

Table 2 shows the proportions of Peds who dismiss families often/always grouped by whether their state has a philosophical exemption policy and by degree of difficulty for obtaining exemptions. In states in which philosophical exemptions are allowed, only 9% of Peds report dismissing families for refusing vaccines in the infant series versus 34% in states that do not allow philosophical exemptions ($P < .0001$). Twelve percent of physicians in states with an easy exemption process dismissed families, versus 22% in states with a medium exemption policy and 28% in states with a difficult exemption process ($P = .01$).

Characteristics of Peds Who Dismiss Families for Refusing Vaccination

In bivariate analyses, among Peds, private practice setting, South and Northeast regions, the absence of a philosophical exemption law, and having a medium or difficult policy for obtaining an exemption were all associated with the practice of dismissing families for refusing vaccines (Table 3). After adjustment, practice setting (private setting referent to health maintenance organization [HMO], university, or public setting [combined], adjusted odds ratio [aOR] 4.90, 95% CI 1.40–17.19), the absence of a philosophical exemption policy (aOR 3.70, 95% CI 1.74–7.85), and the South region (aOR 4.07, 95% CI 1.08–15.31, referent to West) remained significant.

DISCUSSION

In this study, we show that almost all physicians encounter parents who refuse at least 1 vaccine in the infant series. Physicians report using a variety of strategies for handling parents who refuse vaccines, with Peds reporting using such strategies more often than FPs. Although few FPs dismiss families for vaccine refusal, ~1 in 5 Peds report doing so, and there is a great deal of regional variation. Peds who dismiss families for vaccine refusal are more likely to practice in a private setting, to be from the South, and to be in states without philosophical exemption laws and/or with more difficult exemption policies.

Dismissing families from a practice for refusing vaccines is controversial.^{21,23–27,39} In 2005, the AAP published a guideline stating that “pediatricians should avoid discharging patients from their practices solely because a parent refuses to immunize his or her child.”¹³ This guideline was reaffirmed in 2009⁴⁰ and 2013,⁴¹ with a slight change in wording in 2013, perhaps reflecting some of the controversy surrounding this practice among Peds (“...should endeavor not to discharge patients...” replaced “... should avoid discharging patients...”). We are aware of 2 previous national surveys assessing the practice of dismissing families.^{11,28} In a study based on a survey from 2002,²⁸ investigators reported results of a national survey among Peds, with 39% reporting they would dismiss families for refusing all vaccines and 28% dismissing families for refusing select vaccines. They found no differences between “dismissers” and “nondismissers,” although they examined only gender, age, years in practice, and patients seen per week. Our group published results of a national survey among Peds and FPs done in 2009 that had similar findings to our present study regarding the frequency of providers dismissing families (10% dismissing families often or always versus 14% in our present study). The study also reported the same large interspecialty difference in this practice. That study used the same questions as our current study but was within different networks of providers, and did not report on the characteristics of providers who dismiss families. In our recently published study regarding parental requests to “spread out” vaccines, we reported that few physicians dismiss families for such requests,³¹ in contrast to the relatively common practice of dismissing families for refusing vaccines we report here.

Providers in private practice were more likely to dismiss families than those in HMO, university, or public settings. Although perhaps not surprising, because dismissing families may not be an option in such settings, this finding demonstrates the important concept that organizational context matters when considering variations in practice such as dismissal. More Peds than FPs may dismiss families who refuse to vaccinate because a larger proportion of a Ped’s practice is related to vaccination of young infants and, therefore, vaccine refusal is more commonly encountered. However, this may also reflect different philosophies within the specialties. The remarkable regional variation in dismissing families was surprising. Based on the results of our multivariable analysis, it appears that much of this regional variation may be explained by the presence or absence of philosophical exemption laws.

Proportionally fewer states in the South (4 of 17) and Northeast (2 of 9) have philosophical exemption laws than in the West (8 of 13) or Midwest (5 of 12). It is unclear from these data

if this finding is merely an association or if there is a causal relationship in either direction. For example, it may be that in states that allow philosophical exemptions, physicians perceive vaccine refusal as more societally acceptable because of the exemption law and therefore are less likely to dismiss families from their practice. Alternatively, attitudes in these states may be driving policy, and therefore because vaccine refusal is more of a social norm, dismissing families is less acceptable for physicians. There may also be a feedback loop of sorts, such that not having a philosophical exemption policy sets a social norm, and dismissing families may further establish vaccinating one's child as the social norm. With recent changes in laws, particularly in California,⁴² it will be an interesting natural experiment to follow the impact these changes have on the practice of dismissing families.

States that have a philosophical exemption law and an easy exemption process have lower vaccination rates and higher rates of vaccine-preventable diseases.^{5,43–45} Our finding that the practice of dismissing families is associated with the absence of a philosophical exemption law deserves further exploration. Some have hypothesized that dismissing families could lead to increased clustering of vaccine-refusing families within certain regions, leading to outbreaks of vaccine-preventable diseases.⁴⁶ Our finding argues against this hypothesis because lower vaccination rates and higher rates of vaccine-preventable diseases tend to be in states in which physicians are less likely to dismiss families. Others have suggested that having a policy for dismissing families may actually increase vaccine uptake, as it provides a strong message to families on the importance of vaccination.²² Our findings could be consistent with this interpretation. However, we know little about the responses of families who have faced this decision, or about those who have actually been dismissed for refusing to vaccinate. Given the frequency of this practice, this is clearly an area that deserves further exploration. For example, qualitative work among Peds who dismiss families and the families themselves could be very illuminating.

No published studies have examined the impact that a policy of dismissing families has on uptake of vaccines. Because Peds provide care to most young infants in the United States,⁴⁷ it is plausible that the higher rates of vaccination coverage seen in states without philosophical exemption laws are at least in part explained by the more frequent use of this practice by Peds in those states. Although vaccination requirements have been effective at achieving high rates of vaccination and low rates of vaccine-preventable diseases,^{48–52} they are designed to be enforced at child care and/or school entry, which may take place later, often years later, than the recommended timing for the infant series of vaccines. Therefore, a policy of dismissal at the level of the practice or provider will more often affect a family early in the vaccine decision-making process, as opposed to the need to claim a philosophical exemption several years later on kindergarten entry.

More Peds than FPs report requiring parents to sign a refusal to vaccinate form. This may be because the AAP has a clear policy on this issue, recommending that after a thoughtful discussion with the parents, Peds ask parents to sign this form acknowledging the purpose of the vaccine(s), the risks and benefits of the vaccine(s), the potential consequences of refusal, and that the child's doctor, the AAP, the AAFP, and CDC all strongly recommend the vaccine(s).⁵³ The form also acknowledges that refusal to vaccinate may endanger the health or life of the child, and that the parent agrees to inform all health care professionals in all

settings what vaccines the child has not received, resulting in potential isolation and/or further testing. This form is available on the AAP Web site but not the AAFP Web site. The form has not been evaluated with respect to its effectiveness at increasing uptake of vaccines; however, physicians may perceive a degree of legal protection by having nonvaccinating parents sign it, and it provides a strong message to nonvaccinating parents regarding the importance of vaccination. Although slightly fewer than half of surveyed FPs are using a refusal form, the AAFP should consider encouraging this practice by making such a form easily accessible to its members.

There are important strengths and limitations to our findings. This is the first national survey to assess the practice of dismissing families in detail since the AAP clinical guideline discouraging such practice was first published in 2005. The finding that many Peds dismiss families despite this recommendation is an important contribution to the ongoing discussion on how best to address vaccine hesitancy and refusal. Also, the surveyed physicians are generally representative of members of the AAP and the AAFP. However, there were differences in responders and nonresponders with regard to region and presence of a philosophical exemption law, and responders may not express similar views to nonresponders. In addition, the observation of an association between the practice of dismissing families for refusing vaccines and state-level policies is ecologic, and therefore a causal relationship should not be inferred. Finally, results were based on reported practices; actual practices were not observed.

CONCLUSIONS

Several recent studies have highlighted the reality that there are many facets of vaccine refusal that we do not understand.^{54,55} This study underscores the fact that the dynamics of vaccine refusal and providers' responses to it are complicated. Although many have decried the practice of dismissing families for refusing vaccines on ethical grounds, few have actually studied it. Because many Peds still dismiss families despite recommendations to the contrary, this practice should be better explored and understood both for its causes and its intended and unintended consequences.

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ABBREVIATIONS

AAFP	American Academy of Family Physicians
AAP	American Academy of Pediatrics
aOR	adjusted odds ratio
CDC	Centers for Disease Control and Prevention

CI	confidence interval
FP	family physician
HMO	health maintenance organization
Ped	pediatrician

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WHAT'S KNOWN ON THIS SUBJECT:

The American Academy of Pediatrics discourages providers from dismissing families who refuse vaccines for their children, yet some providers continue to do so.

WHAT THIS STUDY ADDS:

We show that ~1 in 5 pediatricians dismiss families who refuse vaccines, and there is significant regional variation in the practice. Dismissing families for refusing vaccines was also associated with stricter state nonmedical exemption policies.

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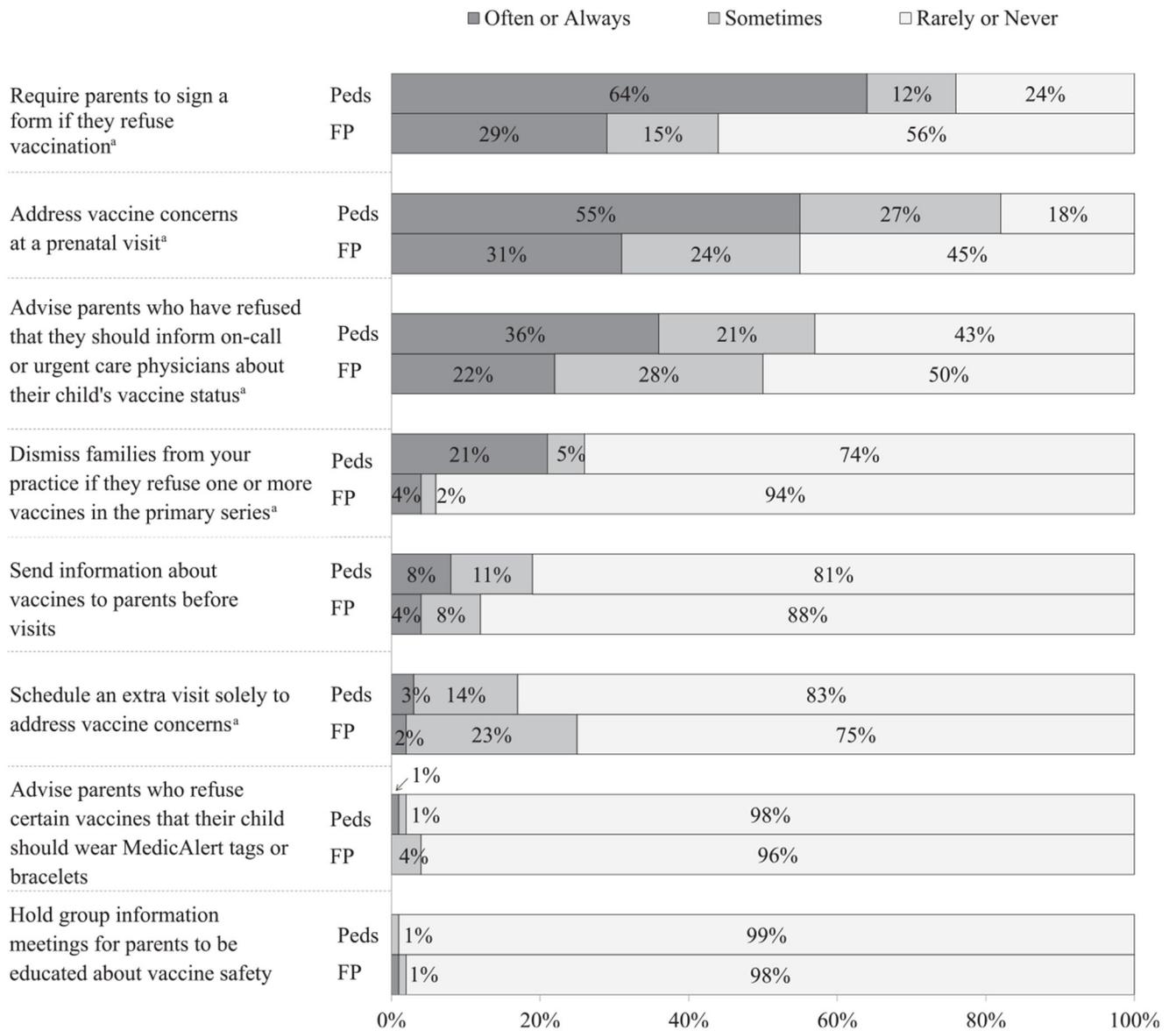


FIGURE 1. Peds and FPs' reported practices to address vaccine hesitancy and refusal ($n = 534$). ^a $P < .05$ for Mantel-Haenszel χ^2 for overall comparison.

TABLE 1
 Comparison of Respondents and Nonrespondents and Additional Characteristics of Respondents' Practices

Characteristic	Total Respondents, <i>n</i> = 534	Total Nonrespondents, <i>n</i> = 281	Peds Respondent, <i>n</i> = 282	FP Respondent, <i>n</i> = 252
Male gender, % ^a	45	55	40	52
Age, y, mean (SD)	51.6 (10.3)	51.5 (9.9)	51.1 (10.4)	52.3 (10.2)
Region of the country, % ^a				
Midwest	24	25	21	28
Northeast	21	16	22	20
South	32	41	34	30
West	23	18	24	22
Practice location, %				
Urban, inner city	35	32	43	27
Urban, non-inner city/suburban	46	47	44	48
Rural	19	21	12	26
Practice setting, %				
Private practice	75	76	78	72
Community or hospital based	19	20	16	23
HMO or MCO	6	4	6	6
State has philosophical exemption ^a	54	44	53	56
Difficulty of exemption				
Easy	27	22	30	25
Medium	43	43	41	46
Difficult	30	35	29	30
Median providers in practice, <i>n</i>	5	—	6	5
Proportion of VFC participants, %	79	—	84	71
Proportion of patients <2 y, %				
<10	40	—	7	76
10–24	31	—	40	21
25–49	25	—	44	3
50	5	—	9	0
Proportion of privately insured patients, %				

Characteristic	Total Respondents, n = 534	Total Nonrespondents, n = 281	Peds Respondent, n = 282	FP Respondent, n = 252
0-24	20	—	17	23
25-49	21	—	21	21
50	59	—	61	56
Proportion of Medicaid/SCHIP patients, %				
0-24	58	—	51	67
25-49	21	—	26	16
50	21	—	23	17
Proportion of uninsured patients, %				
0-24	96	—	98	93
25-49	3	—	2	5
50	1	—	0	2
Patient race/ethnicity, %				
Black/African American <10	51	—	45	59
Black/African American 10	49	—	55	41
Hispanic/Latino <10	53	—	46	61
Hispanic/Latino 10	47	—	54	39
Asian/Pacific Islander <10	83	—	77	90
Asian/Pacific Islander >10%	17	—	23	10

Columns may not add to 100% due to rounding. MCO, managed care organization; SCHIP, State Children's Health Insurance Plan; VFC, Vaccines for Children program. —, information not available for non-respondents.

^a $P < .05$ for comparison of respondents and nonrespondents.

Percentage of Peds Who Report Often or Always Dismissing Families for Refusing 1 Infant Vaccines Related to Presence of a Philosophical Exemption and Degree of Difficulty for Obtaining a Non-medical Exemption in the Ped's State of Practice.

TABLE 2

	State Allows Philosophical Exemption, <i>n</i> = 140 (53%), % (<i>n</i>)	State Does Not Allow Philosophical Exemptions, <i>n</i> = 124 (47%), % (<i>n</i>)	<i>P</i>	Degree of Difficulty Obtaining Exemption			<i>P</i>
				Easy, <i>n</i> = 77 (29%), % (<i>n</i>)	Medium, <i>n</i> = 111 (42%), % (<i>n</i>)	Difficult, <i>n</i> = 76 (29%), % (<i>n</i>)	
Physician reports often or always dismissing families for refusing vaccines	9 (12)	34 (42)	<.0001	12 (9)	22 (24)	28 (21)	.01

States allowing philosophical exemptions: AZ, AR, CA, CO, ID, LA, ME, MI, MN, NM, ND, OH, OK, OR, PA, TX, UT, VT, WA, WI. States with easy exemption policies: AZ, CA, CO, CT, HI, MD, MO, ND, OR, RI, VT, WA, WI. States with medium exemption policies: AK, DC, ID, IL, IN, KS, LA, ME, MA, MI, NV, NJ, NY, NC, OH, OK, PA, SD, TN. States with difficult exemption policies: AL, AR, DE, FL, GA, IA, KY, MN, MT, NE, NH, NM, SC, TX, UT, VA, WY (MS and WV were classified as difficult because they do not allow any nonmedical exemptions).

TABLE 3
 Characteristics of Peds Who Report Often or Always Dismissing Families for Refusing 1 Vaccines in the Infant Series

Characteristic	Bivariable OR (95% CI)	P	Multivariable OR (95% CI)	P
Age, per 10 y	1.16 (0.87–1.54)	.32		
Gender				
Female	Ref.	.34		
Male	1.35 (0.73–2.47)			
Practice location				
Urban	Ref.	.18		
Rural	0.48 (0.16–1.42)			
Setting				
Private practice	5.04 (1.51–16.86)	.01	4.90 (1.40–17.19)	.01
Community or hospital-based/HMO	Ref.		Ref.	
State allows philosophical exemption ^a				
No	5.46 (2.72–10.99)	<.0001	3.70 (1.74–7.85)	.0007
Yes	Ref.		Ref.	
Difficulty in obtaining exemption ^b				
Difficult or medium	2.39 (1.11–5.18)	.03		
Easy	Ref.			
Region				
Midwest	2.47 (0.59–10.40)	.0006	1.24 (0.28–5.57)	.04
Northeast	7.03 (1.93–25.64)		3.08 (0.78–12.16)	
South	9.19 (2.66–31.82)		4.07 (1.08–15.31)	
West	Ref.		Ref.	

OR, odds ratio; Ref., reference.

^aStates allowing philosophical exemptions: AZ, AR, CA, CO, ID, LA, ME, MI, MN, NM, ND, OH, OK, OR, PA, TX, UT, VT, WA, WI.

^bStates with easy exemption policies: AZ, CA, CO, CT, HI, MD, MO, ND, OR, RI, VT, WA, WI. States with medium exemption policies: AK, DC, ID, IL, IN, KS, LA, ME, MA, MI, NV, NY, NC, OH, OK, PA, SD, TN. States with difficult exemption policies: AL, AR, DE, FL, GA, IA, KY, MN, MT, NE, NH, NM, SC, TX, UT, VA, WY (MS and WV were classified as difficult because they do not allow any nonmedical exemptions).