



# Formal training in vaccine safety to address parental concerns not routinely conducted in U.S. pediatric residency programs



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## ABSTRACT

**Objective:** To determine if U.S. pediatric residency programs provide formal training in vaccine safety to address parental vaccine concerns.

**Methods:** An electronic survey was mailed to all members of the Association of Pediatric Program Directors (APPD) to assess (1) if U.S. pediatric residency programs were providing formal vaccine safety training, (2) the content and format of the training if provided, and (3) interest in a training module for programs without training. Two follow-up surveys were mailed at 2 week intervals. Responses to the survey were collected at 4 weeks following the last mailing and analyzed. Logistic regression was used to assess the impact of program size on the likelihood of vaccine safety training. Pearson's chi square was used to compare programs with and without formal vaccine safety training in 5 U.S. regions.

**Results:** The survey was sent to 199 APPD members; 92 completed the survey (response rate 46.2%). Thirty-eight respondents (41%) had formal training in vaccine safety for pediatric residents at their programs; 54 (59%) did not. Of those that did not, the majority (81.5%) were interested in formal vaccine safety training for their residents. Of all respondents, 78% agreed that training in vaccine safety was a high priority for resident education. Thirty-five percent of all respondents agreed that local parental attitudes about vaccines influenced the likelihood of formal vaccine safety training.

**Conclusion:** Most pediatric residency programs surveyed do not include formal training on vaccine safety; yet, such training is supported by pediatric residency program directors as a priority for pediatric residents.

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## 1. Introduction

Increasing numbers of parents in the U.S. are choosing alternative vaccine schedules or refusing recommended vaccines for their children [1–3]. Although some “vaccine-hesitant” parents cite beliefs that vaccines are not necessary, or that vaccine requirements infringe on their parental rights, the overwhelming finding among studies that have investigated the reasons for parental delay or refusal of vaccines have shown the primary reason is due to concerns about vaccine safety [4–8]. It is therefore important for pediatric healthcare providers to be prepared to address questions regarding vaccine safety as the most common concerns of this population.

Training in vaccine safety during pediatric residency would seem most appropriate. The American Board of Pediatrics content outline for general pediatrics board certification recommends

learning how to “plan an appropriate approach to addressing the needs of the vaccine-hesitant family” and to “recognize adverse reactions to various vaccine constituents” [9], yet it is unknown whether U.S. pediatric residency programs provide any formal or structured training opportunities on this topic. Further, the Accreditation Council for Graduate Medical Education (ACGME) program requirements are vague regarding training on vaccines, stipulating that residents should be able to describe the steps in the “procedure, indications, and contraindications” for vaccines [10]. Given the complexity of the childhood vaccination schedule and the increasingly complex environment for Graduate Medical Education, adding required formal resident training on vaccine safety may not be trivial. Thus, it is important to evaluate the types of training and formats that would be acceptable to serve this purpose.

The primary objective of this study was to determine whether U.S. pediatric residency programs provide any formal training on vaccine safety. If programs do not provide training, a secondary objective was to determine if programs would be interested in formal vaccine training for their residents in the future.

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## 2. Methods

Authors SEW and RS developed a survey for the members of the Association of Pediatric Program Directors (APPD) [11]. The APPD is the professional organization for program directors and leaders of U.S. pediatric residency programs with a mission to serve the programs and their leadership [12]. The 17 item survey included items with multiple choice single answer responses, yes/no responses, 5 point Likert responses, and open-ended responses. The survey format followed an electronic algorithm to divide respondents into two groups based on the response to the first survey question (“Does your pediatric residency program include a required, formal educational training module on vaccine safety?”). The two groups were created to collect specific information from programs that have experience with training modules and specific information from programs that do not. Separate survey questions were answered in each group according to the response to the first question. The survey was reviewed and approved by the APPD Research and Scholarship Task Force (specific review criteria are available at [https://www.appd.org/ed\\_res/ResearchSurveys.cfm](https://www.appd.org/ed_res/ResearchSurveys.cfm)) [11].

After completion of this portion of the survey, all respondents were surveyed regarding their opinion on (1) the importance of vaccine safety training for pediatric residents, (2) whether adequate vaccine safety training is provided through bedside or informal teaching methods, and (3) whether vaccine safety or vaccine hesitancy training is influenced by parental attitudes toward vaccines in the local geographical area. Respondents were asked to enter the total number of residents in the program and the state. The estimated time to complete the survey was 2 min. This study was reviewed by the Vanderbilt University Institutional Review Board and was exempt from requiring informed consent due to minimal risk to study participants. No incentives were provided to study participants.

In January 2012, an electronic mailing with a brief introduction to the study and a link to the survey was sent to all APPD members using REDCap Survey [13]. Two follow up electronic mailings with the survey were sent at two week intervals after the initial contact. At four weeks following the last electronic mailing, survey responses were collected and analyzed.

## 3. Analysis

All analyses were conducted using Stata version 12.0. Most analyses required simple proportions or mean calculations. In order to determine whether program size, and potential increased or decreased resources related to size, influenced a program's likelihood of having formal training in vaccine safety, a logistic regression analysis was conducted adjusting for the number of total pediatric residents in the program. The states for each response were grouped into one of five U.S. regions (West, Southwest, Midwest, Southeast, and Northeast). Pearson's chi square test was used to compare pediatric residency programs with and without formal vaccine safety training in the 5 U.S. regions. A post hoc analysis was conducted to determine if there was an association with respondent's beliefs about the influence of local parental attitudes on vaccine safety and vaccine hesitancy training and the likelihood of having formal vaccine safety training (Pearson's chi square).

## 4. Results

One hundred and ninety seven pediatric program directors received the initial electronic mailing and the first follow up survey; 199 received the second follow up survey due to the addition of 2 new members to the APPD. Ninety two program directors completed the survey for an overall response rate of 46.2%. The average

**Table 1**

Description of vaccine safety training in place at 38 pediatric residency programs in U.S.

Training format:	Lecture (11, 28.9%) Online module (5, 13.2%) Didactic session during continuity clinic (14, 36.8%) Other <sup>a</sup> (8, 21.1%)
Who provides training? <sup>b</sup> :	Chief Resident (1, 2.6%) General Pediatric Attending (23, 60.5%) Continuity Clinic Preceptor (14, 36.8%) I.D. Attending (9, 23.7%) Other <sup>c</sup> (5, 13.2%)
Training on any of the following topics <sup>b</sup> :	Common adverse events following vaccines (38, 100%) How vaccines are created, licensed and recommended in the U.S. and who is responsible for making these decisions (industry, then FDA, then ACIP) (17, 44.7%) What resources are available for physicians who believe a patient may have experienced an adverse event (VAERS, CISA, causality algorithm) (29, 76.3%) How to talk with vaccine-hesitant parents about vaccine safety concerns (36, 94.7%)

<sup>a</sup> Standardized patients, videos, required RedBook readings, faculty discussions, journal club discussions, Immunization Health rotation.

<sup>b</sup> Not mutually exclusive.

<sup>c</sup> Nurse, clinical psychologist.

number of residents in the programs was 50 (95% CI: 44.8–55, range of 13–107 with one non-responder to this question). The respondent program directors represented pediatric residency programs from 39 states and Puerto Rico. Thirty-eight respondents (41%) reported having formal training in vaccine safety for pediatric residents and 54 (59%) reported not having formal vaccine safety training. Upon adjustment for the number of residents in each program, programs with more residents were more likely to have training in vaccine safety (OR = 1.02, 95% CI 1.00–1.04;  $p = 0.04$ ). Most respondents were associated with programs in Northeast U.S., followed by the Midwest, Southeast, West and lastly the Southwest. There was no significant association with the location of the respondents' residency program within one of 5 U.S. regions and the likelihood of having formal training in vaccine safety ( $p = 0.35$ ). The region with the most programs reporting formal vaccine safety training was the Midwest; the region with the least was the Southwest.

Among the 38 pediatric residency programs with formal training in vaccine safety, most provided it in either a continuity clinic didactic session (14, 36.8%) or during a standard didactic lecture (11, 28.9%). (Table 1) A general pediatric attending provided the training in most programs (23, 60.5%). All programs which provided training included specific education on common adverse events following immunizations, and most included education on resources for physicians when patients experience adverse events [(e.g., Vaccine Adverse Event Reporting System (VAERS) [14] or the Clinical Immunization Safety Assessment (CISA) [15]; 29, 76.3%] and education on discussing vaccines with vaccine-hesitant parents (36, 94.7%). Less than half of programs provided education on the processes involved in the manufacturing, licensure, and recommendation of vaccines for routine use in the U.S. (Table 1). The reported time dedicated to vaccine safety training varied greatly and the exact time dedicated to vaccine safety training was not reported by all respondents who had formal training at their respective programs. Of respondents who provided this more detailed information, the training length varied greatly; one program required a 15 min discussion, others annual lectures, multiple didactic sessions in continuity clinic, a 6 or 10 lecture series over the course of one year, or a specific Immunization Health rotation. (Table 1) Some programs also reported one-on-one training with a faculty member.

Of the 54 pediatric residency programs that did not provide formal training on vaccine safety, 44 (81.5%) respondents selected

**Table 2**  
Level of agreement among all respondents to three specific questions on vaccine safety training<sup>a</sup>.

Level of agreement selected for each of the following statements	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
Our program provides sufficient training in vaccine safety to address questions of vaccine-hesitant parents through bedside or informal teaching	(17, 18.9%)	(58, 64.4%)	(8, 8.9%)	(7, 7.8%)	(0, 0%)
Formal education in vaccine safety is not a high priority for our pediatric residents	(3, 3.3%)	(6, 6.6%)	(11, 12.1%)	(45, 49.5%)	(26, 28.6%)
The training our residents receive on vaccine safety or vaccine hesitancy is strongly influenced by the local parental attitudes regarding childhood vaccines	(6, 6.6%)	(26, 28.6%)	(14, 15.4%)	(37, 40.7%)	(8, 8.8%)

<sup>a</sup> All respondents addressed these three questions.

that they were interested in such training for their residents. The majority (29, 65.9%) selected an online module as the preferred format for such training. Other formats selected included a written or online tool for residents to refer to for questions (6, 13.6%), a didactic session outline (5, 11.4%), or a standard lecture (4, 9.1%).

Among all respondents, the majority agreed that their training program provided sufficient training in vaccine safety to address questions of vaccine-hesitant parents through bedside or informal teaching (Strongly agree or Agree (75, 83.3%) and disagreed with the statement that formal education in vaccine safety is not a high priority for pediatric residents (Disagree or Strongly disagree (71, 78.1%). Respondents had differing opinions on whether the training that their residents receive on vaccine safety is influenced by the parental attitudes in the local geographical area. (Table 2) There was no significant difference between respondents who had differing opinions regarding the influence of local parental attitudes on vaccine safety training and the reporting of formal vaccine safety training in their program ( $p=0.98$ ).

## 5. Discussion

Because vaccines have been so successful at decreasing the rates of vaccine preventable diseases in the U.S., some parents are now more wary of the side effects of vaccines rather than the benefits of preventing the disease [16,17]. Thus, parents are choosing to delay or refuse vaccinations due to fears over vaccine safety. Pediatricians are the primary provider of children's health and the source parents most frequently cite for accurate vaccine information [18–20]. Therefore, pediatricians need to be well-informed on the topic of vaccine safety in order to address parental concerns and counter the trend of childhood immunization delay and refusal. Our study found that of respondents, the majority of U.S. pediatric residency programs do not have formal training in vaccine safety for their residents. Among those that do not have a program, the overwhelming majority would be interested in an online training module on vaccine safety for their residents. The majority of all respondents believed that formal training in vaccine safety is a high priority for their residents.

Programs that did have vaccine safety training in place utilized a variety of teaching methods, including standardized patient encounters with a mother and child at one facility. The training provided by these programs included education on (1) common adverse events following vaccines, (2) resources for physicians who have a patient with an adverse event, and (3) communicating with vaccine-hesitant parents. However, studies have reported that vaccine-hesitant parents also question the role of the vaccine manufacturer in the licensure and eventual recommendation of childhood vaccines [21], yet less than half of programs reported providing specific training on these issues. An understanding of

these processes could be valuable for future pediatric providers to address during encounters with vaccine-hesitant parents. The time spent on formal vaccine safety training was highly varied, ranging from a 15 min didactic session to an Immunization Health rotation. It is unlikely that the training residents receive in these two programs is similar and standardization of formal vaccine-safety training for programs could be valuable.

We found a statistically significant increase in the odds of having formal vaccine safety training with more residents in the program; however it is uncertain if this has any clinical significance. When querying all respondents, the majority agreed that their program provided enough training on vaccine safety through bedside training or informal teaching to address questions from vaccine-hesitant parents. However, the majority of respondents believed that formal vaccine safety training should be a priority; thus, the informal training may not be sufficient. Currently, there are many suggested strategies on how to address concerns about vaccines with vaccine-hesitant parents which may be imparted by informal bedside teaching, yet it is uncertain which of these strategies are most effective [22]. Also, pediatric providers currently in practice report a need for additional resources to address the complex questions arising from this population [23,24].

Responses varied regarding whether program directors believed parental attitudes in their local community impacted the training that pediatric residents receive on vaccine safety and vaccine hesitancy, with 35% of respondents agreeing that local attitudes impacted the inclusion of formal vaccine safety training while 50% did not. However, we found no association in the likelihood of programs having formal vaccine safety training and program directors response to this item.

Our study includes several limitations. First, we did not have 100% response rate from the APPD membership, therefore we cannot generalize our findings to all U.S. pediatric residency programs. However, with an approximately 50% response rate and APPD members from programs in 39 states and Puerto Rico responding, we believe that the study results represent a strong national sample of the status of pediatric residency programs regarding this issue. Also, although we queried how important the topic of vaccine safety is by questioning whether vaccine safety training is considered a high priority, our survey did not assess how this topic compares to all other topics required in residency training or how it fits into, or would fit into, overall residency training. Further, as shown in Table 2, the majority of respondents agreed that their program provides adequate training in vaccine safety topics through informal bedside training, yet the majority of programs without a formal vaccine safety training program are interested in providing this to their residents. This data is conflicting and should be investigated further; is informal vaccine safety training sufficient to provide adequate knowledge for pediatric residents to address questions from

vaccine hesitant parents or is there a need for a more structured educational experience to provide exposure to the breath of vaccine safety questions that could be posed? Even though respondent from programs with formal vaccine safety training provided a variety of educational formats as shown in Table 1, the list of choices besides “other” was limited. The list of format options could have also been expanded for selection by programs without formal vaccine safety training. Regarding the question: “Please select your level of agreement with the statement: Formal education in vaccine safety is not a high priority for our pediatric residents” (Table 2), the residency program directors who were responding could have interpreted this as asking about the residents’ perceptions of priorities rather than their own. We had some incomplete surveys; including 2 in which respondents did not enter the state for their program and 1 in which the program did not enter the number of residents. Finally, as some responses to survey items were qualitative, analyzing the responses quantitatively is difficult.

As formal training in vaccine safety has been identified as a high priority by our study population, yet is not routinely conducted, future research could evaluate the most important components to include in such training as well as methods to impart this training effectively and efficiently. Although data supports concerns about vaccine safety as the primary reason vaccine-hesitant parents choose to refuse or delay childhood vaccinations, additional non-vaccine safety related concerns of vaccine-hesitant parents could also be included.

## 6. Conclusion

As increasing numbers of parents are questioning the safety of childhood vaccines, pediatric residents need to be prepared to address the questions of vaccine-hesitant parents at the completion of training. Our study found that most U.S. pediatric residency programs do not provide formal training in vaccine safety training for their residents, but are interested in such training. The results of this survey will be used to support the need to address whether formal training in vaccine safety and hesitancy for U.S. pediatric residents is needed and to encourage investigation into what the most effective methods for providing this training may be for the time limited pediatric residency training.

## Financial disclosure

None.

## Conflicts of interest statement

None.

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