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Provider insight on surmounting specialty practice challenges to improve Tdap immunization rates among pregnant women

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Abstract

Background: Pertussis, or "whooping cough," is an acute, contagious pulmonary disease that, despite being vaccine-preventable, has become an increasingly widespread problem in the United States. As a result, the Advisory Committee on Immunization Practices and American College of Obstetricians and Gynecologists updated recommendations stating clinicians should give a Tdap dose during every pregnancy, preferably at 27−36 weeks. Despite this recommendation, reported Tdap vaccine receipt rates during pregnancy vary from 16−61%, and previous studies have shown that clinician recommendation and vaccine administration are strongly associated with vaccine uptake among pregnant women.

Methods: Our aim was to inform new strategies to increase uptake of the Tdap vaccine among pregnant women and, ultimately, reduce pertussis-related morbidity and mortality in infants. We conducted interviews with a sample of 24

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ob-gyns. We subsequently performed grounded theory analyses of transcripts using deductive and inductive coding strategies followed by intercoder reliability assessment.

Results: All physicians interviewed were familiar with the most recent recommendation of giving the Tdap vaccine during the third trimester of every pregnancy, and the majority of physicians stated that they felt that the vaccine was important and effective due to the transfer of pertussis antibodies from the mother to the fetus. Most physicians indicated that they recommended the vaccine to patients during pregnancy, but not all reported administering it on site because it was not stocked at their practice. Implementation challenges for physicians included insurance reimbursement and other challenges (i.e., patient refusal). Tdap vaccination during pregnancy was a lower clinical priority for some physicians. Physicians recognized the benefits associated with Tdap vaccination during pregnancy.

Conclusions: Findings indicate while most ob-gyns recognize the benefits of Tdap and recommend vaccination during pregnancy, barriers such as insurance reimbursement and financial concerns for the practice can outweigh the perceived benefits. This resulted in some ob-gyns reporting choosing not to stock and administer the vaccine in their practice. Recommendations to address these concerns include 1) structural support for Tdap vaccine administration in ob-gyns practices; 2) Continuing medical education-equivalent educational interventions that address management techniques, vaccine coding, and other relevant information; and 3) interventions to assist physicians in communicating the importance of Tdap vaccination during pregnancy.

Keywords: Infectious disease, Public health, Medicine

1. Introduction

Pertussis, or "whooping cough," is one of the most common vaccine-preventable illnesses that remain endemic throughout the world [1]. While pertussis is dangerous for anyone that contracts it, infants are highly susceptible to developing complications from the disease [1]. In 2014, the rate of pertussis among infants <6 months was 150.9 per 100,000 [2]. In an effort to decrease pertussis morbidity and mortality, the Advisory Committee on Immunization Practices (ACIP) has released several recommendations over the years regarding the Tdap (tetanus, diphtheria, and acellular pertussis) vaccine for pregnant women. One of the first strategies was implemented in 2006, when ACIP recommended the use of "cocooning" [3]. or vaccinating all who may come in close contact with infants. This approach proved to be logistically challenging and insufficient when used alone to prevent neonatal pertussis infections for a variety of reasons. Most importantly, cocooning leaves vulnerable newborns

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without any endogenous protective antibodies until they begin their own vaccine series at 2 months of age, requiring the newborn to be solely dependent on the immunity of those around them for the first 2−3 months of their life [4].

Previous recommendations have also included postpartum Tdap immunization administration [3]. In June 2011, ACIP recommended Tdap vaccination during pregnancy for previously unvaccinated women. The aim of this practice was to confer maternal antibodies to the fetus in order to provide direct protection as soon as the baby is born, providing protection when the infant is too young to get his or her own DTaP (diphtheria, tetanus, and acellular pertussis) vaccine series [5]. In October 2012, ACIP recommended that the Tdap vaccine be given to women during every pregnancy (preferably between 27−36 weeks gestation), irrespective of their prior history in receiving the vaccine, to maximize the passive antibody transfer to the infant [6, 7, 8]. Scientific evidence shows that Tdap vaccination at 27−36 weeks gestation is 85% more effective than postpartum vaccination in protecting infants <8 weeks of age [9, 10]. Since 2012, the guidelines have been updated again by the ACIP and the American College of Obstetricians and Gynecologists (ACOG) with recommendations for epidemic situations, wound management, series completion, and for management of other adolescents and adults in contact with infants who may be vulnerable to pertussis transmission [11].

In recent studies, estimates for receipt of Tdap during pregnancy varied, ranging from a reported 14% of publicly insured pregnant women in Michigan to a reported 82% of pregnant women delivering at a University hospital [12, 13]. With the lack of data on Tdap vaccine receipt during pregnancy and the high morbidity and mortality of pertussis among infants at the time of the study, further investigation on the factors that influence Tdap vaccine uptake was warranted.

Previous studies have shown that Tdap vaccine uptake among pregnant women is likely determined by a combination of factors related to both the patient and physician, with physician recommendations having a significant influence [14, 15, 16, 17, 18, 19]. This includes receiving counseling and educational materials from physicians, positive messages regarding vaccination, and accessibility of vaccines, including on-site administration [14]. In addition, the implementation of best practice alert systems embedded within hospital electronic medical records has also shown dramatic improvements in patient acceptance of Tdap immunization during prenatal care (96.8% acceptance rate) [20]. Additionally, several studies have examined patient barriers to Tdap vaccine uptake during pregnancy and these have included concern for vaccine safety and efficacy during pregnancy, lack of knowledge of the risk of pertussis during pregnancy, misinformation about vaccine effectiveness, and issues surrounding access to care [21, 22, 23, 24].

There is limited literature on provider-focused barriers to Tdap vaccination; however, there have been a few studies around provider perceptions [25]. In one study, 95%

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of physicians reported having no concerns with vaccinating during pregnancy [26]. Ninety-two percent of physicians in this survey knew the ACIP Tdap recommendations, but only 80% reported recommending Tdap to all eligible patients and 67% administered the vaccine in office [26]. Another study reported several reasons for physicians not vaccinating during pregnancy, including vaccine safety concerns, discomfort with providing vaccine counseling to patients, lack of vaccine efficacy data, low perceived incidence of pertussis and influenza in the area, and the fact that the Tdap vaccine specifically would be given postpartum in hospitals [16]. Physicians also cited several barriers against Tdap vaccine administration, with the most common including inadequate reimbursement, vaccine associated costs, and lack of patient interest [14, 15]. Despite physician-focused interventions to address these barriers, including toolkits with educational materials [19, 27], it is clear that further research is needed to understand the reasoning behind the perceptions and practices of physicians regarding Tdap vaccination.

2. Methods

2.1. Study design and sample

The study protocol was approved by the Westat, Centers for Disease Control and Prevention (CDC), and Emory University Institutional Review Boards and the study was conducted in 2014. The persons eligible for this study included ob-gyns that offered prenatal care as part of their routine practice. We aimed to recruit a diverse sample of physicians from across the nation in terms of patient composition, Tdap recommendation practices, and Tdap vaccine stocking. Half of the interviews were conducted with ob-gyns whose patient population was at least 50 percent Hispanic, while the remainder of participating physicians saw fewer than 50 percent Hispanic patients. We also aimed to recruit a mix of ob-gyns who did and did not recommend Tdap vaccination to their pregnant patients at each pregnancy; however, nearly all recruited ob-gyns (96%; n = 23) recommended the vaccine during the third trimester (27−36 weeks). We also sought a mixture of physicians who did and did not stock the Tdap vaccine in their offices. In our final sample, 58 percent (n = 14) of ob-gyns stocked the vaccine and 42 percent (n = 10) did not. Although not part of the sampling plan, the resulting sample was overwhelmingly male (92%, n = 22); it is important to note that this is not representative of the gender proportions among ob-gyns in the United States. All physicians were recruited through a commercial market research firm and were provided compensation for their time with a stipend considered non-coercive and reasonable for physician time away from clinical and administrative duties per national IRB standards.

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2.2. Interview format

A semi-structured interviewer's guide (Table 1) was developed in collaboration with ob-gyn and infectious disease clinicians, health communication experts, and behavioral scientists. Particular care was taken in crafting a script that facilitated a conversation on provider perceptions on pertussis and Tdap vaccination, current practices, and preferred patient-provider communication materials and strategies. Twenty-four in-depth interviews, approximately sixty minutes each, were conducted by telephone. Audio recordings of the interviews were made and transcribed verbatim. Transcripts were uploaded to NVivo 10.0 to begin the analysis process.

2.3. Code sheet development and procedures

A detailed code sheet and coding scheme were developed to capture relevant details from the transcripts such as perceptions of pertussis and the vaccine, current recommendation practices, administration and stocking, barriers to administration, and preferred communication materials and strategies. In this study, we specifically asked the physicians, "Do you recommend Tdap vaccine to your pregnant patients?" If the response was affirmative, we subsequently inquired, "At what point in the pregnancy do you recommend the Tdap vaccination?" From this line of inquiry we were therefore able to ascertain if they recommended Tdap immunization and we were able to determine the approximate timing of the recommendations.

Table 1. Interview guide − questions for participants.

1. Can you please tell me a little bit about you and your practice?
2. On a scale of 1−5 with 1 being not at all important and 5 being very important, what do you think of the Tdap vaccine's importance for women? What about the Tdap vaccine's importance for the baby?
3. Why did you give Tdap vaccine for pregnant women an X? Why did you give it an X for the baby?
4. How effective do you think the Tdap vaccine is in protecting pregnant women? What about for protecting their baby?
5. What, if anything, have you heard about the incidence of pertussis in the last few years in the United States?
6. Do you recommend Tdap vaccine to your pregnant patients?
7. If they recommend: About what percent of your pregnant patients would you say take your recommendation and get the Tdap vaccine while pregnant?
8. If they recommend: Can you give me an example of how that conversation goes with patients? What do you usually say when recommending Tdap to pregnant women?
9. Does your office typically administer the Tdap vaccine or refer patients elsewhere?
10. If they administer: Have you experienced any barriers to offering the Tdap at your practice?
11. If they do not recommend Tdap: What are some of the reasons why you do not recommend the Tdap to your pregnant patients?
12. What questions or concerns, if any, do your pregnant patients have about getting the Tdap vaccine?
13. What are some ways you communicate with your pregnant patients?
14. What information or tools do you or your staff need to make a strong recommendation for your pregnant patients to get Tdap?

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Two coders were trained on the code sheet and corresponding definitions. In the initial coding process, these team members reviewed a small sample of printed materials and independently coded the materials in an effort to establish pretest reliability and refine any unclear areas of the code sheet and corresponding definitions. Once reliability was established, coders began to work with the transcripts.

Analyses utilized the constant comparative approach within the grounded theory process model, which employs both deductive and inductive methods to allow for the emergence of theory [27]. The first step in this process included deductive methods, or structural coding, that linked text associated with questions in the interview guide to organize the data [28]. Subsequent content coding leading to thematic elicitation was derived through a process of independent review of all transcripts followed by discussion among the research team about emergent themes. Subsequent axial coding was conducted to evaluate relationships between categories, thereby facilitating the emergence of thematic linkages among variables. Illustrative quotes were selected to describe emergent themes, including major themes as well as critically important minor themes that reflected contrasting perspectives that presented novel opportunities for intervention (hereafter referred to as "outliers") [29, 30].

2.4. Intercoder reliability assessment

Random samples of transcript sections (30%) were cross-coded for reliability in two rounds. Intercoder reliability was established by comparing the presence or absence of codes in a subsample of text from each interview. The overall reliability was 99.3%, which is above the suggested 90% agreement level [31]. The individual codes achieved a high level of agreement, ranging from 94.2% − 100%.

3. Results

The sample of physicians interviewed consisted of 22 males and 2 females. Half ($n = 12$) of the interviews were conducted with physicians who stated that their patient population was $\geq$50% Hispanic, while the remainder of participating physicians ($n = 12$) stated that they saw $<$50% Hispanic patients. In general, the physicians were experienced ob-gyns who had been practicing (post-residency) for a minimum of 12 years. Of those interviewees who specifically noted years of practice ($n = 20$), the range was 12−35 years. In terms of patient volume, these physicians generally saw between 60−150 patients per week.

3.1. Recommendation vs. administration

Physicians were asked about their current practices of recommending the vaccine to pregnant patients, administering the vaccine on site, and referring patients to

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alternative sources. Nearly all of the ob-gyns (92%, n = 22) recommended the Tdap vaccine to their patients during weeks 27–36 of pregnancy.

> *I wouldn't discuss it with a new mom, you know, at a first OB visit, I mean there are a lot of other things to discuss, but at twenty seven weeks, I would tell her that the recommendation is to vaccinate all pregnant women for pertussis and for protection of the baby*

There were two outliers, in terms of their practice of Tdap vaccine recommendation. One reported recommending the Tdap vaccine postpartum, while the other only brought up the recommendation if the patient brought it up first. The one who recommended the postpartum immunization relied upon previous ACIP guidance in making the recommendation at this stage, as opposed to more recent guidelines that indicated antepartum immunization was recommended.

Additionally, 58% (n = 14) of ob-gyns stocked the vaccine and 42% (n = 10) did not. Six out of the ten physicians who did not stock the vaccine indicated that they were not as persistent as they could be in their recommendations. One physician stated:

> *We probably are little lax in recommending it is my guess. I don't know what my nurse practitioners do…but you know after this conversation, I'm sure going to start recommending it more.*

The most prominent reasons cited by physicians for their lack of persistence included their office not stocking and administering the vaccine, unfamiliarity with recommendations made by other staff in their office, and the sentiment that there were other important issues to discuss with their pregnant patients.

In terms of administering and stocking the vaccine, 8 of the 10 physicians who did not stock the vaccine explicitly stated they did not feel that not having the vaccine on site was a barrier for their patients. Physicians who did not administer and stock the vaccine at their practices sent their patients to a local pharmacy or their primary care provider to receive the Tdap vaccine.

> *We've been, we've been very successful in educating some primary care physicians who have not been aware of the recent recommendations or just having them be aware and having these patients come and be accommodated as new patients to initiate vaccines first and then carry on their care for whatever other primary care needs they may have in the future.*

3.2. Implementation challenges

Overall, the four main barriers to vaccine administration cited by physicians were insurance reimbursement, logistics, patient refusal, and transportation barriers.

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The most common barrier to vaccine administration and stocking was insurance reimbursement. Physicians were not willing to take the risk that a patient's insurance may not cover the Tdap vaccine and their practice would then have to take care of the cost. In order to avoid this risk, 10 out of 24 physicians mentioned that they did not administer or stock the vaccine in their practices. Additionally, 8 out of these 10 physicians mentioned that insurance reimbursement was the main reason why they did not stock the vaccine and administer it on site.

> *I think the biggest issue is really reimbursement, and just the hassles of trying to, you know, we physicians, we're getting squeezed in every possible direction. And, there again, I don't really want to get in a situation where it can — the supplier is not going to tell me, I can't tell a supplier 50 percent of my patients didn't pay, they'll say who cares, they just bill.*

The other two who did not administer the vaccine felt that it was easier to send the patient to a nearby pharmacy to receive the vaccine without any challenges. There were also two physicians who stock and administer the vaccine on site, but also discussed insurance reimbursement as being an issue that they face currently and one physician who knew this was a challenge for others, even though it was not for him.

Another important barrier that physicians mentioned was coordination of the logistics involved in vaccine administration. This includes initiating the process if the practice were to start administering the vaccine, as well as having an individual in charge of ordering and stocking the vaccine for continued vaccine administration.

Patient refusal was the most common non-structural barrier to vaccine administration and was cited as an impediment by all physicians interviewed. This issue arose among both physicians that administered the Tdap vaccine in their practices and those that referred patients to another source for vaccination. Physicians indicated some of the common reasons patients tended to refuse included potential out of pocket costs associated with getting the vaccine, concerns about the safety of vaccination during pregnancy, as well as overall vaccine hesitancy.

Some physicians were asked how they responded to these patients and they all stated that while they recommended the vaccine, ultimately it is the patient's decision. One physician explained:

> *Well, yeah I just try to explain the thought behind the whole vaccination process like with the whole pertussis protection…and that the CDC recommended or the ACOG recommends it, but some people are, you know, that you're just not going to change their mind.*

Additionally, three physicians mentioned that transportation was a concern for patients going off site to receive the vaccine. Of these three, two still did not administer and stock the vaccine on site, despite knowing it was a concern.

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3.3. Low clinical priority for ob-gyns

Physicians were asked if they knew about recent outbreaks of pertussis within their community, as well as the incidence of the disease in the United States over the past few years. Nineteen out of the twenty-four physicians in the sample knew about recent outbreaks across the country either through reading literature or attending conferences. However, none of the physicians had seen a case of pertussis in their practice and nine physicians explicitly stated that pertussis was not a prevalent enough concern within their communities to warrant attention in their practices.

> *…I just don't feel as adamant about it [vaccinating against pertussis] just because of the relative infrequency that we've seen the problem arise in the community.*

Six additional physicians mentioned that Tdap vaccination was not a priority in discussions with their patients, however they did not provide reasons for this. However, all twenty-four of the physicians interviewed did agree that pertussis was a dangerous disease, particularly for infants. As one physician explained:

> *I think the main importance of the vaccine is to confer immunity, you know, in the newborn, before they can be vaccinated, because, again, newborns are very susceptible to pertussis and it's potentially a lethal disease.*

All twenty-four physicians stated that they were made aware of the importance of vaccinating women during pregnancy through literature sources produced by ACOG. Twenty-two physicians stated that they believed that the literature and recommendations were credible, while two would like more research to be done before they are convinced of the benefits of Tdap vaccination during pregnancy. In general, physicians were familiar with the risks of pertussis and up to date on the literature on Tdap vaccination, and recent recommendations, however the responses elicited from physicians showed that Tdap vaccination was a low clinical priority among these ob-gyns.

3.4. Vaccine benefits recognized

In addition to addressing physician perceptions of pertussis and the Tdap vaccine, this study also aimed to elicit physicians' understanding of the benefits of giving the vaccine during pregnancy in order to gain an overall understanding of the factors that influenced physician recommendation and administration.

Physicians were asked to discuss how important they felt the Tdap vaccine was for both the protection of the pregnant woman and the baby. Fifteen out of the twenty-four physicians indicated that they felt that Tdap vaccination during pregnancy was more important for the protection of the baby than for the protection of the mother. While all physicians did not explain the reasoning behind their answer, one reason

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given for a higher ranking for infants was that many adults have received the Tdap vaccine at some point in their life and still have some immunity. Seven physicians felt that Tdap vaccination during pregnancy was equally important for the protection of the mother and the baby. There were also two outliers that believed that the Tdap vaccination during pregnancy was more important for the protection of the mother than for the baby.

Of the 24 physicians, 22 reported recommending Tdap vaccination during pregnancy, 1 recommended it postpartum, and 1 chose to not recommend it at all unless it was first mentioned by the patient in which case he advocated vaccination during pregnancy. However, with evolving recommendations over time, physicians may not have been entirely aware of the optimal timing for immunization administration. 21 of the 22 physicians that reported recommending vaccination during pregnancy mentioned that they understood the concept of antibody transfer and how it contributed to the effectiveness of the vaccine and mentioned this concept in some capacity to their patients. One physician, despite reporting recommending the Tdap vaccine during pregnancy, did not completely embrace revaccinating during a subsequent pregnancy to confer passive immunity and antibody transfer.

Additionally, physicians were also asked to discuss their beliefs regarding the effectiveness of the vaccine in protecting a baby after birth. This received varied responses from the sample. Twenty-three physicians felt that overall the Tdap vaccine was effective, and they believed that the lower incidence of pertussis confirmed this fact. However, there was one outlier physician who felt that there was not enough evidence to conclude that the vaccine is beneficial when administered during pregnancy and wanted more evidence in the literature. Table 2 further summarizes these emergent themes related to physician perceptions and practices.

4. Discussion

Preventive health behaviors, particularly vaccination, are heavily influenced by physician recommendation [14, 16, 17]. In the case of Tdap vaccination during pregnancy, the recommendation made by ACIP and endorsed by ACOG is relatively recent and, thus, all patients may not be familiar with it. Several studies have shown that patients are more likely to receive a vaccination during pregnancy, including Tdap, if their healthcare provider recommends it during visits and provides easy access to it [14, 16, 32–37].

In order to understand why pertussis morbidity and mortality among infants still remains high, this study aimed to elicit information from ob-gyns on their perceptions and practices regarding pertussis and Tdap vaccine recommendation, administration, and stocking. While the majority of physicians felt that it was their responsibility as an ob-gyn to recommend the vaccine to their patients, the strength of their

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Table 2. Emergent Themes related to Perceptions and Practice.

	Prevailing view – major theme	Contrasting/outlier view – minor theme
Recommendation vs. administration	"I certainly understand the recommendations and support those, but I just don't feel as adamant about it just because of the relative infrequency that we've seen the problem arise"	"I think that with everything else that we have to worry about taking care of these patients and their unborn children…the last thing on my mind is this vaccine. So I really think we're making a huge deal out of something that is not life threatening and earth shattering."
	"I would start by saying that we do not stock in our office, that doesn't preclude me from prescribing it, where you can go to the pharmacy, get the vaccine as a medical benefit, like a prescription, bring it back here and we can give you the shot."	"Well, usually, it's, oh we recommend this and we don't have it available in the office, we just want you to understand that you will be getting it in the hospital, and if the patient has concerns, or doesn't want it, I mean, they wouldn't, you know, state that otherwise, it's sort of much, hey, you're getting this, that's it."
Implementation challenges	***Reimbursement Challenge:*** "The reimbursement is another issue. I don't really like to, you know, submit any more claims to the insurance company for them to deny that I already do…"	"I don't want to set a dual standard care where you give or take a public assistance patient and you can't give them a vaccine being reimbursed but then you're giving them to some people that can pay. So, my limitation on that is the inability to get reimbursed for, on a consistent basis. Otherwise, I would probably push it."
	Logistical Challenge: "…Because I'm like not the administrator person in our office, you know, I don't get too involved in, you know, but storage, you know how long, expiration, I mean there's like a lot of stuff that goes on I think that, you know, is complicated."	N/A
	Transportation Challenge: "…We actually sent the patients to the health department to get it, which was a little bit of an issue because most of them, well not most of them, but some of them depend on public transportation and so we actually had to figure out they were going to get there from the building that we were in…"	N/A
	Patient Refusal Challenges: "She just didn't like vaccines in general, and she didn't think she needed it, and she just doesn't want to expose her baby to anything, and she didn't feel she needed it."	N/A
Low clinical priority for ob-gyns	"Well, again, and you know babies, newborns are susceptible to pertussis if it's prevalent in the community. So,	"Yeah, it's not high. I mean we still have herd immunity, I mean it's, I mean I think they're making a big

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Table 2. (*Continued*)

	Prevailing view − major theme	Contrasting/outlier view − minor theme
	I mean, if it was prevalent, I would probably give it a five [on a 1−5 scale], but if it's not prevalent in the community, then the chances of babies getting exposed to it I think are fairly small."	deal out of it. I'm not, I'm not convinced it's a big of a problem as they're saying it is, but, you know, I don't see it."
Vaccine benefits recognized	"I think the main importance of the vaccine is to confer immunity, you know, in the newborn, before they can be vaccinated, because, again, newborns are very susceptible to pertussis and it's potentially a lethal disease."	"If some woman got vaccinated say two to three years ago, she probably has some antibodies to pertussis that are still present and therefore will be transmitted to the baby. Now then, I don't understand them to be as high as if she get revaccinated, but there's probably some protection still remaining."
	"I think it's effective, and I don't see a lot people with pertussis, so I assume it's working."	"Well, there's studies actually in the, in the CDC report, there's actually a reference to a study that indicated that the benefit if anything was a very, very negligible or slight benefit for the patient receiving it to protect her baby. It's, you know, when you use this product I would imagine you're using it more with the intention of protecting the mother, not with the intention of, of providing passive immunity to the baby."

recommendation varied. As cited in other studies, women have recalled in approximately 66% of time, discussion about pertussis vaccination with providers [33]. In our study, however, physicians cited top-of-mind reasons such as insurance reimbursement, logistics, transportation challenges, and patient refusal as primary barriers to Tdap vaccine administration. The largest barrier to stocking and administering the Tdap vaccine was reimbursement.

The overall sentiment among physicians regarding pertussis was that they had heard about recent outbreaks in some capacity, either through literature or a conference they had attended. However, the majority of physicians had not heard of any outbreaks in the area they practiced, nor had they seen patients with pertussis. As a result, they did not think that the susceptibility to pertussis among their patient population was high, resulting in a perceived lower clinical priority. Further, the majority of physicians agreed that infants were vulnerable to pertussis and the symptoms of the disease were much more severe and potentially deadly among this age group. This study also aimed to understand physicians' perceptions on the action of administering the Tdap vaccine to pregnant patients. All physicians interviewed were familiar with the most recent recommendation of giving the Tdap vaccine during the third trimester of every pregnancy. Additionally, the majority of physicians

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stated that they felt that the vaccine was important and effective due to the transfer of pertussis antibodies from the mother to the fetus.

Based on the results of this study, provider interventions to increase their awareness of the importance of Tdap vaccination and address some of the structural barriers faced by providers may help improve uptake of the vaccine during pregnancy. These interventions would cover a range of topics including information on coding for reimbursement, proper ways to communicate the importance of Tdap vaccination during pregnancy, and information on pertussis and Tdap vaccination in the United States, A recent study found lack of awareness about the need for the Tdap vaccine during pregnancy led to non-vaccination by physicians [33]. Similarly, one of the findings of this study was that physicians didn't connect the potential importance of maternal Tdap vaccination in reducing pertussis among infants, particularly in their local area. As such, educational interventions in the form of continuing medical education (CME) modules, educational sessions at conferences, and provider-targeted health promotion campaigns may be beneficial and should be developed and evaluated.

There were several limitations in this study. The sample was not as diverse as originally intended, particularly regarding physician gender and years in practice. Additionally, social desirability bias was also a primary concern, as it is in any study in which respondents are asked to report on their adherence to recommended behaviors. While the findings are consistent with previous surveys and studies regarding Tdap vaccination during pregnancy, it is important to note that the study was conducted shortly after the release of ACOG recommendations on Tdap immunization for each pregnancy; the data collection also occurred prior to the development of extensive resources and educational platforms to increase Tdap vaccination in ob-gyn practices. Further, data were collected in 2014 and provider attitudes and behaviors may have since changed. Finally, due to the qualitative nature of this study, findings are not intended to be representative of the entire population of ob-gyns in the United States. While this study poses several limitations, it provides an understanding of provider perceptions, practices, and other influential factors associated with Tdap vaccination.

5. Conclusion

Barriers to recommending, stocking, and administering the Tdap vaccine among ob-gyns include insurance reimbursement, office logistics, transportation challenges, and patient refusal. Physicians did not express safety concerns with the Tdap vaccine itself, but often did not find it cost effective or efficient for their practice to stock or administer the vaccine. Providers provide the vehicle to Tdap vaccination and, ultimately, lower rates of pertussis morbidity and mortality among susceptible infants.

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As such, provider interventions on vaccine coding for reimbursement as well as interventions to increase patient education and awareness would be most useful. There are materials to help increase Tdap vaccination available for download from CDC (www.cdc.gov/pertussis/pregnant) and ACOG (www.immunizationforwomen.org). While this study specifically focuses on Tdap vaccination during pregnancy as a prevention mechanism, the results can be applied more broadly in disease prevention. Physician perceptions and practices significantly impact disease prevention, and it is important to address physician barriers, in addition to the barriers of the population at risk, to get a complete picture.

Declarations

Author contribution statement

Arpita Mehrotra, Laura A. Randall, Paula M. Frew: Analyzed and interpreted the data; Wrote the paper.

Allison Kennedy Fisher, Jennifer Mullen, Leslie Rodriguez, Angela J. Jiles, Alison P. Albert: Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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