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Assessing the impact of a pharmacy-provided personalized vaccination recommendation on immunization rates of adolescents

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Background: Adolescents should receive timely doses of recommended vaccinations. The coronavirus disease 2019 (COVID-19) vaccination approval for adolescents presented an opportunity for community pharmacists to address gaps in adolescent immunization schedules. Objectives: The objectives of this research were to (1) identify adolescent immunization gaps, (2) identify number of patients receiving recommended vaccination(s) at the community pharmacy, and (3) determine how many vaccinations were administered after the intervention. Methods: Three pharmacies conducted the prospective intervention. Adolescents aged 11-17 years initiating the Pfizer-BioNTech COVID-19 vaccination series were eligible to receive a personalized vaccination recommendation (PVR), which included up to 3 other vaccinations. State immunization information systems were assessed after dose 1 of the COVID-19 vaccine to create the recommendation(s) and reassessed 6 months after providing the PVR for accepted recommendations. Patient demographics and number of vaccinations administered were assessed using descriptive statistics. Results: Of the 225 adolescents who received COVID-19 vaccine dose 1, 74.7%, 75.1%, and 83.1% were indicated to receive tetanus, diphtheria, and acellular pertussis (Tdap), meningococcal conjugate (MenACWY), or human papillomavirus (HPV) vaccine, respectively. Thirty-three (14.7%) adolescents were up to date on all 3 vaccinations assessed. Of the 225 adolescents, 180 returned to the same location for COVID-19 vaccine dose 2 and received a PVR. Forty-two caregivers reported that their adolescent previously received 1 or more of the recommended vaccinations, indicating that state immunization information systems were inaccurate. Six months after the PVRs were given, 24 vaccinations had been administered. Conclusions: Most adolescents presenting for a COVID-19 vaccine were indicated, according to state immunization information systems, to receive at least 1 additional vaccination. After pharmacist-provided PVR and education, vaccine uptake occurred. Considering caregiver-reported inaccuracies, pharmacists should be cognizant of potential discrepancies when providing PVRs. In addition, this study highlights the value of a state immunization information system.

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Background

In Kansas and Missouri, vaccination rates among the adolescent population are suboptimal. As recommended by the Centers for Disease Control and Prevention (CDC), adolescents should receive timely doses of routinely recommended vaccinations. In particular, adolescents are indicated to receive vaccinations that protect against tetanus, diphtheria, and acellular pertussis (Tdap), meningococcal conjugate (MenACWY), and human papillomavirus (HPV).
Vaccination is important to reduce an adolescent’s risk of disease and associated complications. Infection with tetanus can result in serious symptoms including inability to open the mouth and difficulty swallowing or breathing, with the potential to have complications of laryngospasm, fractures, and infections. Before available vaccinations, 100,000-200,000 cases of diphtheria occurred, and approximately 14,000 deaths were reported annually. Since vaccinations, diphtheria is no longer a leading cause of childhood death in the United States. The rare occurrence of tetanus and diphtheria is encouraging; however, pertussis remains a more frequent occurrence. Data in the United States from 2013 to 2017 revealed 7522 cases of pertussis in the adolescent population, in which the hospitalization rate is approximately 0.8%. Despite this, in 2020, the estimated Tdap vaccination coverage in Kansas was 89% and 84% in Missouri, which is below the Healthy People 2020 goal and national coverage estimate of 90%.5

In 2019, 375 cases of meningococcal disease were reported in the United States. Fortunately, this number is relatively low because even with treatment, meningococcal disease is fatal for 10%-15% of individuals, and up to 20% of survivors will suffer long-term disabilities. Moreover, about 1 in 20 cases can lead to an outbreak, which can have a negative impact on the affected population. The MenACWY vaccine can help to protect adolescents from invasive meningococcal disease and any associated long-term complications. Estimated vaccination rates against meningococcal disease in 2020 was 83% for Kansas and 85% for Missouri, which are both less than the estimated national average of 89%.

The vaccination to protect against HPV is a 9-valent vaccine. From 2013 to 2016, 15% of individuals aged 20-34 were positive for 1 or more HPV types prevented by this available vaccine. Yet, in 2020, up-to-date HPV vaccination coverage for male and female adolescents aged 13-17 years in Kansas and Missouri was 53%, below the national average of 59%. Both states are well below the Healthy People 2030 goal for 80% of adolescents to be vaccinated against HPV. HPV can lead to anal, cervical, oropharyngeal, penile, vaginal, and vulvar cancer. Annually, there are an estimated 34,800 cancer cases resulting from HPV; increasing HPV vaccination rates can be impactful, considering that 92% of these cancer cases are preventable by vaccination.

The reduction of in-person doctor office visits during the coronavirus disease 2019 (COVID-19) pandemic owing to infection or risk of exposure was likely a contributing factor to the reduction in the number of adolescents receiving age-appropriate vaccinations. Data assessing vaccinations in the adolescent age group indicated a drastic decline in vaccinations in 2020, by as much as 84% when compared with 2018-2019. Improving these vaccination rates can help to protect the adolescent population from contracting Tdap, MenACWY, and HPV. Community pharmacists are accessible health care professionals who can serve as vaccinating providers for this population. The 2021-2022 influenza season highlighted the scope of pharmacists as vaccinators, with 40.4 million individuals receiving an influenza vaccine at a pharmacy compared with 30.8 million at a physician’s office. Pharmacists are well equipped to provide vaccination services to the adolescent population in the community setting, in turn supporting pediatricians and other vaccinating providers.

A state immunization information system allows health care providers, including pharmacists, to access an individual’s vaccination records. These state registries are designed to be a useful resource to increase transparency of administered vaccinations across different health care settings within the state to promote vaccination efforts. Documentation within a state immunization information system can prevent duplicate vaccination recommendations and can aid in timely administered vaccines. Community pharmacist review of state immunization information systems to produce vaccination recommendations can support other health care providers.

The COVID-19 vaccination authorization for adolescents aged 11-17 years has presented a unique opportunity for community pharmacists to evaluate and address identified gaps in adolescents’ vaccination schedules. This study sought to determine whether a pharmacist-provided personalized vaccination recommendation (PVR) for Tdap, MenACWY, and HPV would result in increased vaccine uptake for the adolescent population as determined by immunization registry reporting.

Objectives

The primary objective of this research was to identify immunization gaps for adolescents receiving the COVID-19 vaccination based on immunization registry data. Following the pharmacist-provided PVR, other objectives were to identify the number of patients who received vaccination(s) in the community pharmacy setting and to determine how many vaccinations were administered to adolescents after the intervention altogether.

Methods

Study site

A prospective intervention was conducted at 3 pharmacy sites operated by a grocery store chain located in the Kansas City metropolitan area. All 3 sites were Kansas pharmacies located within 25 miles of the Missouri border, so residents of both states comprise the patient population at each site.

Inclusion and exclusion criteria

Adolescents aged 11-17 years initiating the Pfizer-BioNTech COVID-19 vaccination (Pfizer Inc, New York, NY) series at any of the 3 study sites were eligible for a PVR. Anyone who received dose 1 of the COVID-19 vaccine before the start of the study did not allow for sufficient time for development of the PVR and was excluded. In addition, anyone who did not return to the same site for their second COVID-19 vaccine dose was excluded from analysis.

Study approach

Adolescents initiating the COVID-19 vaccine series between October 2021 and December 2021 were eligible to receive a PVR. Insurance information and the COVID-19 vaccination
search the Kansas immunization information system “WebIZ” and Missouri immunization information system “ShowMeVax” to obtain immunization records. After assessing the state immunization information systems, a PVR for each adolescent was developed, which included the vaccine(s) that were yet to be administered based on CDC recommendations. For each recommended immunization, the associated copayment for pharmacy administration and a patient-friendly vaccine education handout from the CDC were included. The PVR and vaccine education handout(s) were attached to the patient’s consent form used for both doses of the COVID-19 vaccine series. When the adolescent returned to the pharmacy for dose 2 of the COVID-19 vaccine, the community pharmacist or pharmacy intern retrieved the consent form, provided the PVR, and gave the education handout(s) to the caregiver. When providing the PVR, the pharmacist presented the anticipated copayment(s) for vaccine administration of typically $0 to the caregiver and offered to administer the adolescent’s recommended vaccination(s) at this time. If the caregiver declined the offered vaccination(s), the PVR handout instructed caregivers on how to schedule an appointment to receive the recommended vaccination(s) at the pharmacy and walk-in availability. Six months after the PVR was provided to the adolescent’s caregiver during COVID-19 vaccine dose 2 administration, the immunization information systems were reviewed a second time to determine whether the recommended vaccinations were administered.

Patient demographics, number of vaccination recommendations, and number of vaccinations administered were assessed using descriptive statistics. Data were evaluated using the SPSS v.27 (IBM Corp, Armonk, NY) software. The University of Kansas Medical Center Human Subjects Committee granted exemption for this project.

Results

A total of 225 adolescents were eligible for a PVR. The majority of adolescents were white, non-Hispanic, and 11 years old, as seen in Table 1. Of the 225 adolescents, 168 (74.7%) were indicated to receive a Tdap vaccination, 169 (75.1%) were indicated to receive a MenACWY vaccination, and 187 (83.1%) were indicated to receive an HPV vaccination, as seen in Figure 1. Most adolescents (n = 162; 72%) were indicated to receive 3 vaccinations, 4 (1.8%) were indicated for 2 vaccinations, and 26 (11.5%) were indicated for only 1 vaccination. A total of 33 (14.7%) adolescents were up to date on all 3 vaccines.

Of the 225 adolescents, 180 (80%) returned to the same site to receive COVID-19 vaccine dose 2 and received their PVR and were therefore included in the analysis. When the PVR was given to the caregiver, 42 (23%) caregivers reported that their adolescent previously received 1 or more of the recommended vaccinations.

Within 6 months after the 180 PVRs were provided to the caregivers, 13 (7.2%) unique patients received 24 vaccinations: 6 Tdap, 6 MenACWY, and 12 HPV vaccines. All vaccinations were administered at a pediatrician’s office according to the state immunization information systems.

Discussion

To our knowledge, this is the first study to examine pharmacists providing PVRs in coordination with the COVID-19 vaccination series. This study aimed to address any gaps in an adolescent’s recommended immunization schedule after assessing Tdap, MenACWY, and HPV immunization status using WebIZ and ShowMeVax. Twenty-four vaccinations were documented 6 months after the intervention, indicating that barriers to adolescent vaccinations beyond awareness of needed vaccinations may exist.

Olusanya et al. assessed barriers to childhood and adolescent vaccination uptake in the United States in the context of the COVID-19 pandemic. Challenges identified that may have contributed to vaccine delay included parental education level, overwhelmed health care systems, and restrictions on in-person office appointments resulting in fewer opportunities for providers to encourage vaccinations. The authors recommended health professionals work to increase personalized patient-provider interactions. They also concluded that patients should be receiving vaccinations at alternative immunization locations, such as community pharmacies, to alleviate bottlenecks elsewhere in the health care system.

The current study sought to overcome these obstacles by leveraging contact with a health professional in the community pharmacy to promote vaccine uptake by means of a PVR with education materials provided directly to caregivers. Other attempts made to increase childhood and adolescent vaccination rates have been assessed, primarily involving other health care educators including physicians, physician assistants, nurses, nurse practitioners, and medical assistants. Our study focused on pharmacists, expanding existing knowledge of interventions to increase adolescent vaccination rates. Fourteen studies providing health education were reviewed by Oyo-Ita et al., 6 of which focused on interventions either in the community directly or in a health

| Table 1 | Adolescent demographics |
|---------|-------------------------|
| **Demographics** | **N = 225** |
| **Age (years)** | n (%) |
| 11 | 167 (74.2) |
| 12 | 20 (8.9) |
| 13 | 9 (4) |
| 14 | 7 (3.1) |
| 15 | 6 (2.7) |
| 16 | 11 (4.9) |
| 17 | 5 (2.2) |
| **Race** | n (%) |
| White | 140 (62.2) |
| Black or African American | 9 (4) |
| Asian | 4 (1.8) |
| More than 1 race | 20 (8.9) |
| Other | 11 (4.9) |
| Not listed | 41 (18.2) |
| **Ethnicity** | n (%) |
| Hispanic | 12 (5.3) |
| Not Hispanic | 144 (64) |
| Not listed | 69 (30.7) |
In the health care facility interventions, parents were given verbal vaccine education and provided a PVR at the time of clinic visit. These studies concluded that this intervention may have improved the uptake of 3 doses of diphtheria-tetanus-pertussis vaccine for children. Similarly, providing education and a PVR directly to the caregiver the day of another service and subsequent uptake of vaccines was seen in our study in the community pharmacy setting. Whereas the patients in the study conducted by Oyo-Ita et al. were children, our study involved an adolescent population, indicating that providing education and a PVR to caregivers may improve vaccine uptake regardless of the child’s age. Another study focused on presenting HPV health education, including vaccine recommendations and an educational handout, to caregivers of 9- to 12-year-old females. This caregiver-directed health education intervention resulted in 11 (50%) unvaccinated females initiating the HPV vaccination series during the follow-up period. Our results align with the results of this research as our study provided a PVR and educational handouts to each caregiver whose adolescent was indicated for the HPV vaccine; 12 HPV vaccinations were administered within 6 months of intervention.

After receiving the PVR, 42 caregivers reported that 1 or more of the recommended vaccinations had been administered previously. This discrepancy indicates that there may be a lack of reporting that is causing statewide immunization information systems to be inaccurate. In Kansas and Missouri, pharmacies are required to report all administered vaccinations to the state immunization information system. Yet, other vaccination providers such as pediatrician’s offices, health clinics, and health departments are not mandated to report administered vaccinations to these immunization information systems. Only 58% of U.S. states and territories require all vaccine providers to report to the state immunization information system, and less than half (39%) require reporting for all ages. The optional reporting for some providers in Kansas and Missouri may have led to the immunization information systems not being up to date. With some providers reporting to the state immunization information systems voluntarily, the number of vaccinations needed in the PVR provided to the caregiver could have been falsely elevated owing to the lack of required reporting.

During the 6-month follow-up period, 24 vaccinations were administered, all of which were administered at a pediatrician’s office. The low number of adolescents up to date on vaccinations may have also been due to an increase in telehealth visits because of the risk of exposure of COVID-19 during the peak of the pandemic. As doctor offices started to transition back to in-person appointments, the availability of an appointment may have been an additional factor.

On the other hand, after the pharmacist-provided PVR, the true number of vaccinations administered within the 6-month follow-up period could have been higher than what the results show. If an adolescent received one of the pharmacist-recommended vaccinations from a provider who does not report to the state immunization information system, the data would not have been captured when reassessing the databases at the 6-month follow-up time period. The study highlights the need for all immunization providers to upload records to the respective state immunization information system. This shift would improve the completeness of the immunization information systems, therefore improving the accuracy of pharmacist-provided PVRs to the adolescent population.

Limitations

This study lacked diversity among the study population despite having 3 different study site locations. Furthermore, lack of voluntary reporting to state immunization information systems may have impacted the completeness of the PVR and the accuracy of number of accepted recommendations.

Conclusions

Pharmacist-provided PVRs affected vaccination rates among the adolescent population. Implementing PVRs allowed community pharmacists to deliver vaccination recommendations individualized for each adolescent directly to their caregivers. Additional studies surrounding increasing adolescent vaccination uptake in the community pharmacy setting and evaluating state immunization registry regulations would be beneficial.

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