

Impact of pharmacist integration in a pediatric primary care clinic on vaccination errors: A retrospective review

Anna Haas-Gehres, Sonya Sebastian, and Kristen Lamberjack

Abstract

Objective: To measure the impact of ambulatory clinical pharmacist integration in a pediatric primary care clinic on vaccination error rates and to evaluate missed opportunities.

Methods: A retrospective, quasi-experimental review of electronic medical records of visit encounters during a 3-month period compared vaccine error rates and missed opportunities between two pediatric residency primary care clinics. The intervention clinic has a full-time ambulatory clinical pharmacist integrated into the health care team. Pharmacy services were not provided at the comparison clinic. A vaccine error was defined as follows: doses administered before minimum recommended age, doses administered before minimum recommended spacing from a previous dose, doses administered unnecessarily, live virus vaccination administered too close to a previous live vaccine, and doses invalid for combinations of these reasons.

Results: 900 encounters were randomly selected and reviewed. The error rate was found to be 0.28% in the intervention clinic and 2.7% in the comparison clinic. The difference in error rates was found to be significant ($P = 0.0021$). The number of encounters with greater than or equal to one missed opportunity was significantly higher in the comparison clinic compared with the intervention clinic (29.3% vs. 10.2%; $P < 0.0001$).

Conclusion: The pediatric primary care clinic with a pharmacist had reductions in vaccination errors as well as missed opportunities. Pharmacists play a key role in the pediatric primary care team to improve the appropriate use of vaccines.

Keywords: Immunizations, errors, primary care, pediatrics, medication safety, ambulatory care.

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Vaccines continue to be an important public health measure. Childhood and adolescent vaccine schedules published annually by the Advisory Committee on Immunization Practices, American Academy of Pediatrics, and American Academy of Family Practitioners currently recommend immunizations against 16 vaccine-preventable diseases.¹ Increased knowledge of diseases and immunization technology has fueled development of new vaccines.

Practitioners at all levels are faced with the task of understanding and remaining up to date with vaccine schedules. While the increasing number of vaccines has shown a public health benefit, the recommended schedules have increased in complexity. Vaccine schedules outline timing between doses needed to achieve the highest rates of vaccine effectiveness. Deviations from these recommended schedules can decrease vaccine effectiveness. For example, studies have shown early administration of the third hepatitis B vaccine results in decreased immunity.² This level of complexity and the dynamic nature of vaccine recommendations can be a barrier to appropriate vaccine use.

Previous research has shown that invalid vaccine doses occur with varying frequency. A retrospective analysis of provider-reported vaccine histories found that 10.5% of U.S. children received at least one invalid dose (any vaccine dose administered ≥ 5 days before recommended minimum age or interval).³ Additionally, a prospective evaluation of vaccine records found 35.5% of patients received at least one invalid vaccine dose.⁴ In another study, invalid doses contributed to a decline in overall vaccination rates when removed from evaluation.⁵

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Table 1. Clinic encounters during 3-month chart review

Patients/encounters	Comparison clinic	Intervention clinic	<i>P</i>
No. patients ^a	3,044	3,057	
No. encounters	1,446	1,552	
No. vaccine doses administered in randomized encounters	623	718	<0.0001
Visit type of randomized encounters			0.4882
Well visits	231	248	
Sick visits	204	190	
Immunization only	15	12	

^aUnique patients ≤18 years of age.

In addition to the problem of invalid doses, missed vaccine opportunities in the pediatric population result in decreased coverage rates. The primary cause of underimmunization at 3 months of age was missed opportunities.⁶

Vaccines have been shown to reduce the burden of diseases. However, the efficacy and safety of vaccines depends on appropriate use. The role of pharmacists in the primary care setting is expanding, with pharmacist involvement capable of improving patient outcomes in many areas. Accordingly, research is important to understanding the impact of pharmacist interventions. However, prior to this study, there had been no available research investigating the impact of pharmacist involvement in a pediatric primary care clinic on the appropriate use of vaccines.

Objectives

The primary objective of this study was to measure the impact of ambulatory clinical pharmacist integration in a pediatric primary care clinic on vaccination error rates. The secondary objective of the study was evaluation of missed opportunities.

Methods

This study was conducted at Nationwide Children's Hospital in Columbus, Ohio—a freestanding pediatric hospital and health system that consists of 10 primary care locations located throughout central Ohio. In 2011, the primary care network cared for 65,053 patients. The hospital's institutional review board granted its approval before initiation of the study.

A retrospective, quasi-experimental chart review was designed to determine the impact of pharmacist integration in a pediatric primary care clinic. Two clinics in the primary care network were selected for comparison. Physically, both clinics are located in the same zip code and are separated by one mile. The clinics have similar schedule templates, as demonstrated by the distribution of visit types and unique patients served (Table 1). Vaccine policies, including schedules, storage, and administration, are standardized across the network. No vaccine shortages were present within the network during the study period.

Staffing levels are consistent throughout all clinics in the primary care network, but different individuals staff each clinic. Within each clinic, attending physicians, residents, and staff remained consistent throughout the study period. Across the network, resident physicians are enrolled in the same residency program, and attending physicians are managed under the same department.

However, the intervention clinic has a full-time, board-certified ambulatory clinical pharmacist integrated in its health care team. At the time of the study, this pharmacist had been practicing in the pediatric primary care setting for 6 years. This pharmacist regularly reviews charts and provides education to both providers and patients to ensure appropriate use of immunizations, in addition to numerous other interventions. No electronic clinical decision support for vaccines was available during the study period.

In contrast, the comparison clinic has no pharmacy personnel on staff to ensure appropriate use of immunizations through chart review interventions or provider and patient education.

Inclusion criteria

Encounters included in the study were all visits (well-child, sick, and immunization-only visits) for the months of April, May, and June 2011. Charts were excluded for patients older than 18 years of age. Encounters were randomized through computer randomization.

Data collection

Data was collected from the health system's electronic medical record, and two pharmacists on the research team conducted chart reviews. Each pharmacist conducted reviews individually, with periodic consults between reviewers to ensure consistency. Reviewers analyzed encounters for which they were not involved in care.

The research team reviewed each randomized chart using the 2011 recommended immunization schedules published by the Centers for Disease Control and Prevention (CDC). For each encounter, the following was documented by the research team: visit type, provider type, number/type of vaccine doses given, vaccine er-

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