Improving Capture of Vaccine History: Case Study from an Evaluation of 10-Valent Pneumococcal Conjugate Vaccine Introduction in Kenya

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Abstract. With the accelerated introduction of new vaccines in low-income settings, understanding immunization program performance is critical. We sought to improve immunization history acquisition from Ministry of Health vaccination cards during a vaccine impact study of 10-valent pneumococcal conjugate vaccine on pneumococcal carriage among young children in Kenya in 2012 and 2013. We captured immunization history in a low proportion of study participants in 2012 using vaccination cards. To overcome this challenge, we implemented a household-based reminder system in 2013 using community health workers (CHWs), and increased the retrieval of vaccine cards from 62% in 2012 to 89% in 2013 ($P < 0.001$). The home-based reminder system using CHWs is an example of an approach that improved immunization history data quality in a resource-poor setting.

INTRODUCTION

Streptococcus pneumoniae (pneumococcus) is a leading cause of mortality among children and adults in resource-poor countries.¹ Pneumococcal conjugate vaccines (PCVs) are effective for reducing morbidity and mortality caused by pneumococcus in children.^{1–3} As of December 2012, 44% of World Health Organization member states had added PCV to their national immunization programs.⁴

Reliable vaccination histories are essential for assessing vaccine and program effectiveness, but obtaining these histories can be challenging. Most vaccine impact field studies rely on the vaccine card as the source of immunization data. A Kenya coverage study for pentavalent vaccine (combined *Haemophilus influenzae* type b, hepatitis B, diphtheria, pertussis, and tetanus vaccine) demonstrated that 81% of families had a vaccine card for children < 5 years in their possession during household visits.⁵ Immunization information from registries may be used to supplement vaccine cards.⁵ Relying solely on maternal recall is associated with substantial errors.⁶ The objective of this study was to improve immunization history acquisition from vaccination cards during a vaccine impact study of 10-valent PCV on pneumococcal carriage among young children in Kenya in 2012 and 2013.

METHODS

The Kenya Medical Research Institute, in collaboration with the U.S. Centers for Disease Control and Prevention's International Emerging Infectious Program, has conducted population-based infectious disease surveillance (PBIDS) in Asembo, a rural site in western Kenya.^{7–10} We used the PBIDS platform to randomly select and enroll children in annual, cross-sectional nasopharyngeal pneumococcal colonization surveys to assess vaccine impact before and after PCV10

introduction in 2011. We collected immunization histories of participating children to assess carriage rates among PCV10 vaccinated and unvaccinated children < 5 years. Immunization histories were primarily assessed using a vaccination card provided by the Ministry of Health. The card is given to the parent and includes growth record, medical history, and receipt of vaccines in the national immunization program. Parents are instructed to carry this card with them whenever they bring their child for care or vaccinations.

Households of randomly selected children in Asembo were visited by community health workers (CHWs) annually and invited to participate in the pneumococcal carriage surveys. CHWs are community members who have undergone training that includes enrollment of participants in surveillance activities and epidemiologic studies. To assess immunization histories during each annual survey, CHWs requested that each child's parent or guardian bring vaccine cards for all children < 5 years residing in the household to the study clinic during the recruitment home visit, usually < 1 week before the clinic visit.

We observed low rates of vaccine card-verified immunization histories in 2012. Therefore, a household-based reminder system using CHWs was implemented during the 2013 survey. During the recruitment home visit, this intervention included 1) written note by the CHW on the study's invitation sheet confirming visual sighting of the vaccine card during this visit, 2) binding the vaccine card with the invitation sheet, and 3) weekly performance feedback with field supervisors (Figure 1) when vaccine card retrieval challenges were systematically recorded. We compared proportions of all immunization histories verified by vaccine card at the time of swabbing between 2012 and 2013 (pre- and post-intervention).

RESULTS

During pre-intervention in 2012, 62% of immunization histories were documented by vaccine card inspection among 177 children enrolled in the carriage study (Table 1). Reasons for lack of verified immunization histories during the 2012 survey among 67 child study participants included 41 (61%) parent forgot, 20 (29%) vaccine cards were lost, and 6 (10%) for unknown reasons.

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FIGURE 1. Vaccine card-verified immunization history improvement strategy.

During post-intervention in 2013, 89% of immunization histories were verified by vaccine card among 203 children enrolled in the carriage study ($P < 0.001$ compared with 2012). Reasons for lack of verified immunization histories during post-intervention among 23 child participants included 1 (4%) parent forgot, 20 (87%) vaccine cards were lost, 1 (4%) was damaged, and 1 (4%) was at another clinic.

DISCUSSION

We describe results of a household-based reminder system using CHWs to improve vaccination history data quality for a study evaluating the effect of PCV10 on pneumococcal carriage and transmission in Kenya. We summarize challenges regarding immunization history collection and effectiveness of

methods used to overcome these challenges. We demonstrated a 27% improvement in vaccine card retrieval utilizing a model of incorporating feedback for process improvement.

Practical methods for process improvement can make an impact on data quality, which determines the accuracy of results. Our household-based intervention used the plan-do-study-act quality improvement system, an iterative process that achieved measurable improvements in obtaining immunization histories from participants in the pneumococcal carriage survey.¹¹ After identifying low vaccine card-verified immunization histories in 2012, we planned to have higher vaccination card retrieval in 2013 by identifying modifiable factors that could improve the proportion of participants bringing vaccine cards to the study clinic. By engaging team members and brainstorming, we executed our plan and adapted it by monitoring performance and requested corrective actions by providing frequent feedback to team members.

The home-based reminder system contributed to our successful increase in vaccine card retrieval and verified immunization histories; however, our intervention could not address situations in which vaccine cards were lost, burned, or destroyed. The pneumococcal carriage study was able to capture some missing immunization histories using data collected from the ongoing demographic surveillance system.⁹

We learned at least three lessons. First, field studies with continuous close monitoring and evaluation can improve data quality in low resource settings. Second, we demonstrated a team-based approach that incorporates feedback from all members is effective. Third, we learned that successful process improvement requires reevaluation of interventions to ensure documented success. We recommend evaluation, monitoring,

TABLE 1

Vaccine card-verified immunization histories among child participants in the pneumococcal carriage survey in Kenya before and after intervention

	Pre-intervention (2012)	Post-intervention (2013)	<i>P</i> value
	<i>N</i> (%)	<i>N</i> (%)	
Vaccine card-verified immunization histories for child (< 5 years) participants	110/177 (62)	180/203 (89)	< 0.001
Male	62/92 (67)	91/103 (88)	< 0.001
Female	48/85 (57)	89/100 (89)	< 0.001

and feedback of data collection procedures, so that effective interventions can be implemented to improve data quality during public health field studies in resource-poor settings.

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