

Evaluation of Baby Advocate, a Childhood Immunization Reminder System

Childhood immunizations, based on CDC recommendations, are recognized as a cost effective and health promoting practice. However, ensuring full immunization requires a long-term commitment on the part of parents and providers. This article describes a program at Advocate Health care to increase the percentage of children fully immunized at two years to 90%. Termed Baby Advocate, the program uses a mailed reminder system that includes vaccine and growth and development information along with gifts and incentives. Volume, satisfaction and immunization status data are presented. Key words: *ambulatory care, childhood immunization, prevention, reminder systems, quality improvement*

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INTRODUCTION

Immunization rates for children are rising in the United States. However, immunization coverage levels are not evenly distributed, with lower rates occurring among economically deprived populations.¹ Despite great efforts and significant improvements, Chicago continues to lag behind both national performance and the 90% immunization goal for childhood immunizations.

According to the Centers for Disease Control and Prevention (CDC), 1999 Chicago coverage for 4 diphtheria, tetanus, and pertussis (DTaP); 3 polio; 1 measles, mumps, and rubella (MMR); and 3 *Hemophilus*

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influenzae type b (Hib) vaccinations was 71%, lower than the U.S. coverage of 78% and the state of Illinois coverage of 77%.² Immunization assessments at private practices around Chicago show full immunizations averaging between 60% and 75%.³ As a result, vaccine-preventable diseases still occur. For example, both Chicago and the nation experienced a measles epidemic in 1989–1991.¹ According to the CDC, there were 55,622 measles cases and 123 deaths from the disease between 1989 and 1991. After that outbreak, major vaccination campaigns were launched, with the number of reported cases down to 89 in 1999. Also reported in 1999 were 44,560 cases of varicella, 7,288 cases of pertussis, and 7,694 cases of hepatitis B were reported in the United States.⁴

IMMUNIZATION

Parents often find it difficult to keep up with the changes in the schedule of immunizations. Each year, the Advisory Committee on Immunization Practices of the National Immunization Program at the CDC, the American Academy of Pediatrics, and the American Academy of Family Physicians develop a schedule based on the latest research. For 2001, the following vaccines are included on the immunization schedule⁵:

- HepB—To prevent hepatitis B, a virus contracted by contact with contaminated blood, the HepB vaccine is usually given at birth, 2 months, 4 months, and between 6 and 18 months.
- DTaP—This vaccine provides protection against diphtheria, tetanus, and pertussis. The vaccine was reformulated, using specific proteins from pertussis (making it acellular) to reduce the side effects of the vaccine. Diphtheria is a highly contagious respiratory disease that can result in airway obstruction, coma, and death. Tetanus

(lockjaw) is a bacterial infection in the nervous system transmitted through a break in the skin. It causes death in a third of its victims. Pertussis (whooping cough) is a highly contagious bacterial respiratory disease that can result in pneumonia, encephalitis, and death. DTaP is typically administered at 2, 4, and 6 months, and at 15–18 months.

- Polio—Polio is a virus that attacks the central nervous system and can cause paralysis. Previously, the polio vaccine was administered in oral drops that contained a live vaccine. Because of the rare occurrence of vaccine-associated paralytic polio, the vaccine now contains an inactive form of the virus and is given by injection at 2 and 4 months, and between the ages of 6 and 18 months.
- Hib—The *Haemophilus influenzae* type b vaccine protects against bacterial meningitis and pneumonia. It is given at 2, 4, and 6 months, and between 12 and 15 months.
- PCV—The pneumococcal vaccine protects against the bacterial form of meningitis and pneumonia most prevalent in children. It is given at 2, 4, and 6 months, and between 12 and 15 months.
- MMR—This vaccine protects against measles, mumps, and rubella (German measles). Measles, a respiratory viral disease, can result in pneumonia, encephalitis, seizures, and death. Mumps, a viral disease, can cause meningitis and deafness. Rubella, a viral respiratory disease, can cause deafness, heart defects, mental retardation, and liver and spleen damage. The MMR vaccine is given at 12–15 months.
- Varicella—Varicella (chickenpox) is a virus of the herpes family. Vaccination prevents complications such as pneumonia and skin infections. The vacci-

nation is typically given between 12 and 18 months.

- HepA—Hepatitis A is a virus typically transmitted by oral contact with fecal matter. The Hepatitis A vaccine is recommended for use in selected states and/or regions where the disease is moderately or highly endemic and for certain high-risk groups.

Patient reminder systems have been found to be effective in increasing both adult and childhood immunization rates, regardless of baseline immunization rates. They are effective in a variety of settings, including academic settings, private practices, and public health clinics. Post card, letter, and telephone call reminders have all demonstrated effectiveness, with telephone reminders being most effective but also most costly.¹

BABY ADVOCATE INITIATIVE

As an integrated health care delivery system in Chicago, Advocate Health Care is committed to improving childhood immunization rates in the area. Since 1999, Advocate has partnered with state and local health departments, federal agencies, and corporations to provide vaccination reminders to parents during their child's first two years of life. Team members are listed in Table 1. Termed *Baby Advocate*, the initiative is designed to:

1. Increase the percentage of children fully immunized at two years to 90%;
2. Increase family access to immunization and growth and development information; and
3. Increase partnership with vaccine providers.

Babies born at an Advocate hospital or with an Advocate physician are enrolled in the program. Babies who receive care in a Neonatal Intensive Care Unit are excluded from the program. The program families receive mailings that include a welcome brochure, a vac-

cination record, vaccination reminder letters, vaccine information statements, and growth and development newsletters. Mailings are timed to correspond with the recommended vaccination schedule and well child visits. Mailings occur at 2 weeks, 1 month, 3 months, 5 months, 11 months, 14 months, 18 months, and 24 months of age. Gifts and incentives are also provided to parents. For example, at one year, each baby receives a Baby Advocate T-shirt. Parents are given the opportunity to complete evaluations at 7 and 18 months, and they receive small gifts when they return completed surveys. All mailings and fulfillment activities are provided by HealthAdvisor, Advocate's telemanagement department.

Materials were developed or modified by an interdisciplinary team of experts. The welcome brochure introduces the program to parents in 11 different languages, selected because they are the most common languages in the hospital service areas. It was impossible to have all materials available in all 11 languages. Thus, the welcome brochure introduces the program and suggests that the family find someone who can help them interpret subsequent mailings.

All other materials are available in both English and Spanish. Vaccination reminder letters list the vaccines that are due at a particular time and encourage parents to schedule appointments. In addition, a toll-free number is provided for assistance in finding a physician and to answer questions about vaccinations. Vaccination information statements, produced by the CDC, are also mailed with the reminder letters. The use of these statements is mandated in physician offices and clinics. The Baby Advocate team opted to use the same statements in order to reinforce the office-based communications.

The vaccine record is based on the schedule recommended by the Advisory Committee on Immunization Practices, the American

Table 1. Baby Advocate team members

Team Member—Company or Institution	
Phyllis A. Arthur—Merck & Co.	Nancy Mabbott—Advocate Hope Children's Hospital
Marilyn Bachar—HealthAdvisor	Marie Maslowski—Advocate Ravenswood Medical Center
Anita Berry—Healthy Steps	Maryanne McDonald—Advocate Charitable Foundation
Sylvia Boeder—Advocate Good Samaritan Hospital	Edward Mihalek—Centers for Disease Control and Prevention
Susan Bream—Advocate Medical Group	Crystal Mobley—Advocate Bethany Hospital
Cheryl Byers—Chicago Department of Public Health	Madhu Nappi—Illinois Department of Public Health
Peggy Cowling—Advocate South Suburban Hospital	Jennifer Nemkovich—HealthAdvisor
Jan Daniels—Illinois Department of Public Health	Cheryl Oakdale—Advocate Lutheran General Hospital
Heather Dawson—Advocate Lutheran General Hospital	Georgianne Pellettieri—HealthAdvisor
Chris Dedowitz—Advocate Health Centers	Gale Poindexter—Advocate South Suburban Hospital
Steve Derks—Government and Community Relations	Scott Sarran, MD**—Advocate Health Centers
Marcia Fahrenwald—Cook County Department of Public Health	Candace Sibby—Advocate Good Samaritan Hospital
Carol Frank—Advocate Illinois Masonic Medical Center	Donna Siemons—Advocate Health Partners
Colleen Hefferan—Clinical Excellence	Jackie Smith—Advocate Trinity Hospital
Cathee Johnson—Dreyer Medical Clinic	Carla Thomas—Advocate Health Centers
Michael Kimak—Wyeth-Ayerst Pharmaceuticals	Greg Waters—Business Development
Linda Kozicki—Business Development	Bonnie Woodard—Dreyer Medical Clinic
Patti Ludwig-Beymer*—Clinical Excellence	
Veronica Lunningham—Advocate Health Centers	

*Leader

**Physician Executive Sponsor

Academy of Pediatrics, and the American Academy of Family Physicians.⁶ Although the Baby Advocate program covers only the first two years of life, the vaccination record extends through age 18. Because Chicago is not considered a moderately or highly endemic area, the HepA vaccine is not included on Advocate's vaccination record. However, an empty column is included for any additional vaccines received by the child (see Figure 1).

The growth and development newsletter is adapted from the "Link Letters," produced as part of the Healthy Steps National Demonstration project. Advocate Health Care is a Healthy Steps demonstration site and received permission from the Commonwealth Fund to use the newsletters. The format was changed slightly to be consistent with the Baby Advocate look. Content was essentially unchanged.

Record of Childhood Vaccinations

Look at this record. The white boxes tell you when your baby needs "baby shots." Each box tells you the best range of times for your baby to receive the vaccine.

The record will help you schedule visits to your baby's doctor. Be sure to take your baby to the doctor regularly.

Take this record with you to all doctor visits. Each visit, review the record with your doctor. When your baby receives a vaccination, ask your doctor to date and sign the record.

Keep this record in a safe place. You may need it later, when your child enters school. Be sure to keep it up-to-date so you can enter our Baby Advocate grand prize drawing.

Child's name: _____ Birthdate: _____

AGE	HEP B (0-2 months)	DTaP (2 months)	Polio (2 months - IPV)	MMR	HIB (2 months)	Var (4 months)	PCV (2 months)	Other
2 Months	(1-4 months)	(2 months)	(2 months - IPV)		(2 months)		(2 months)	
4 Months		(4 months)	(4 months - IPV)		(4 months)		(4 months)	
6 Months	(6-18 months)	(6 months)	(6-18 months - IPV)		(6 months)*		(6 months)	
12 Months				(12-15 months)	(12-15 months)	(12-15 months)	(12-15 months)	
15 Months		(15-18 months)						
4-6 Years		(4-6 years)	(4-6 years - IPV)	(4-6 years)				
11-12 Years	Catch-up doses, if needed			Catch-up doses, if needed		If needed		
13-18 Years		(Td only) 11-18 years and every 10 years thereafter						

Schedule recommended by the Advisory Committee on Immunization Practices (ACIP), the American Academy of Pediatrics (AAP) and the American Academy of Family Physicians (AAFP), January 2001

* Talk to your doctor about the schedule that is right for your baby.

Don't let your name get lost in the shuffle.

Figure 1. Record of Childhood Vaccinations.

METHODOLOGY

HealthAdvisor and the Clinical Excellence Department collaborate on measurement. The ultimate effect of the initiative will be measured by vaccination status at two years of age. However, an interim 7-month evaluation was conducted and is reported here. The evaluation research was conducted with babies born between June 1999 and March 2000. Satisfaction and immunization status data were collected between January and October 2000. Key measures used to evaluate the effectiveness of Baby Advocate include:

1. Volume—HealthAdvisor, the department that provides fulfillment for the Baby Advocate products, tracked the total number of families being sent information monthly by site.
2. Satisfaction—Several satisfaction questions were included as part of a questionnaire distributed when the child reached the age of 7 months. In addition, program satisfaction was discussed with a subsample of families in a telephone interview.
3. Immunization Status—Parents were asked to report the number of vaccines received by their child as part of the 7-month questionnaire. In addition, each parent was asked to permit the child's physician to release vaccination data. With permission, physician office vaccination records were obtained and analyzed.

RESULTS

Volume

As of April 30, 2001, 27,994 babies were enrolled in the program, with 4.2% receiving materials in Spanish. A total of 120,669 mailings have been sent to families to date.

Satisfaction

A total of 1,378 7-month surveys (17.7% of those distributed) were completed and returned; 52% indicated that the program helped parents to get shots for their babies. Scores varied by geography (see Figure 2), with individuals from less affluent areas indicating that the reminders were more helpful. On the other hand, little variation on the helpfulness of the growth and development materials was seen by site, with 93% indicating that the program helped parents to understand their baby's growth. Overall, materials were positively evaluated. On a scale of 0–4, with 4 indicating very satisfied, the newsletters were rated 3.41, vaccine information statements were rated 3.14, and the vaccine record was rated 2.99.

During the third quarter of 2000, staff members telephoned 162 individuals who had agreed to follow-up contact. Interviews were successfully completed with 115 participants. Interviews were open-ended. Without prompting, most participants (88.7%) indicated that all materials were helpful, and smaller numbers specifically mentioned the vaccine information statements (4.3%), reminder letters (2.6%), and other mailed materials (2.7%). Only two participants (1.7%) indicated that the materials were not helpful. When asked in an open-ended question the most important factor in getting their child immunized on time, physician was mentioned most frequently (see Table 2).

Immunization status

Despite encouraging parents to use and refer to the vaccine record, up to 12% of parents indicated that they did not know which vaccines their child had received. The gold standard for determining vaccination status is the medical record. Thus,

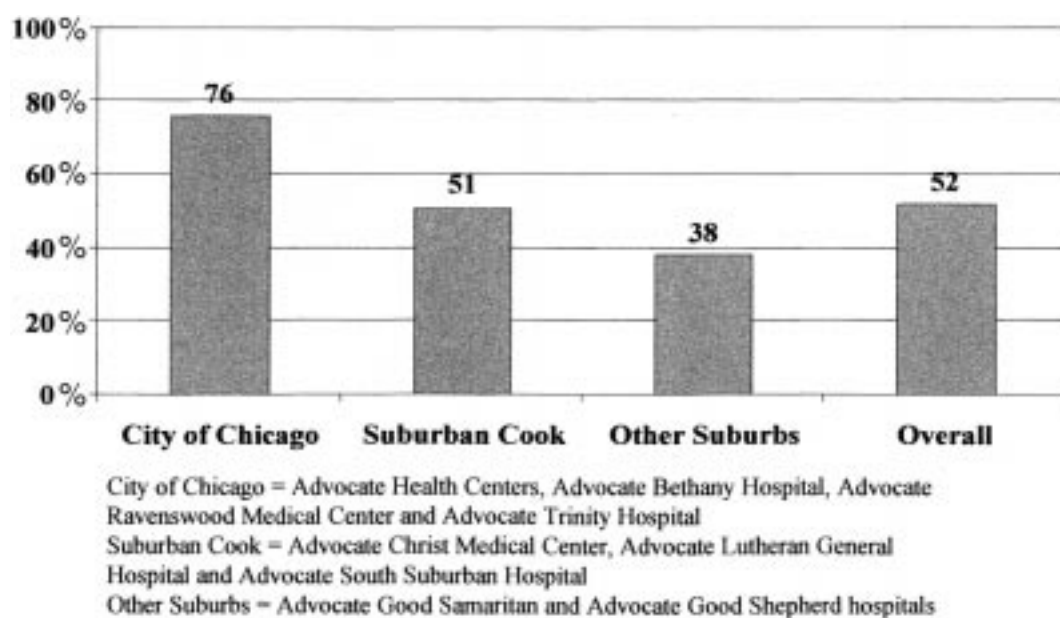


Figure 2. Percentage of respondents agreeing that mailed reminders helped them to get “baby shots,” by geographic location.

we requested permission from parents to obtain their children’s vaccination records from their physicians. A total of 517 physicians verified vaccination status. There were no statistically significant differences between the nonverified and the verified groups in terms of age, gender, race/ethnicity, or parent report of vaccination status.

Seven-month vaccinations were defined as up-to-date using national definitions as follows:

- HepB—2 or more doses
- DTaP—3 or more doses
- Polio—2 or more doses
- Hib—3 or more doses

The 7-month data are compared to national data in Figure 3. For three of the four

Table 2. What helps you the most to get your baby vaccinated on time? (n = 109)

Item	Number of Responses
Physician and office staff	69 (63%)
Mailed reminders	31 (28%)
Shot record	6
Vaccine information statements	3

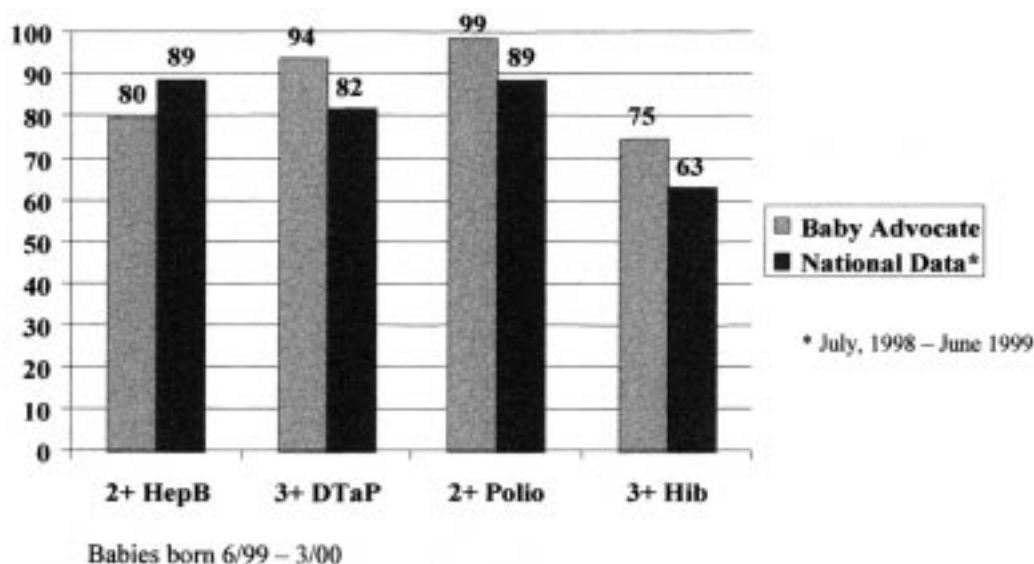


Figure 3. Physician-verified vaccination status at 7 months of age, n = 517.

vaccines, more Baby Advocate babies were up-to-date than the national data.

DISCUSSION

Outcomes suggest that immunization at 7 months of age for those receiving reminders is higher than the national performance for three (DTaP, polio, and Hib) of four vaccines. The lag in HepB vaccination may be related to the concern over the thimerosal content in the HepB vaccine that resulted in the July 1999 recommendation to cease administration of the vaccine at birth temporarily. Although the CDC suggested resuming inoculations with a new thimerosal-free vaccine in August 1999, only 39% of the hospitals in Chicago have resumed administration at birth.⁷

The Baby Advocate Team was initially disappointed by the perceived helpfulness of the reminders. However, by stratifying the data, it appears that the program is found to be

most helpful by parents who receive care at one of Advocate's Chicago sites. These parents tend to have a lower socioeconomic status than do parents receiving care at suburban sites and, thus, represent the potentially vulnerable group that we are trying to reach.

Conducting the 7-month study yielded valuable insights that resulted in small changes to the program. For example, some women indicated a concern about their child fussing and crying from the vaccination injections. As a result, the team developed a calming strategy handout that is mailed to all parents early in the program.

Providing reminders for babies over a two-year period requires effective partnerships and strong internal support. Materials could not have been developed and produced without input from a variety of internal and external experts and could not have been produced without financial support from a variety of funders. The resulting program has been well received by parents.

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