The Impact of Outreach Efforts in Reaching Underimmunized Children in a Medicaid Managed Care Practice

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Background: National immunization standards call for all primary care providers to implement immunization tracking systems that include contacting families when children are overdue for vaccines. The restructuring of Medicaid systems toward managed care models with a greater emphasis on having defined medical homes for children presents opportunities to expand the use of immunization recall systems among low-income children.

Objective: To assess the impact of telephone, mail, and a combined approach to reaching underimmunized children enrolled in a hospital-based Medicaid managed care practice.

Design and Methods: All underimmunized children younger than 6 years who had been continuously enrolled in the hospital-based Medicaid managed care practice for 3 months were randomly assigned to 1 of 4 groups: (1) control group with no intervention, (2) telephone reminder group, (3) mail reminder group, or (4) sequential mail/telephone reminder group. After a 10-week follow-up, medical records and the hospital’s computerized appointment scheduling system were reviewed to determine the effect of the outreach effort on appointments made, visits attended, immunizations received, and immunization status.

Results: Outreach efforts had a positive impact on the proportion of children immunized and on the resulting immunization coverage rates. The percentage of children receiving immunizations during the 10-week follow-up was 4.2% (3/71) for the control group, 16.7% (10/60) for the telephone reminder group, 19.0% (12/63) for the mail reminder group, and 25.7% (18/70) for the sequential mail/telephone reminder group. The percentage of children up-to-date for all immunizations at the end of the 10-week follow-up was 2.8% (2/71) for the control group, 13.3% (8/60) for the telephone reminder group, 14.3% (9/63) for the mail reminder group, and 17.1% (12/70) for the sequential mail/telephone reminder group. Forty-eight children were seen during follow-up without receiving all indicated vaccines.

Conclusions: Outreach efforts were modestly successful in reaching underimmunized children in a Medicaid managed care practice, although the lack of accurate information on telephone numbers and addresses limited the effectiveness. Missed opportunities for immunization also reduced the impact of outreach on immunization coverage.

DESIGN AND METHODS

OVERVIEW

In this randomized controlled trial, underimmunized children were assigned to 1 of 4 groups: (1) control group, (2) telephone reminder group, (3) mail reminder group, or (4) sequential mail/telephone reminder group. Assignments made to the primary care clinics, visits to the clinics, immunizations received or newly documented, and immunization status of the children were assessed after a 10-week follow-up.

The protocol was approved by the Institutional Review Board at Rhode Island Hospital, Providence.

SETTING

All children enrolled in Medicaid in Rhode Island, except those in foster care and those meeting the Social Security definition of disabled, are required to participate in Rhode Island’s Medicaid managed care program (Rite Care). Uninsured children from families who do not meet traditional Medicaid eligibility criteria but whose family income is below 250% of the federal poverty line are also eligible to participate. All Rite Care enrollees select a participating managed care plan and choose or are assigned to a primary care provider who is responsible for providing a range of health services. Children can receive primary care services only from their defined provider, although they may change their primary care provider by making a request through the managed care plan.

This study focused on children enrolled in Rite Care who were enrolled in the primary care clinics at Hasbro Children’s Hospital/Rhode Island Hospital, a university-affiliated teaching hospital in Providence. These clinics serve as the medical home for more than 10% of the 50000 children enrolled in Rite Care. Children are assigned to an attending physician within the clinics, and medical care is provided by teams of attending physicians, fellows, residents, nurse practitioners, and nurses. The primary care clinics did not have a formal immunization outreach program before the study.

SAMPLE

Children were eligible for the study if they were younger than 6 years as of September 30, 1998, and continuously enrolled in the primary care clinics at Hasbro Children’s Hospital/Rhode Island Hospital during July, August, and September 1998. The managed care plans provide the clinics with a computerized list of patients whose medical home is designated as one of the hospital’s pediatric primary care clinics. Children were considered continuously enrolled if they were included in the first enrollment list of each month from July through September 1998, regardless of their visit history, including if they had never been seen at the clinics. A 3-month minimal enrollment was chosen to give some time for newly enrolled children to make a visit to the clinics on their own. The study focused on children younger than 6 years, in keeping with the ongoing emphasis on immunization efforts among preschool children.

The immunization status of the 2117 children meeting the eligibility criteria at Hasbro Children’s Hospital/Rhode Island Hospital was assessed using a computerized immunization tracking system. From October through December 1998, the medical records of all children deemed to be underimmunized were reviewed to verify their immunization status. Children were considered underimmunized if they were overdue for diphtheria and tetanus toxoids and pertussis, polio, Haemophilus influenzae type b, measles-mumps-rubella, or hepatitis B vaccines. Table 1 lists the minimal number of each vaccine required to be considered up-to-date at specific ages for the purposes of this study. These standards were derived from the schedule recommended by the Committee on Infectious Diseases of the American Academy of Pediatrics in 1997. Minimal numbers of vaccine doses were used as the standards to identify children who were overdue for vaccines, rather than those who were currently due. All administered vaccines were included in the assessment, regardless of vaccine timing. Children who appeared on the enrolled lists provided by the managed care plans but had not yet made a visit or forwarded their old medical records to the clinics, and therefore had no documented immunizations, were considered underimmunized and in need of outreach.

nizations, sometimes followed by more intensive efforts aimed at those families who do not respond. Although proactive, this method involves contacting many families who would have had their children immunized without the reminder. Given that resources were limited and immunization rates were known to be relatively high in this study setting, focusing outreach efforts on underimmunized children was a more practical approach. Although research findings support the value of this approach as well, some aspects of Medicaid managed care programs could reduce the impact of immunization recall systems. For example, the lack of accurate address and telephone contact information for this population could limit the effectiveness of recall attempts. In a study of public clinics, Stehr-Green et al found that telephone reminders did not have a statistically significant impact unless analyses were restricted to families with accurate telephone numbers. Because of these types of concerns relevant to Medicaid managed care, this study was undertaken to determine if recall systems would be effective in a Medicaid managed care practice and to assess the relative impact of mail and telephone approaches to contacting families.

RESULTS

INTERVENTION

A total of 264 underimmunized children were included in the study; 71 were randomized to the control group, 60 to the telephone reminder group, 63 to the mail reminder group, and 70 to the sequential mail/telephone reminder group. The groups were similar before the intervention in sex, age, and vaccine-specific immunization rates.

The mean number of telephone call attempts in the telephone reminder group was 1.8, and the mean dura-
Of the 2117 children eligible for the study, 333 were underimmunized. Fourteen of these children had received a recent immunization, rendering them ineligible to receive needed vaccines in the coming weeks, and were therefore excluded from the study. The computerized appointment schedule for the primary care clinics was examined for each child, and the 55 children who already had an appointment scheduled in the primary care clinics within 10 weeks were also excluded from the study. The remaining 264 children constitute the study sample.

INTERVENTION

The computerized immunization tracking system operates on a commercially available database (FileMaker Pro; FileMaker Inc, Santa Clara, Calif). Random numbers were generated for children in the immunization tracking system for the purpose of this study. When a child had met all study inclusion criteria, the random number was used to determine which type of outreach the child would receive. The control group received no intervention. English- and Spanish-speaking clinic receptionists attempted to call families in the telephone reminder group, informing them that their child was behind on his or her immunizations and requesting that they make an appointment with their primary care provider. If the family agreed, the receptionist would schedule the appointment during the telephone call and ask them to bring their immunization record with them to the appointment. Telephone numbers were obtained from the hospital registration system, unless the child had never been seen at the hospital, in which case the telephone number listed by the managed care organization was used. Only 1 child had no telephone number from either source. At least 3 telephone call attempts were made, one each in the morning, afternoon, and early evening, before concluding that the family could not be contacted.

For the mail reminder group, a letter was sent to the family, informing them that according to the clinic records the child was behind on his or her immunizations. The letter requested that the family call the clinic to schedule an appointment with their primary care provider and that they bring all immunization records with them to that appointment. A letter was also sent to the families of children in the sequential mail/telephone reminder group. One week after mailing the letter, a clinic receptionist reviewed the computerized scheduling system to determine if the family had scheduled an appointment. If so, no further action was taken. If not, the receptionist telephoned the family, using the same basic procedures as for the telephone reminder group.

FOLLOW-UP

After a 10-week follow-up, the medical records of study children were reviewed to determine the number of visits the child had attended (including nurse-only visits) and any newly received or newly documented immunizations. With these additional data, the immunization status of the study children was then reassessed, using the immunization tracking system. The computerized appointment scheduling system also was reviewed to determine whether any visits were scheduled but not kept, and to assess whether any visits had occurred that were not documented in the medical record.

DATA ANALYSIS

Study data were analyzed using commercially available software (FileMaker Pro and SAS, version 6.12; SAS Institute, Cary, NC). The independent variable was the type of intervention. The 4 main dependent variables were: (1) appointments scheduled at the primary care clinics during follow-up, (2) visits to the primary care clinics during follow-up, (3) immunizations received during follow-up, and (4) immunization status at the end of follow-up. The dependent variables were expressed as proportions, for example, the proportion of children with a scheduled appointment. Differences in proportions were assessed using $x^2$ tests, with $P < .05$ considered significant. Comparisons were made between the 3 intervention groups (telephone reminder, mail reminder, and sequential mail/telephone reminder). The 3 intervention groups were also combined into 1 group and compared with the control group. An intention-to-treat approach was used for analyses unless otherwise specified.

<table>
<thead>
<tr>
<th>Table 2</th>
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<table>
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<tr>
<th>Follow-up</th>
<th>Intervention Groups</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visits during follow-up</td>
<td>16.9%</td>
<td>38.9%</td>
</tr>
<tr>
<td>Immunizations during follow-up</td>
<td>42.9%</td>
<td>48.7%</td>
</tr>
<tr>
<td>Appointments scheduled</td>
<td>21.1%</td>
<td>50.8%</td>
</tr>
</tbody>
</table>

The differences in rates were statistically significant between the control group and the combined intervention groups for appointments scheduled (21.1% vs 50.8%; $P = .001$) and for visits made (16.9% vs 38.9%; $P = .001$). Although the trend...
was for the mail reminder group to have lower rates than either the telephone or sequential mail/telephone reminder groups, these differences did not reach statistical significance (P = .18 for appointments; P = .22 for visits).

Of the 28 children whose families were successfully contacted in the telephone reminder group, 25 (89.3%) had an appointment scheduled, and 19 (67.8%) made a visit. Of the 44 children in the mail reminder group whose letters were not returned, 20 (45.5%) had an appointment scheduled, and 15 (34.1%) made a visit. Of the 40 children in the sequential mail/telephone reminder group whose letter was not returned or who were contacted by telephone, 28 (70.0%) scheduled an appointment, and 22 (55.0%) made a visit.

IMMUNIZATIONS

Children in the intervention groups also were more likely to receive an immunization compared with the control group (P < .05). The percentage of children immunized during follow-up was 4.2% (3/71) for the control group, 16.7% (10/60) for the telephone reminder group, 19.0% (12/63) for the mail reminder group, and 25.7% (18/70) for the sequential mail/telephone group. Differences between the 3 intervention groups were not statistically significant (P = .41).

Given the study inclusion criteria, all children in the sample were underimmunized at entry into the study. At the end of follow-up, children in each of the 3 intervention groups were more likely to be up-to-date for immunizations compared with children in the control group (P < .05). Using minimal standards defined in Table 1, the percentage of children up-to-date for diphtheria and tetanus toxoids and pertussis, polio, Haemophilus influenzae type b, and measles-mumps-rubella was 2.8% (2/71) for the control group, 13.3% (8/60) for the telephone group, 14.3% (9/63) for the mail group, and 17.1% (12/70) for the sequential mail/telephone group of underimmunized children. Differences between the 3 intervention groups were not statistically significant (P = .82).

The major reason that children were not brought up-to-date during follow-up was that they had not made a visit to the clinics during this time. However, nearly one quarter (57/233) of the study children who were not up-to-date for immunizations at the end of the study had made a visit to the clinics (14.5% [10/69] for the control group, 34.6% [18/52] for the telephone reminder group, 18.5% [10/54] for the mail reminder group, and 32.8% [19/58] for the sequential mail/telephone group). Forty of these children did not receive any immunizations at all, and an additional 8 did not receive all indicated immunizations. Nine of the children were immunized for all indicated vaccines but required multiple doses of vaccines to be brought up-to-date.

The impact of the intervention is more pronounced when families who were not contacted were removed from the analyses. Of those in the telephone reminder group who were successfully contacted, 25.0% (7/28) were up-to-date at the end of follow-up. Of those in the mail reminder group whose letter was not returned because of a wrong address, 18.2% (8/44) were up-to-date. For the sequential mail/telephone group, 20.0% (8/40) of those who were contacted by telephone or whose letter was not returned were up-to-date for immunizations at the end of follow-up.

This study demonstrates that outreach efforts in a Medicaid managed care practice were successful in immunizing children who otherwise would not have received the immunizations in a timely manner. Thirty-nine percent of children in the intervention groups were seen during the 10-week follow-up, compared with 16.9% in the control group. As a result, a greater proportion of children became up-to-date for immunizations in the intervention groups compared with those in the control group (15.0% vs 2.8%, respectively). With the presence of defined provider-patient relationships in primary care-oriented Medicaid managed care systems, providers can readily identify the group of children for whom they are responsible, including families who do not routinely seek preventive services. This identification allows for targeted outreach efforts to an extent that is not possible under traditional fee-for-service Medicaid.

Differences between the 3 intervention groups in appointments, visits, immunizations received, or immuni-

### Table 1. Minimal Number of Vaccines Needed to Be Considered Up-to-Date*

<table>
<thead>
<tr>
<th>Age</th>
<th>DTaP</th>
<th>Hib</th>
<th>Polio</th>
<th>Hep B</th>
<th>MMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 y to &lt; 6 y</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>19 mo to &lt; 5 y</td>
<td>4</td>
<td>4†</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>16 mo to &lt; 19 mo</td>
<td>3</td>
<td>4†</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>7 mo to &lt; 16 mo</td>
<td>3</td>
<td>3†</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>5 mo to &lt; 7 mo</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>3 mo to 5 mo</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>= 3 mo</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*DTaP indicates diphtheria and tetanus toxoids with acellular pertussis; Hib, Haemophilus influenzae type b; Hep B, hepatitis B; and MMR, measles-mumps-rubella. Taken from schedule recommended by the American Academy of Pediatrics.†Or at least 1 vaccine after 15 months.

### Table 2. Appointments Made, Visits to the Primary Care Clinics, Immunizations Received, and Immunization Status of Study Children by Intervention Group*

<table>
<thead>
<tr>
<th>Intervention Groups</th>
<th>Control Group (n = 71)</th>
<th>Telephone (n = 60)</th>
<th>Mail (n = 63)</th>
<th>Mail/Telephone (n = 70)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCC appointment during FU</td>
<td>21.1</td>
<td>56.7</td>
<td>41.3</td>
<td>54.3</td>
</tr>
<tr>
<td>PCC visit during FU</td>
<td>16.9</td>
<td>43.3</td>
<td>30.2</td>
<td>42.9</td>
</tr>
<tr>
<td>Immunized during FU</td>
<td>4.2</td>
<td>16.7</td>
<td>19.0</td>
<td>25.7</td>
</tr>
<tr>
<td>Immunizations up-to-date at end of FU</td>
<td>2.8</td>
<td>13.3</td>
<td>14.3</td>
<td>17.1</td>
</tr>
</tbody>
</table>

*Data are given as percentages. PCC indicates primary care clinics; FU, 10-week follow-up. For all 4 indicators, differences between the intervention groups combined and the control group are significant at P < .05; differences between the 3 intervention groups are not significant at P = .05.
limited to immunization delivery but should also be ex-

Finally, reminder systems need not be 

the children up-to-date for all vaccines, although they did 

show a trend in favor of a combined approach. A formal 

cost analysis for the 3 intervention methods was not per-

formed. However, the telephone outreach method ap-

peared easiest to use, since all outreach efforts must 

result in a telephone conversation with a receptionist 

to make an appointment. The effort reaching the families 

by telephone was not a major burden. The mean num-

ber of telephone call attempts in the telephone re-

minder group was 1.8, and the mean duration of suc-

cessful telephone contacts was less than 2 minutes. Given 

that the telephone method was as effective and ap-

peared to be the most efficient, this method is now rou-

tinely used in these primary care clinics for outreach of 

underimmunized children.

Although the outreach efforts had a positive impact 

that has justified continuing outreach in this study 

setting, most children were still not effectively reached.

As a result, the percentage of children brought up-to-

data was disappointingly low, and the interventions would 

be expected to have only a small effect on improving im-

munization rates for the Medicaid managed care prac-

tice as a whole. The major factor limiting the impact of 

the intervention was the lack of accurate telephone num-

bers and addresses for the families. Part of this problem 

is related to the target population, which appears to be 

mobile and subject to changing or losing telephone ser-

vice. The findings demonstrate that Medicaid managed 

care providers must put additional effort into maintain-

ing and updating information systems to maximize their 

possible uses, such as updating address and telephone 

number information. This may also be true concerning 

the accuracy of enrollment lists, as 10 families con-

acted by telephone during the study (3 in the tele-

phone reminder group and 7 in the sequential mail/ 

telephone group) denied being patients of the practice.

For designated patient panels to be a useful approach 

to outreach, the patient lists must be accurate and current.

Providers also may need to augment the relatively simple 

outreach methods used here with more aggressive tech-

niques such as home visits. The fact that some children 

were seen in the clinics during follow-up but did not re-

ceive all indicated vaccines emphasizes the need to work 

with providers to avoid missed opportunities for im-

munization as well. Presenting to the primary care 

provider is only a partial success; underimmunized 

children must receive the needed vaccines.

In summary, the outreach methods resulted in chil-

dren receiving needed services in the Medicaid man-

aged care practice. However, more vigorous efforts are 

still needed. In addition, reminder systems need not be 

limited to immunization delivery but should also be ex-

panded to focus on other key preventive services, such 

as screening for lead poisoning. The goal should be for 

all children in these new delivery systems to receive op-

timal levels of all indicated preventive services.

Accepted for publication August 2, 2000.

Funding was provided by the Hallet Trust.

We thank Birkin James Diana, BA, and April McAlis-

ter, for their assistance on the project. We also thank 

the health care providers and staff of the primary care clinics 

at Hasbro Children's Hospital/Rhode Island Hospital, Providence, 

for their cooperation with this study and for the ef-

forts they make in immunizing children.

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REFERENCES

1. The National Vaccine Advisory Committee. Strategies to sustain success in child-


2. Centers for Disease Control and Prevention. Standards for pediatric immuniza-


4. Larson EB, Olsen E, Cole W, Shortell S. The relationship of health beliefs and a 

postcard reminder to influenza vaccination. J Fam Pract. 1979;8:1207-1211.

5. Larson EB, Bergman J, Heidrich F, Alvin BL, Schneeweiss R. Do postcard re-

minders improve influenza vaccination compliance? A prospective trial of dif-


6. Brimberry R. Vaccination of high-risk patients for influenza: a comparison of tele-

phone and mail reminder methods. J Fam Pract. 1988;26:397-400.

7. McDowell I, Newell C, Rosser W. Comparison of three methods of recalling 


8. Sliagit PG, Rodenvald LE, Savagea J, Yoons L, Doane C. Improving influenza 

vaccination rates in children with asthma: a test of a computerized reminder sys-

tem and an analysis of factors predicting vaccination compliance. Pediatrics 1992; 

90:871-875.

9. Kemper KJ, Goldberg H. Do computer-generated reminder letters improve the 

rate of influenza immunization in an urban pediatric clinic? AJDC. 1993;147: 

717-718.

10. Rossner WW, McDowell I, Newell C. Use of reminders for preventive procedures 

in family medicine. CMAJ. 1991;145:897-913.

11. Rossner WW, Hutchison BG, McDowell I, Newell C. Use of reminders to increase 

compliance with tetanus booster vaccination. CMAJ. 1992;146:911-917.

12. Abramson JS, O'Shea M, Ratledge DL, Lawless MR, Givner LB. Development of a 

vaccine tracking system to improve the rate of age-appropriate primary im-

munization in children of lower socioeconomic status. J Pediatr. 1995;126:583- 

586.

13. Linkins RW, Dini EF. Vaccine uptake by children with special health care needs. 


status of children enrolled in a hospital-based Medicaid managed care practice: 

the importance of the timing of vaccine administration. Pediatr Infect Dis J. 1999; 

18:783-788.

15. Liu TA, Capra AM, Makol J, Black SB, Shinefield HR. Effectiveness and cost-

effectiveness of letters, automated telephone messages, or both for under-


16. Yolken JM, Glennick DS. Increasing the immunization of preschool children: an 


17. Liu TA, Black SB, Ray P, et al. Computer-generated recall letters for under-


computer-generated reminders to improve vaccination coverage at inner-city 


health care reform: Oregon, Hawaii, Tennessee, and Rhode Island. Health Care 

