

# PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

## **Adoption of Reminder and Recall Messages for Immunizations by Pediatricians and Public Health Clinics**

Cheryl D. Tierney, Hussain Yusuf, Shawn R. McMahon, Donna Rusinak, Megan A. O'Brien, Mehran S. Massoudi and Tracy A. Lieu

*Pediatrics* 2003;112;1076

DOI: 10.1542/peds.112.5.1076

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://pediatrics.aappublications.org/content/112/5/1076.full.html>

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2003 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



# Adoption of Reminder and Recall Messages for Immunizations by Pediatricians and Public Health Clinics

Cheryl D. Tierney, MD, MPH\*; Hussain Yusuf, MBBS, MPH‡; Shawn R. McMahon, MD, MPH‡; Donna Rusinak, BS§; Megan A. O' Brien, MPH§; Mehran S. Massoudi, PhD, MPH‡; and Tracy A. Lieu, MD, MPH§||

**ABSTRACT.** *Objective.* Strong scientific evidence and national recommendations support the use of reminder and recall messages to improve immunization coverage rates, yet reports have suggested that only a minority of pediatric practices use such messages. Our aims were to 1) determine the proportions of pediatric practices and public clinics that currently use practice-based reminder or recall messages and routinely undergo immunization assessment efforts, 2) evaluate barriers and supports to implementing these practices, and 3) identify predictors of either current use or plans for future adoption of these practices.

*Methods.* This study combined qualitative and quantitative methods in sequential phases. In the qualitative phase, we conducted semistructured, open-ended interviews with a convenience sample of 18 clinician-administrators representing adopters and nonadopters of these messages in both private practices and public health clinics. In the subsequent quantitative phase, we mailed a structured, closed-ended survey to national samples of randomly selected pediatricians ( $n = 600$ ) and public clinics ( $n = 600$ ).

*Results.* Response rates were 75% for pediatricians and 77% for public clinics. Among pediatricians, 38% were conducting regular assessments of immunization coverage but only 16% were currently using routine reminder or recall messages. Among public clinics, 85% were conducting regular assessments and 51% were using reminder or recall messages. Among pediatricians' practices, the most commonly reported barriers to the adoption of reminder or recall messages were lack of time and funding and the inability to identify children at specified ages. For pediatricians' practices, the strongest predictors of current use of reminder or recall messages were having a champion who led efforts to improve immunization delivery (odds ratio: 1.85; 95% confidence interval: 1.08–3.18) and current use of regular immunization assessments (odds ratio: 2.30; 95% confidence interval: 1.33–3.84). Likewise, for public health clinics, having a champion to lead immunization improvement efforts and believing that their current system needed improve-

ment was associated with current use of reminder or recall messages.

*Conclusions.* Reminder and recall messages remain underused by both pediatricians and public health clinics. Promising strategies to promote adoption of these approaches in both the private and the public sectors include identifying and training champions to promote immunization delivery improvement efforts and helping practices develop methods to identify children at specific ages. *Pediatrics* 2003;112:1076–1082; *immunizations, interventions, quality of care, recall, reminder, assessment.*

---

ABBREVIATIONS. OR, odds ratio; CI, confidence interval.

---

Despite increases in immunization coverage rates over the past decade,<sup>1</sup> national coverage rates for several vaccines remain just below the Healthy People 2010 goals of 90% for each vaccine series among young children.<sup>2,3</sup> Approximately 1 in 4 children aged 19 to 35 months has missed at least 1 recommended vaccine.<sup>2</sup>

Reminder and recall messages sent by mail or telephone have been found effective at increasing childhood immunization coverage rates in many settings,<sup>4,5</sup> including private practices,<sup>4</sup> academic centers,<sup>6,7</sup> health maintenance organizations,<sup>8,9</sup> and public health clinics.<sup>10–13</sup> On the basis of this evidence, the Task Force on Community Preventive Services in 1999 strongly recommended that all practices implement these approaches.<sup>14</sup> In addition, both the National Vaccine Advisory Committee<sup>15,16</sup> and the Task Force on Community Preventive Services<sup>17,18</sup> have recommended routine immunization audits to determine immunization coverage levels for preschool-age children in both the public<sup>19</sup> and private<sup>20</sup> sectors.

Despite these recommendations and the compelling evidence of effectiveness, a 1995 survey indicated that only 35% of pediatricians and 23% of family physicians were using reminder or recall messages (R. Zimmerman, unpublished data). One study in an urban teaching clinic identified some barriers to implementing such messages.<sup>7</sup> However, important gaps exist in our understanding of how frequently these barriers occur in varying health care delivery systems on a national basis.<sup>18</sup> Policy makers need more specific information about these barriers, as well as the factors that have helped adopters of reminder or recall messages and assessment/feedback

From the \*Harvard Combined Pediatric Health Services Research Fellowship Program, Boston, Massachusetts; ‡National Immunization Program, Centers for Disease Control and Prevention, Atlanta, Georgia; and §Center for Child Healthcare Studies, Department of Ambulatory Care and Prevention, Harvard Pilgrim Healthcare and Harvard Medical School, ||Division of General Pediatrics, Children's Hospital, Boston, Massachusetts.

Received for publication Oct 23, 2002; accepted Apr 24, 2003.

Reprint requests to (C.D.T.), Baystate Health System, High Street Health Center, 140 High St, Pediatrics, Springfield, MA 01199. E-mail: cheryl.tierney@bhs.org

PEDIATRICS (ISSN 0031 4005). Copyright © 2003 by the American Academy of Pediatrics.

systems overcome them. The perspectives of pediatricians are particularly important because >70% of children receive their vaccines from pediatricians<sup>21</sup> and >80% receive vaccines in the private sector.<sup>22</sup>

The aims of this study were to 1) determine the proportion of pediatric practices and public clinics that currently use practice-based reminder or recall messages and make regular immunization assessment efforts, 2) evaluate barriers and supports to implementing these practices, and 3) identify predictors of either current use or plans for future adoption of these approaches.

## METHODS

### Overview

This 2-phase study began with a qualitative phase in which we conducted semistructured interviews with key informants to identify appropriate issues and questions about catalysts and barriers to adopting reminder, recall, or assessment/feedback approaches. This was followed by a quantitative phase with a cross-sectional design in which we mailed a structured, closed-ended survey to national samples of immunization providers in the private and public sectors. The study was approved by the Human Studies Committee of Harvard Pilgrim Health Care and was classified exempt by the Institutional Review Board of the Centers for Disease Control and Prevention.

### Qualitative Phase

We conducted semistructured interviews with a convenience sample of 18 clinician-administrators. We reviewed published literature and interviewed several experts in immunization delivery research to identify domains for the interview. The 8 domains were 1) current immunization practices, 2) messages to parents (reminders, recall messages, or other), 3) barriers to implementation of reminder or recall messaging, 4) assessment and feedback efforts for monitoring immunization coverage rates, 5) insurer and immunization reimbursement, 6) practice characteristics and demographics, 7) immunization registry participation, and 8) practice attitudes about immunizations. We then interviewed 10 adopters of reminder or recall messages (3 providers in private practice, 4 providers in public health clinics, 1 administrator in a health maintenance organization practice, and 2 administrators from insurance plans) and 8 nonadopters (3 in private practice, 2 in public health clinics, and 3 from insurance plans). Interviews were conducted to the point of theoretical saturation such that additional interviews yielded no new issues or themes related to our study questions. The interviews, which lasted 30 to 60 minutes, were conducted by at least 2 investigators (C.D.T., T.A.L., and/or D.L.R.) and were audiotaped. Interview notes and tapes were reviewed for common themes and areas of similarity and contrast between adopters and nonadopters of reminder and recall messages.

### Quantitative Phase

#### Survey Development

Results of the qualitative phase were used to identify content areas and questions for the national surveys. The 21-item survey covered 5 domains: 1) messages to parents (reminders, recall messages, or other), 2) barriers to implementation of reminder or recall messaging systems, 3) other immunization practices (eg, assessment/feedback efforts, immunization registry participation), 4) practice attitudes about immunizations, and 5) practice characteristics and demographics.

Routine use of immunization assessments was defined as measuring immunization coverage rates at least every 2 years. Use of a reminder system was defined as routinely sending messages by either telephone or mail to parents of children at preselected ages (eg, all 24-month-olds) to remind them of an upcoming immunization or well visit, regardless of whether the child had an appointment scheduled. Use of a recall message system was defined as routinely sending messages to parents of children at preselected ages to notify them of a past-due immunization or well visit. In our survey, we defined these messaging protocols as having a

“practice-based” system. The survey asked whether the group had an individual who led efforts to improve immunization delivery, which we defined as an immunization “champion.”

#### Data Collection

The surveys were mailed to 2 subgroups: a random sample of 600 pediatricians from the American Medical Association master file and a random sample of 600 public health clinic providers from the National Association of City and Community Health Officers database. Two waves of surveys were mailed in winter 2001. The first mailing included a pen as a thank-you gift. An error by the mail house that conducted the first mailing resulted in our not being able to track surveys to separate responders from non-responders. The second mailing was sent to each person in the original sample, with a cover letter asking them to ignore the request if they had already completed the survey. In the pediatrician subgroup, results include the responses to both waves. However, in the public health clinic subgroup, the responses to both waves combined yielded a response rate of >100%. To avoid the problem of duplicate surveys for public health clinics, we included only the responses from the first wave in analyses.

### Statistical Methods

Response rates were calculated using the method described by the American Association for Public Opinion Research.<sup>23</sup> Bivariate analyses included the  $\chi^2$  test, the Wilcoxon rank-sum test, and the Spearman correlation coefficient. Multivariate analyses were conducted using logistic regression for dichotomous outcomes and linear regression for ordinal outcomes. Predictors that were significant at  $P < .20$  in bivariate analyses were included in multivariate models. We used an iterative, forced-entry approach, entering variables in successive models and removing variables when a correlation matrix suggested that they were highly correlated with other variables in the model.

## RESULTS

### Qualitative Findings

As Table 1 shows, both adopters and nonadopters of reminder or recall messages identified time and money as the most important barriers to implementing these methods. However, several areas of contrast suggest how adopters overcame these barriers. Adopters were more likely than nonadopters to identify immunization delivery as a responsibility of the health care system, rather than the responsibility of the parent or the individual provider alone. Adopters were also more likely to identify immunization delivery as a top priority and to have a single person who led improvement efforts. In addition, several adopters identified an immunization registry or feedback to staff about successes and problems in immunization efforts as an important factor.

### Quantitative Findings

#### Study Populations

Of the 600 surveys mailed to pediatricians, 447 were returned and 434 (97% of 447) were eligible. The response rate among pediatricians was 75% (434 completed surveys/estimated 582 eligible). Of the 600 surveys mailed to public health clinics, 459 were returned and 440 (96% of 459) were eligible. The public health clinic response rate was 77% (440 completed/estimated 575 eligible).

In the pediatrician sample (Table 2), the most common types of practice were solo or 2-physician practices (32%) and single-specialty groups (44%). The majority of pediatricians in the study population (55%) were in suburban settings, and 52% had < 20%

**TABLE 1.** Similarities and Contrasts Between Adopters and Nonadopters of Reminder or Recall Messages, From Qualitative Interviews With Private Practices and Public Health Clinics

	Adopters	Nonadopters
Private practices (barriers: time and money were/are the greatest barriers, but adopters found ways to overcome this [grants provided]; other barriers: information technology support, staff buy-in, staff computer skills)		
Areas of similarity	Top priority for practice Needs leader to be successful Report success to practice to maintain motivation	Not in top 5 priorities
Areas of contrast	View underimmunization as a system problem, not an individual provider problem Measured immunization coverage rates, found problems, and implemented messages to improve coverage View duplication of work as a problem: immunizations logged into computer and written in chart	Most had access to computer systems that could track data or produce lists if desired Rely on patients to seek immunizations proactively Had previous reports of good immunization rates, or were not interested in measuring rates Registry participation is variable to low
Public health clinics (top priority; need computer support; time and money important barriers)		
Areas of similarity	Grant provided to help with costs of startup Feedback to staff is important Accountability to state is important	Reporting: state has not measured rates Not currently participating in immunization registry
Areas of Contrast	Key to success is staff buy-in and leader to own the initiative Funding for clinic tied to performance measures Registry with a report function is helpful Immunization drives the activities in the clinic	

Medicaid patients. In contrast, most public health clinics in the study population (66%) were in rural settings and most had >20% Medicaid patients (77%).

#### *Use of Assessments and Reminder or Recall Messages*

Among pediatricians, 37% were currently using assessments and 16% were using practice-based reminder messages, recall messages, or both (Table 3). Thirty-one percent of the pediatricians agreed with the statement that their practice was likely to adopt a new system to send reminder or recall messages during the next year. Public health clinics were more likely than pediatricians to be currently using assessments (85%) or reminder and/or recall messages (51%).

#### *Barriers to Adopting Reminder or Recall Messages*

The patterns of identified barriers to adopting reminder or recall messages were similar between adopters and nonadopters of these practices (Table 4). Both adopters and nonadopters most commonly named lack of time and funding as barriers to adoption. In the pediatrician group, the next most commonly named barrier (29% of adopters and 35% of nonadopters) was not having a simple way of identifying children at a specific age. Lack of knowledge about how to get started and limited computer skills were named as barriers by only 10% to 18% of respondents in any subgroup.

#### *Factors Associated With Adoption of Reminder or Recall Messages by Pediatricians' Practices*

In bivariate analyses, the current use of reminder or recall messages by pediatricians' practices was associated with having a key person (hereafter referred to as a champion) who led efforts to improve immunization delivery, use of immunization assessments, type of practice, and percentage of patients insured by Medicaid (Table 5). The immunization champions in pediatric practices were mostly physicians or nurse practitioners (57%) and less often nurse managers or nurses (32%). In contrast, champions in public health clinics were mostly nurse managers or nurses (90%). Solo and 2-physician practices (21%) were much more likely to be using reminder or recall messages than single-specialty groups (10%) or multispecialty groups (14%;  $P < .001$ ).

In the final multivariate model, we removed type of practice because it was highly correlated with other potential predictors. In the final model, current use of assessments (odds ratio [OR]: 2.30; 95% confidence interval [CI]: 1.33–3.84) and having a champion (OR: 1.85; 95% CI: 1.08–3.18) were the variables most highly associated with current use of reminder or recall messages.

We also conducted bivariate and multivariate analyses to identify predictors of agreement with the statement, "During the next year, our practice is

**TABLE 2.** Characteristics of Respondents in the Two Study Groups

Characteristic	Pediatricians ( <i>n</i> = 434)		Public Health Clinics ( <i>n</i> = 440)	
	<i>n</i>	%	<i>n</i>	%
Type of practice				
Solo or 2-physician practice	139	32	—	—
Single specialty group	191	44	—	—
Multispecialty group	71	17	—	—
Other*	29	7	—	—
No. of advanced practice clinicians at site†				
0	0	0	83	21
1–5	250	58	300	74
6–20	132	31	16	4
>20	48	11	5	1
No. of nurses at site‡				
0	NA	NA	295	67
1–5	NA	NA	85	19
6–20	NA	NA	41	9
>20	NA	NA	17	4
Setting				
Urban	118	28	80	19
Suburban	236	55	67	16
Rural	74	17	286	66
% of patients insured by Medicaid				
<20%	222	52	100	23
20%–<50%	141	33	172	40
50%–<80%	51	12	135	31
80%–100%	16	4	28	6

NA indicates not applicable.

\* In the pediatrician subgroup, the “other” category included 13 respondents from staff or group-model health maintenance organizations, 3 from hospital-based practices, 6 from community health centers, 3 from public health clinics, and 4 from other types of practices. In the public health clinic subgroup, 92% of respondents were public health clinics, 1% were hospital-based practices, 4% were community health centers, and 3% were other types of practices.

† Clinicians included physicians, nurse practitioners, and physician assistants.

‡ Did not collect this information for private sector.

**TABLE 3.** Proportions of Pediatricians and Public Health Clinics With Current Use or Future Plans to Use Immunization Assessments, Reminder or Recall Messages

Immunization Practice	Pediatricians ( <i>n</i> = 433)	Public Health Clinics ( <i>n</i> = 439)
	( <i>n</i> [%])	( <i>n</i> [%])
Currently making assessment efforts	162 (37)	371 (85)
Planning to start assessment efforts during the next year*	85 (20)	29 (7)
Currently using message systems for immunizations		
Reminders only	37 (8)	74 (17)
Recalls only	18 (4)	85 (19)
Reminders and recalls	16 (4)	64 (15)
Reminders, recalls or both	71 (16)	223 (51)
Planning to adopt a new system to send reminders or recalls for immunizations during the next year†	105 (24)	80 (18)

\* Number of respondents reporting plans to start routinely measuring immunization rates during the next year, among those who were not currently conducting routine assessments (by self-report on 2 questions; *n* = 241 pediatricians and *n* = 50 public health clinics).

† Number of respondents reporting plans to adopt a new system for reminder or recall messages during the next year, among those who were not currently using such messages (by self-report on several questions; *n* = 343 pediatricians and *n* = 146 public health clinics).

likely to adopt a new system that involves sending messages to improve immunization delivery.” In the final linear regression model, pediatricians were more likely to report plans for future adoption of recall or reminder messages when they had a champion who led efforts to improve immunization delivery ( $P < .03$ ), when they conducted routine assessments for immunization coverage ( $P < .05$ ), when they believed that their current immunization deliv-

ery system needed improvement ( $P < .001$ ), and when >20% of their patients were Medicaid insured ( $P < .007$ ). In addition, they were less likely to report plans to adopt a new system when they already had a computerized billing system ( $P < .004$ ), when they received immunization delinquency reports or lists from an outside source ( $P < .02$ ), or when they practiced in urban or suburban rather than rural settings ( $P < .005$ ).

**TABLE 4.** Barriers to Adoption of Reminder or Recall Messages Most Frequently Cited by Adopters Versus Nonadopters\*

Barrier	% in This Subgroup Citing This Factor as a Barrier			
	Pediatricians		Public Health Clinics	
	Adopters (n = 59)	Nonadopters (n = 371)	Adopters (n = 170)	Nonadopters (n = 266)
Lack of time to lead this type of effort	34	55	26	46
Lack of time to review records routinely	41	52	38	27
Lack of start-up funding	29	56	29	61
Lack of maintenance funding	27	50	31	57
No simple way of identifying children at a specific age	29	35	17	38
No simple way to determine who needs messages	19	33	8	25
Limited computer skills of office staff	14	11	18	11
Lack of knowledge on how to get started	10	21	4	18
Other	14	11	17	16

\* Adopters were asked, "What were the barriers encountered when adopting your reminder or recall system?" Nonadopters were asked, "What barriers would you anticipate if you were to adopt a reminder or recall system?"

**TABLE 5.** Predictors of Current Use of Reminder or Recall Messages by Pediatricians' Practices\*

Predictor	N in this Subgroup	% in This Subgroup Currently Using Reminder or Recall Messages	Bivariate Analysis	Multivariate Analysis	
			<i>P</i> *	OR	95% CI
Current use of immunization assessments			.001		
Yes	162	23		2.30	1.33–3.84
No	269	12		Referent	...
Practice has key person who leads efforts to improve immunization delivery†			.0061*		
Yes	213	22		1.85	1.08–3.18
No	218	11		Referent	...
Type of practice			.0002	NS	
Solo or 2-physician practice	139	21			
Single-specialty group	191	10			
Multispecialty group	71	14			
Other‡	29	41			
% Medicaid patients			.03	NS	
<20%	222	13			
20%–<50%	141	19			
50%–<80%	51	27			
80%–100%	16	6			

NS indicates not significant.

\* Other variables that were evaluated and found not to be significant in bivariate analyses were having an immunization summary page as part of the medical record; having a computerized medical record, appointment, or billing system; participating in a local or regional immunization registry; believing that the practice's patients are at high risk for missing an immunization or acquiring a vaccine-preventable disease; believing that the practice's current immunization delivery system does not need improvement; receiving immunization reports or lists from an outside source such as a health plan or a state agency; estimated immunization coverage rate among 2-year-olds; number of clinicians at the practice site; and practice setting.

† *P* value is from Fisher exact test.

‡ The "other" group includes staff or group model health maintenance organizations, hospital-based practices, and community health centers.

### Other Findings

We conducted multivariate analyses to identify predictors of 1) current use of reminder or recall messages by public health clinics, 2) current use of assessments by pediatricians and public health clinics, and 3) future plans by pediatricians to implement routine immunization coverage assessments. Current use of reminder or recall messages by public health clinics was associated with having a champion who led efforts to improve immunization delivery (OR: 3.01; 95% CI: 1.34–6.73) and believing that the current immunization delivery system needed improvement (OR: 1.70; 95% CI: 1.29–2.24).

Current use of assessments by pediatricians' practices was associated with having a champion who led efforts to improve immunization delivery (OR: 1.38; 95% CI: 0.89–2.13) and participating in a local or

statewide immunization registry (OR: 1.85; 95% CI: 1.20–2.85). Current use of assessments by public health clinics was associated with participation in a local or statewide immunization registry (OR: 1.75; 95% CI: 1.00–3.07). Private providers were more likely to report plans to implement immunization assessment efforts in the next year when they had a champion who leads efforts to improve immunization delivery ( $P < .002$ ), believed that the current immunization delivery system needs improvement ( $P < .008$ ), or did not have a computerized billing system ( $P < .03$ ).

### DISCUSSION

#### Major Findings

This study suggests that fewer than 1 in 5 pediatric or multispecialty group practices are currently using

immunization reminder or recall messages. Practices in which a champion was leading efforts to improve immunizations or that conduct routine assessments of immunization coverage were approximately twice as likely to be using reminder or recall messages as other practices. These factors were also highly associated with the reported likelihood of adopting a new reminder or recall system during the next year.

Both adopters and nonadopters of immunization reminder or recall messages named lack of time and funding as the most important barriers to implementing such methods. The qualitative phase of our study found that adopters had used many different methods to overcome these barriers, including eliciting staff interest through feedback reports and participation in local or state immunization registries. The qualitative interviews also suggested that adoption of reminder or recall messages is associated with the perception that immunization delivery is a responsibility of the health care system, rather than of the parent or the individual provider alone.

### Interpretation and Context

In the national survey, having a champion to lead efforts to improve immunization delivery was strongly and independently associated with both current use of reminder or recall efforts and plans to initiate assessments of immunization coverage rates in the next year. This finding is aligned with ideas described by Rogers in the book *Diffusion of Innovations*.<sup>24</sup> Rogers suggested that opinion leaders, who are respected and influential in the community, play an important role in the adoption of new practices. Experts in clinical practice improvement believe that it is possible to identify people who are predisposed to be champions and to enable and reinforce their work (Dennis Ross-Degnan, ScD, personal communication).

These results suggest that it may be useful to try to identify and train champions to promote the adoption of reminder or recall messages in their own practices or clinics. It may also be possible to have such champions act as opinion leaders to promote the adoption of immunization assessment and message systems by other practice groups. The use of peers as opinion leaders to disseminate clinical practice changes has succeeded in several other health care delivery issues, including the management of acute myocardial infarction.<sup>25,26</sup>

The lack of a simple way to identify children at a specific age was a barrier cited by more than one third of the respondents to the national survey. The adoption of reminder messages might be enhanced by helping practices to develop strategies for identifying children at specific ages using either manual systems or computer programs linked with billing systems. Most pediatricians (83%) reported having a computerized billing system. We were surprised by the finding that practices with computerized billing systems were actually less likely than those without to report plans to adopt a new reminder or recall messaging system within the next year. It is possible that existing computerized billing systems may actually impede adoption of new practices as a result of

either true technologic limitations or the perception that they would be difficult to adapt for use in messaging.

Participation in immunization registries was associated with immunization assessment efforts in both the pediatrician and public health clinic subgroups. Assessment efforts alone may be an effective strategy for improving immunization rates,<sup>27</sup> and in the current study, they were associated with the current use of reminder or recall messages.

### Limitations

One strength of this study is the use of both qualitative and quantitative methods that enabled us to describe barriers and supports from the perspectives of both specific practices and the national population. In the national survey, the response rates were relatively high compared with other studies of health care providers. However, because survey respondents tend to give socially acceptable answers, our results may overestimate the true rates of use of reminder or recall and assessment practices. In addition, the cross-sectional design of this study enabled us to identify associations but precludes making causal inferences between predictors and immunization practices.

### Policy Implications

Recall and reminder messages remain underused by both pediatricians and public health clinics. Encouraging pediatric practices to adopt these approaches is particularly important because most US children receive their vaccines from private sector providers. For both pediatricians and public health clinics, adopting these practices will require overcoming limits on time, funding, and practices' inability to identify children at specific age groups. Promising strategies to promote adoption of these practices include encouraging use and expansion of immunization registries, recruiting and training champions to promote immunization delivery improvement efforts, and helping practices to develop methods to identify children at specific ages.

### ACKNOWLEDGMENTS

This study was supported by the Centers for Disease Control and Prevention via the American Association of Health Plans (contract 0957-053). Dr Tierney's work was supported by a grant (T32 HP10018) from the Health Resources and Services Administration, Department of Health and Human Services, to the Harvard Pediatric Health Services Research Fellowship Program.

We gratefully acknowledge the contributions of the many clinicians and administrators who contributed to the qualitative interviews and the national survey. We appreciate the advice of Henry Bernstein, DO, James Cooley, MD, Gary Freed, MD, Victoria Freeman, DrPH, Peter Margolis, MD, Lance Rodewald, MD, Stacie Smith, MPH, and Richard Wasserman, MD, during the study's planning stages. We thank Tungela Grayson of the American Association of Health Plans and Deborah Mercy of the Centers for Disease Control and Prevention for administrative guidance and Charlene Gay for excellent assistance with manuscript preparation.

### REFERENCES

1. National Immunization Program. Immunization coverage in the U.S. Available at: <http://www.cdc.gov/nip/coverage/#NIS>. Accessed June 1, 2002

2. Centers for Disease Control and Prevention. National, state, and urban area vaccination coverage levels among children aged 19–35 months—United States, 2001. *MMWR Morb Mortal Wkly Rep.* 2002;51:664–665
3. US Department of Health and Human Services. With understanding and improving health and objectives for improving health. In: *Healthy People 2010*. Washington, DC: US Government Printing Office; 2000:14-35–14-37
4. Szilagyi PG. Effect of patient reminder/recall interventions on immunization rates: a review. *JAMA.* 2000;284:1820–1827
5. Shefer A, Briss PA, Rodewald L. Improving immunization coverage rates: an evidence-based review of the literature. *Epidemiol Rev.* 1999;21:96–142
6. Oeffinger KC. The effect of patient education on pediatric immunization rates. *J Fam Pract.* 1992;35:288–293
7. Kempe A. Immunization recall: effectiveness and barriers to success in an urban teaching clinic. *J Pediatr.* 2001;139:630–635
8. Lieu TA, Black SB, Ray P. Computer-generated recall letters for under-immunized children: how cost-effective? *Pediatr Infect Dis J.* 1997;16:28–33
9. Lieu TA, Capra AM, Makol J, et al. Effectiveness and cost-effectiveness of letters, automated telephone messages, or both for underimmunized children in a health maintenance organization. *Pediatrics.* 1998;101(4). Available at: <http://www.pediatrics.org/cgi/content/full/101/4/E3>
10. Dietz VJ, Baughman AL, Dini EF, et al. Vaccination practices, policies, and management factors associated with high vaccination coverage levels in Georgia public clinics. *Arch Pediatr Adolesc Med.* 2000;154:184–189
11. Dini EF, Linkins RW, Chaney M. Effectiveness of computer-generated telephone messages in increasing clinic visits. *Arch Pediatr Adolesc Med.* 1995;149:902–905
12. Pierce C, Goldstein M, Suozzi K, et al. The impact of the standards for pediatric immunization practices on vaccination coverage levels. *JAMA.* 1996;276:626–630
13. Stehr-Green PA, Dini EF, Lindegren ML, Patriarca PA. Evaluation of telephoned computer-generated reminders to improve immunization coverage at inner-city clinics. *Am J Public Health.* 1993;108:426–430
14. Centers for Disease Control and Prevention. Vaccine preventable diseases: improving vaccination coverage in children, adolescents, and adults. A report of the recommendations of the Task Force on Community Preventive Services. *MMWR Morb Mortal Wkly Rep.* 1999;48:1–15
15. Centers for Disease Control and Prevention. Standards for pediatric immunization practices. *MMWR Morb Mortal Wkly Rep.* 1993;42:1
16. Centers for Disease Control and Prevention. Notice to readers: recommendations of the Advisory Committee on Immunization Practices, the American Academy of Pediatrics, and the American Academy of Family Physicians: use of reminder and recall by vaccination providers to increase vaccination rates. *MMWR Morb Mortal Wkly Rep.* 1998;47:715–717
17. Morey SS. Task force outlines ways to improve vaccination coverage. *Am Fam Physician.* 1999;60:2431–2432
18. Task Force on Community Preventive Services. Recommendations regarding interventions to improve vaccination coverage in children, adolescents, and adults. *Am J Prev Med.* 2000;18:92–96
19. LeBaron CW, Chaney M, Baughman AL, et al. Impact of measurement and feedback on vaccination coverage in public clinics, 1988–1994. *JAMA.* 1997;277:631–635
20. Massoudi MS, Walsh JA, Stokley S, et al. Assessing immunization performance of private practitioners in Maine: impact of the assessment, feedback, incentives, and exchange strategy. *Pediatrics.* 1999;103:1218–1223
21. Santoli JM, Rodewald L, Maes EF, et al. Vaccines for Children program, United States, 1997. *Pediatrics.* 1999;104(2). Available at: <http://www.pediatrics.org/cgi/content/full/104/2/e15>
22. LeBaron CW, Lyons B, Massoudi MS, Stevenson J. Childhood vaccination providers in the United States. *Am J Public Health.* 2002;92:266–270
23. The American Association for Public Opinion Research. *Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys*. Ann Arbor, MI: AAPOR; 2000
24. Rogers E. *Diffusion of Innovations*. New York, NY: Simon & Schuster; 1995
25. Thompson O'Brien MA, Oxman AD, Haynes RB, Davis DA, Freemantle N, Harvey EL. Local opinion leaders: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev.* 2000;2:CD000125
26. Soumerai SB, McLaughlin TJ, Gurwitz JH, et al. Effect of local medical opinion leaders on quality of care for acute myocardial infarction: a randomized controlled trial. *JAMA.* 1998;279:1358–1363
27. Bordley WC, Chelminski A, Margolis PA, et al. The effect of audit and feedback on immunization delivery: a systematic review. *Am J Prev Med.* 2000;18:343–350

## BETTER THAN WELL

“Over the past half-century, American doctors have begun to use the tools of medicine not merely to make sick people better, but to make well people better than well. Bioethicists call these tools ‘enhancement technologies,’ and usually characterize them as ‘cosmetic’ technologies or ‘lifestyle’ drugs. But terms such as ‘enhancement’ can be misleading, and not just because most enhancements can also be accurately described as treatments for psychological injuries or illnesses. They are misleading because the people who use the technologies often characterize them not merely as a means of shaping identities. These are tools for working on the self.”

Elliott C. American bioscience meets the american dream. *American Prospect*. June 1, 2003

Submitted by Student



## Adoption of Reminder and Recall Messages for Immunizations by Pediatricians and Public Health Clinics

Cheryl D. Tierney, Hussain Yusuf, Shawn R. McMahon, Donna Rusinak, Megan A. O'Brien, Mehran S. Massoudi and Tracy A. Lieu

*Pediatrics* 2003;112;1076

DOI: 10.1542/peds.112.5.1076

<b>Updated Information &amp; Services</b>	including high resolution figures, can be found at: <a href="http://pediatrics.aappublications.org/content/112/5/1076.full.html">http://pediatrics.aappublications.org/content/112/5/1076.full.html</a>
<b>References</b>	This article cites 21 articles, 2 of which can be accessed free at: <a href="http://pediatrics.aappublications.org/content/112/5/1076.full.html#ref-list-1">http://pediatrics.aappublications.org/content/112/5/1076.full.html#ref-list-1</a>
<b>Citations</b>	This article has been cited by 8 HighWire-hosted articles: <a href="http://pediatrics.aappublications.org/content/112/5/1076.full.html#related-urls">http://pediatrics.aappublications.org/content/112/5/1076.full.html#related-urls</a>
<b>Subspecialty Collections</b>	This article, along with others on similar topics, appears in the following collection(s): <b>Infectious Diseases</b> <a href="http://pediatrics.aappublications.org/cgi/collection/infectious_diseases_sub">http://pediatrics.aappublications.org/cgi/collection/infectious_diseases_sub</a>
<b>Permissions &amp; Licensing</b>	Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at: <a href="http://pediatrics.aappublications.org/site/misc/Permissions.xhtml">http://pediatrics.aappublications.org/site/misc/Permissions.xhtml</a>
<b>Reprints</b>	Information about ordering reprints can be found online: <a href="http://pediatrics.aappublications.org/site/misc/reprints.xhtml">http://pediatrics.aappublications.org/site/misc/reprints.xhtml</a>

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2003 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

