Objectives: To assess the availability and use of Washington State’s CHILD (Children’s Health, Immunization, Linkages, and Development) Profile and other computerized immunization tracking systems, to determine physicians’ attitudes about these systems, and to identify factors associated with using them.

Design: Randomized, population-based, cross-sectional survey.

Participants: Washington family physician and pediatrician specialty organization members providing childhood immunizations in 1998 (N=2472).

Main Outcome Measures: Reported CHILD Profile and other computerized systems use.

Results: The adjusted response rate was 75% (n=1331). Overall, 37.7% of respondents had heard of CHILD Profile, 6.3% used it, and 24.9% used other systems. Groups significantly more likely not to use computerized systems than referent pediatricians in areas fully implementing CHILD Profile were family physicians (adjusted odds ratio [aOR], 2.4; 95% confidence interval [CI], 1.4-4.0), private physicians (aOR, 8.0; 95% CI, 3.2-20.1), physicians taking fewest opportunities to immunize (aOR, 2.3; 95% CI, 1.4-3.7), and physicians practicing in local health jurisdiction areas with CHILD Profile marketing activity (aOR, 2.1; 95% CI, 1.2-3.9) or in those areas with little or no registry activity (aOR, 2.6; 95% CI, 1.6-4.4). Those with systems agreed that they save time (71.0%), make status checks easier (87.1%), and increase immunization coverage (88.6%). Those without systems agreed that they help practices (90.3%) and increase efficiency (76.5%), but fewer agreed that they reduce costs (30.2%).

Conclusions: Although most physicians agreed that computerized systems are useful, few had them or used them. Provider-based systems can improve immunization coverage, but the feasibility and effectiveness of communitywide and statewide systems remain unexplored. Because these systems depend on participation, more understanding is needed to help organizations implement them. Interventions to increase availability and use should address provider and health organization needs.

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Barriers to “on-time” childhood vaccinations remain despite intensive public health efforts to overcome them.¹⁻³ A major focus of these efforts recently has been the elimination of missed opportunities to vaccinate, a major contributor to inadequate childhood immunization coverage.⁴⁻⁻¹⁰ To improve provider vaccination practices, a growing number of public health agencies and private clinical practices in the United States are developing and using provider-based computerized immunization management systems and registries.¹¹⁻¹⁴ Evaluations of such systems suggest that they can help providers use computer-assisted patient reminders and recalls and improve immunization delivery.¹¹⁻¹² In 1993, published standards for pediatric immunization practices recommended that providers use immunization tracking systems.

In addition, in the past few years, various public health and clinical experts and agencies, including the National Vaccine Advisory Committee and the Centers for Disease Control and Prevention, have recommended implementing community-wide or larger area-wide, population-based computerized immunization registries throughout the United States.¹⁷⁻²⁰ In many states, such systems are being implemented. Although provider-based immunization systems are not considered to be population-based immunization registries, provider-based systems may contribute child patient records to and share new records from population-based systems.

In Washington State, partner agencies have been developing a community-
wide and statewide registry and health promotion system called CHILD (Children’s Health, Immunization, Linkages, and Development) Profile. A major goal of this system is to help ensure that Washington’s children from birth to age 6 years receive needed preventive health services. At the time of this study (1998), the CHILD Profile immunization tracking system was at different stages of implementation and provider recruitment in several, but not all, local health jurisdictions (LHJs) in the state. This system was first developed and implemented in western Washington by LHJs in Seattle-King and Snohomish counties. Age-appropriate health promotion materials were mailed to parents beginning in 1993, and marketing of the tracking system to health care organizations began between 1994 and 1995. At the time of this survey, CHILD Profile did not have the capability to automatically generate immunization reminders or recalls, but participating providers could query the system for vaccine status information for their patients and then use queries for reminders or recall.

Some private practices and managed care organizations (MCOs) in Washington State have also been implementing provider-based computerized immunization tracking systems. For example, Washington’s largest health maintenance organization (HMO), Group Health Cooperative, had already developed a registry among its staff-model HMO practices at the time of this study but not among its affiliate private practices. Several of these provider-based systems were being linked to CHILD Profile in areas where it was being implemented.

Because approximately 80% of childhood immunizations are given by private providers in Washington State, communitywide and statewide immunization registries and provider-based immunization tracking systems depend on the participation of private providers and health plans. Consequently, in 1998, we surveyed Washington family practice physicians and pediatricians who provide childhood immunizations to (1) assess the availability and use of CHILD Profile and other computerized immunization tracking systems, (2) determine physician attitudes about the usefulness of such systems in their practice, and (3) identify factors associated with using such systems.

PARTICIPANTS AND METHODS

SURVEY PROCESS

Approval to conduct the survey using physician member organization lists was obtained from the human subjects review boards of the Department of Social and Health Services and the Department of Health, the University of Washington, and Washington State University. After a pilot survey in late 1997, we attempted, in early 1998, to contact all 2472 physician members of the Washington chapters of the American Academy of Pediatrics (n = 791) and the American Academy of Family Physicians (n = 1681). The membership chapters agreed to participate in the survey and provided their most current lists. This contact information was supplemented as needed by telephone directory information, state Medicaid provider lists, and information from practices or clinics for some physicians who had changed practices.

We randomly assigned family practice physicians and pediatricians, by specialty, to initial contact by either telephone

first (with a minimum of 10 contact attempts) or US Postal Service 2- to 3-day Priority Mail first. The telephone and the mail survey questionnaires had the same order of questions and other content. Telephone interviewers were trained to give the same information to physicians reached by telephone as given in the mail survey. When eligible, consenting physicians who were reached by telephone were interviewed. If the physician did not have time for the interview, another telephone interview time was scheduled or, if requested, a survey was mailed. All mail surveys included stamped return envelopes. Mail surveys included at least 1 follow-up mailing. However, after approximately 8 weeks, nonrespondents were contacted again using the alternate method. Initial data collection was discontinued after roughly 3 months. Approximately 6 months later, with additional funding, a final Priority Mail follow-up of the remaining nonresponders was conducted.

When contacted, physicians were informed about the purpose of the study and were asked to consent to participate. Eligible physicians were those who, at the time of the survey, administered childhood immunizations and practiced in Washington State. Emergency department and non–English-speaking physicians were excluded.

SURVEY INSTRUMENT, VARIABLES OF IMPORTANCE, AND DATA ANALYSIS

To assess the availability and use of computerized patient immunization tracking systems, participating physicians were asked about whether they had heard of CHILD Profile, whether they used CHILD Profile or some other immunization computerized tracking systems in their practice, and, if they used a system, how often they accessed it during child clinic visits. Related to one of our objectives, respondents were also asked how much they agreed or disagreed with statements about specific attributes of and their attitudes about immunization tracking systems.

We considered several variables as potential markers of physician and health system barriers to the availability and use of computerized patient immunization systems. These variables included a composite of answers about immunization practices in a series of questions about how often physicians would give vaccines during 17 specific scenarios for child patients, with a range of illnesses, visiting for well-child care, chronic condition care, or acute care. All of these visit scenarios represented immunization opportunities in which 1 or more vaccinations would be indicated by the unified immunization practice guidelines. We summed answers to the 17 visit scenario questions to calculate the number of different visit scenarios during which each physician would “often” immunize and categorized these composite responses into 4 groups. Other immunization practice questions were modified from questions developed by Szilagyi et al. To answers to questions about immunization practices or immunization tracking systems with Likert-type scaled response options were grouped together. Practices conducted “always” or “most of the time” were considered often-conducted practices. Also, several summary measures or indices on related topics were developed.

The following physician and practice characteristics were also included in the survey: gender, number of years since medical school graduation, whether a residency was completed, number of children cared for each week, type of practice setting (eg, HMO, different private practice settings, public health department or community clinic, hospital, or other settings), size of the community in which the practice was located, type of relationship with managed care organizations (MCOs) (eg, no relationship, contractor, affiliate, or employee), and whether the practice contracted with a health plan having immunization guidelines. Because we had no direct measure of the ex-

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tent of CHILD Profile’s marketing to specific practices, we used practice ZIP codes to assign a classification for the type of CHILD Profile activity occurring in the LHJ area where the physician’s primary practice was located (eg, whether CHILD Profile was being implemented, marketed only, or conducted as a “follow-up” health promotion activity by the LHJ only or whether no registry activity was occurring in the LHJ area).

We calculated adjusted response rates using the Council of American Survey Research Organization (CASRO) method, which adjusts for the number of known ineligible respondents and the number of estimated ineligible nonrespondents (CASRO Completion Rates Task Force, unpublished data, 1982). We used χ² tests to compare percentages of physician and practice characteristics and survey answers from pediatricians with those from family physicians. To evaluate the contribution of various factors to the “risk” of physicians not using computerized immunization systems, relative risks were estimated using unadjusted odds ratios (ORs), and adjusted ORs (aORs) were calculated using multiple logistic regression. SAS statistical software was used for all data analyses.29

RESULTS

RESPONSE RATES AND RESPONDENT CHARACTERISTICS

There were 1331 completed interviews, 88 refusals, and 558 known ineligible physicians. After the 3-month follow-up, the overall CASRO adjusted response rate was 63%. The rate increased to 75% after the final 6-month follow-up. The initial 3-month CASRO response rate for the Priority Mail first group was 62%, which was higher than the rate of 41% for the telephone first group. However, after the 6-month follow-up, the final CASRO response rate of 77% for the Priority Mail first group was only slightly higher than the 73% rate for the telephone first group.24 These subsequent response rate gains were primarily made when Priority Mail attempts were used. Before the 6-month follow-up, CASRO response rates were higher for pediatricians than for family physicians, but they did not differ by practice location.

Patient care loads and practice settings differed significantly between family physicians and pediatricians (Table 1). Compared with pediatricians, family physicians cared for fewer children per week (eg, 16.6% of family physicians cared for ≥31 children per week, whereas 76.1% of pediatricians reported caring for that many children). Compared with pediatricians, more family physicians practiced in public health settings and community clinics, HMOs, and settings other than hospitals and private practices (40.6% vs 23.7%), and more were employed by HMOs (15.1% vs 11.2%). However, regardless of specialty, 81.2% of all physicians stated they had an affiliate or contract relationship with an MCO.

More family physicians than pediatricians contracted with an MCO plan that had immunization guidelines (88.6% vs 78.8%) and practiced in nonurban or rural communities (37.2% vs 29.6%). Compared with pediatricians, family physicians took fewer opportunities to immunize children in visit scenarios at which vaccines were indicated (eg, 26.8% of family physicians compared with 18.5% of pediatricians would vaccinate in ≥7 of the 17 vaccine-indicated scenarios). In contrast, family practice physicians were more likely than pediatricians to practice in LHJ areas with little or no CHILD Profile activity (17.0% vs 10.7%), whereas more pediatricians (58.6%) than family physicians (52.2%) practiced in areas implementing CHILD Profile (Table 1).

AVAILABILITY AND USE OF COMPUTERIZED IMMUNIZATION TRACKING SYSTEMS

Significantly more pediatricians (52.3%) than family physicians (31.6%) had heard of CHILD Profile (Table 2). Although only 6.3% of all physicians stated that they had used CHILD Profile, more pediatricians (11.3%) than family physicians (4.2%) had done so. An additional 24.9% of both physician specialists stated that they used some other computerized immunization tracking system. Overall, 30.4% of physicians stated that they used CHILD Profile, another computerized tracking system, or a combination of systems.

ATTITUDES ABOUT COMPUTERIZED IMMUNIZATION TRACKING SYSTEMS

Pediatrician and family physician attitudes or impressions about computerized tracking systems differed little (Table 3). Overall, among physicians with CHILD Profile or another computerized system, 64.1% used the system often to track immunizations, and 63.1% referred to the system during patient visits. Most of these physicians stated that they strongly or somewhat agree that computerized tracking systems have some beneficial features (Table 3). Of those using systems, 68.6% agreed that computer systems give patient immunization status information during office visits, and 88.6% agreed that they increase immunization coverage. Most physicians with systems also agreed that they reduce unneeded vaccinations (68.8%), save time (71.0%), and make status checks easier (87.1%).

Among physicians without a computerized tracking system, most (76.5%) believed that a system would increase their office practice’s efficiency, and almost all (90.3%) believed that a system would be helpful to their office practice. However, fewer of these physicians (30.2%) said that a system would reduce office costs.

FACTORS ASSOCIATED WITH NOT USING COMPUTERIZED IMMUNIZATION TRACKING SYSTEMS

After examining crude ORs, we modeled 5 characteristics for their associations with physicians’ not using CHILD Profile or other computerized immunization tracking systems in their practices: medical specialty, type of practice, relationship of practice with MCOs, cumulative number of visit scenarios (of 17 scenarios) in which each physician would often immunize when a vaccination was indicated, and practice location by category of LHJ involvement in CHILD Profile (Table 4). We also controlled for number of years in practice since graduating from medical school, number of children cared for per week, and the initial survey contact method.

Findings from the unadjusted analyses were mostly consistent with those from the logistic regression analy-
ses (Table 4). After adjusting for other factors, family physicians were 2.4 (95% confidence interval [CI], 1.4-4.0) times more likely than pediatricians not to use computerized tracking systems. Compared with physicians practicing in HMOs, those in private practice were 8.0 (95% CI, 3.2-20.1) times more likely not to use a system. Those in most other practice settings (other than HMOs, hospitals, or public or community clinics) were significantly more likely not to use a computerized system. In univariate analyses, 22.5% of HMO affiliates and MCO contractors stated that they used a system compared with 75.4% of HMO employees (unadjusted OR, 10.4; 95% CI, 7.1-15.1). After adjusting for other factors, including survey recruitment method, affiliates of staff-model HMOs or contractors with MCOs (aOR, 2.5; 95% CI, 1.1-6.0) and physicians having no MCO relationship (aOR, 3.5; 95% CI, 1.1-11.1) remained significantly more likely not to use a system than those employed by HMOs. Physicians in practices in LHJ areas with CHILD Profile marketing only or little or no CHILD Profile activity were 2.1 (95% CI, 1.2-3.9) and 2.6 (95% CI, 1.6-4.4) times, respectively, more likely not to use a computerized system than those practicing in areas where CHILD Profile was being implemented. In univariate analyses, we also found linearly increasing ORs for physicians not having computerized systems as fewer CHILD Profile activities were occurring in areas corresponding to where their practices were located (χ² linear test for trends with P<.001).

Physicians who would take the fewest opportunities to immunize (ie, who would often immunize children in ≤7 of the 17 total visit scenarios) were 2.3 (95%
CI, 1.4-3.7) times more likely not to use a system than those who would take almost all opportunities (ie, who would often vaccinate in 16-17 visit scenarios). Other lower scorers also were less likely than the highest scorers not to have a system, although the difference was not statistically significant.

**COMMENT**

Most physicians surveyed agreed that computerized immunization systems are or would be useful, but few (30.4%) had them or used them. Although almost 40% of physicians had heard of CHILD Profile, only a small percentage used it (6.3%). Physicians using other computerized systems may not realize that these systems may have been linked to the CHILD Profile system. Compared with the referent group, physicians more likely not to use CHILD Profile or some other computerized immunization tracking system or both were more likely not to have a system, although the difference was not statistically significant.

### Table 2. Use of Computerized Immunization Tracking Systems, Washington State, 1998

<table>
<thead>
<tr>
<th></th>
<th>Pediatricians (n = 391)</th>
<th>Family Physicians (n = 940)</th>
<th>Total (N = 1331)</th>
<th>P Value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ever heard of CHILD Profile</td>
<td>52.3</td>
<td>31.6</td>
<td>37.7</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Use CHILD Profile</td>
<td>11.3</td>
<td>4.2</td>
<td>6.3</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Use another type of computerized tracking system</td>
<td>25.6</td>
<td>24.7</td>
<td>24.9</td>
<td>.73</td>
</tr>
<tr>
<td>Use CHILD Profile, another type of computerized tracking system, or both</td>
<td>34.4</td>
<td>28.7</td>
<td>30.4</td>
<td>.04</td>
</tr>
<tr>
<td>Immunization records were computerized in an office computer system</td>
<td>33.2</td>
<td>22.4</td>
<td>25.6</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

*Data are given as percentages. CHILD indicates Children’s Health, Immunization, Linkages, and Development. †Based on χ² tests for significant percentage differences between pediatricians and family physicians.

### Table 3. Attitudes Toward Computerized Immunization Tracking Systems Among Providers With and Without Systems, Washington State, 1998

<table>
<thead>
<tr>
<th></th>
<th>Pediatricians (n = 127)</th>
<th>Family Physicians (n = 208)</th>
<th>Total (N = 335)</th>
<th>P Value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Often use computerized system to track immunizations</td>
<td>60.8</td>
<td>66.2</td>
<td>64.1</td>
<td>.33</td>
</tr>
<tr>
<td>Often refer to computerized record during patient visits</td>
<td>64.5</td>
<td>62.2</td>
<td>63.1</td>
<td>.67</td>
</tr>
<tr>
<td>Strongly or somewhat agree that the computer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saves time</td>
<td>73.6</td>
<td>69.5</td>
<td>71.0</td>
<td>.43</td>
</tr>
<tr>
<td>Makes status checks easier</td>
<td>87.1</td>
<td>87.1</td>
<td>87.1</td>
<td>.99</td>
</tr>
<tr>
<td>Reduces unneeded revaccination</td>
<td>71.1</td>
<td>67.3</td>
<td>68.8</td>
<td>.49</td>
</tr>
<tr>
<td>Aids in sending reminders</td>
<td>69.3</td>
<td>81.0</td>
<td>76.8</td>
<td>.02</td>
</tr>
<tr>
<td>Gives immunization status</td>
<td>63.6</td>
<td>71.6</td>
<td>68.6</td>
<td>.14</td>
</tr>
<tr>
<td>Increases immunization coverage</td>
<td>87.7</td>
<td>89.1</td>
<td>88.6</td>
<td>.70</td>
</tr>
<tr>
<td></td>
<td>Providers Without a Computerized System</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n = 256)</td>
<td>(n = 720)</td>
<td>(N = 976)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Answered yes that a computer would</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Be helpful to the practice</td>
<td>90.0</td>
<td>90.4</td>
<td>90.3</td>
<td>.87</td>
</tr>
<tr>
<td>Increase efficiency</td>
<td>74.2</td>
<td>77.4</td>
<td>76.5</td>
<td>.32</td>
</tr>
<tr>
<td>Reduce costs in the office</td>
<td>30.3</td>
<td>30.2</td>
<td>30.2</td>
<td>.99</td>
</tr>
</tbody>
</table>

*Data are given as percentages except where indicated. †Based on χ² tests for significant percentage differences between pediatricians and family physicians.

In Washington State, it seems that staff-model HMOs may have been more successful than other practice settings at implementing computerized immunization tracking. Although 90% of physicians were employed by or had some relationship with MCOs, most were HMO affiliates or MCO contractors rather than HMO employees. Provider and health plan incentives to implement computerized systems may differ depending on the type of relationship providers have with MCOs. Staff-model HMOs have organizational structures, such as centralized data and accounting systems, that would be amenable to more rapid immunization system implementation. By contrast, MCOs with affiliate and contract practices and practices with no MCO affiliations might have less capacity or fewer incentives to implement computerized systems, especially if implementation depends on capital investments by the provider practice. The association between computerized system use and self-reported physician practices related to immunization opportunities suggests that physician awareness of missed opportunities to vaccinate may be affected by or may affect the use of interventions such as computerized tracking systems.
This study has several potential limitations. We could not assess the practices or perspectives of physicians not associated with the American Academy of Pediatrics or the American Academy of Family Physicians, for example, nonmember general practice physicians or physicians who recently moved to Washington. Neither did we attempt to survey other health providers, such as nurse practitioners or physician assistants, who practice independently from physicians and who also provide immunizations.

Also, answers provided by respondent physicians may not adequately represent all eligible physicians because nonrespondents may not have the same opinions and practices as respondents. In addition, responses by physicians contacted via Priority Mail first may be different from those of the telephone first group, although the final response rates between the 2 groups were almost identical. To account for any potential differences regarding the use of computerized systems between these latter groups, we adjusted for the survey method used.

Self-reports about immunization practices or use of computerized systems may differ from actual practices, especially among those contacted by telephone. Selective recall or the desire to reflect “good” practices may result in more favorable practice reports, especially because reminder and recall systems and immunization tracking have been promoted and supported in the literature for some time.11-20,30,31 It is also possible, especially in large health delivery organizations, that physicians may not have been fully aware of all office practices or of the immunization record-keeping systems available or used. This lack of knowledge might occur if childhood immunizations were primarily given or managed by nurses or other health professionals in the practice. Also, some physicians may not be aware that their practice’s computerized system may be linked to the registry. Limited knowledge about system capabilities might have led to overestimates or underestimates of their availability and use. Because we asked different questions depending on the use of computerized systems, we could not explore the effects of physicians’ attitudes toward these systems on whether physicians’ did or did not participate in these systems. Finally, ORs may overestimate the relative risks for not using computerized systems because the prevalences of not using computerized systems did not ideally fit the “rare disease” assumption.

Despite these limitations, to our knowledge, this is one of the first statewide studies to report on factors associated with the use of computerized immunization registries. Our findings are based on a large, statewide study of physicians published in major medical journals in 1991.34

The results of this survey provide baseline prevalences of computerized immunization tracking system use that are useful for monitoring state implementation of such systems and changes in provider attitudes about these systems. Statewide, community-specific, and health organization-specific information regarding tracking system use and attitudes is needed to inform and influence
What This Study Adds

Despite the strong interest in implementing population-based immunization registries, there is little published research evaluating the implementation of communitywide and statewide computerized immunization registries and providers' use of computerized immunization tracking systems linked to registries. Few studies (1) address whether providers who have computerized immunization systems use their systems or (2) explore factors associated with computerized system use that might suggest incentives to increase the use of computerized systems and registries. This study is also relevant to providers' use of computerized systems in general and contributes to the growing field of medical informatics. Specific findings from this study suggest that although most physicians agreed that computerized systems are useful, few had them or used them. In addition, staff-model HMOs may have been more successful than other practice settings in implementing these systems at this stage. Other factors associated with not using systems included some characteristics of physicians, such as specialty, practice type, physicians' immunization practices, and the extent of registry marketing exposure based on practice location. This article includes recommendations for increasing the adoption and use of computerized immunization systems, including the need to identify the roles of standards of practice and to include “value-added” incentives. Also, we suggest additional data monitored over time from multiple levels, including providers, would help efforts to increase registry participation.

health care organization management and public health decision making and to track system marketing and implementation efforts.

Washington physicians' positive attitudes toward immunization tracking and the availability of other computerized systems seem promising for further development of provider- or health plan–based systems linkable to community-based systems, even if such linkages may not be accomplished easily. Because these systems depend both on practice and provider participation, further work is needed to understand how to help providers and health care organizations implement them. As our findings suggest, further information is needed to identify effective ways that HMOs and other MCOs contracting with private physicians can promote these systems among their affiliates.

These results also suggest some potential factors influencing provider and health care organization decisions about computerized immunization tracking, such as providers' training, practice setting, immunization practices, and external payer affiliations. Indeed, these factors may be markers for specific barriers faced by the provider or organization that should be further assessed. However, the factors influencing decisions about implementing these systems are complex. Providers' theoretical support for these systems is probably tempered by perceptions about the utility of the system, which, for example, has yet to include all child immunization information from every provider that a patient visits, as suggested in another recent study of perceptions about CHILD Profile in Seattle-King County and in a study using statewide provider focus groups during the design of a registry in North Carolina.

Factors that predict registry participation may also relate to the known and perceived clinical and business utility that such systems might have to practices or health care organizations. Because of the variability of health care delivery organizations in the United States, who makes decisions and how decisions are made differ. Such differences might explain, in part, the differences noted in this study between medical specialties and among practice types. Strategies to promote tracking systems need to address the distinct needs of individual practices and health care organizations.

Physician surveys are necessary but not sufficient tools for gaining a better understanding of how immunization tracking systems can be implemented in various practices. Other approaches should include assessing the roles physicians and other immunization providers play as decision makers or in influencing decision makers to implement computerized systems. Identifying specific incentives or barriers faced by physician and nonphysician decision makers and providers would be particularly important. What the standards of practice are for immunization delivery and how providers understand them most likely play a role in these decisions as well. Understanding how these standards influence providers to use computerized systems would be valuable, particularly as standards change over time and as new scientific evidence regarding effective use of computerized systems becomes available.

Moreover, even if complete population-based tracking systems become available, decision makers may not be interested in participating in them. For these systems to be used clinically, providers need assurance that these systems have accurate and complete information about pediatric patients with multiple immunization providers in their system’s area. Tracking systems should also include features that are effective in increasing vaccination coverage, such as computerized immunization patient reminder and recall features, and that meet other clinical objectives or business needs.

As the use of information technology in health care continues to increase, as practice standards change, and as immunization registry participation increases, evaluations should assess the value of specific system features, the availability of these features to health organizations as incentives for participation, and the purported practice benefits of immunization registries.

Finally, having computerized immunization systems does not guarantee that practices will have the capacity or incentives to use computerized immunization data on an ongoing basis. Better understanding of the factors that encourage ongoing use is also needed. The feasibility of full implementation and the effectiveness of communitywide and statewide immunization systems still remain unknown and should be evaluated over time.

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