

Utility of an Immunization Registry in a Pediatric Emergency Department

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Objectives: Determine prevalence of participation and under-immunization rate in a regional immunization registry (IR) among patients presenting to a university pediatric emergency department (PED). Rate of agreement between parental report and documented immunization status was also measured.

Methods: A convenience sample of parents of patients younger than 11 years registered in the PED were approached with a short questionnaire. When informed consent was obtained, the Central New York (CNY) IR was accessed via computer to see if the child was in the registry and to ascertain if their immunizations were up-to-date (UTD). Rate of agreement between parental report and immunization status documented in the IR was calculated.

Results: 698 (97%) of 720 patients consented to participate. Of these, 235 (34%, 95% CI, 30–37) were enrolled in the IR. Eighty-five (36%, 95% CI, 30–42) enrolled patients were under age 2. Sixty-seven (29%, 95% CI, 23–34) were from private group practices, 146 (62%, 95% CI, 56–68) were from university/community health center clinics and the source of primary care for 22 patients (9%) was unknown. Only 67 (29%, 95% CI, 23–34) parents of children in the IR were aware that they were enrolled. Of IR patients, 225 (96%, 95% CI, 93–98) stated they were UTD, while only 143 (61%, 95% CI, 55–67) were documented to be so.

Conclusions: A significant number of patients seen in the PED were in the CNY IR. More than one-half of the parents of enrolled children did not recall that they had previously registered their child. Only 61% of patients were UTD, whereas parents reported that almost all were. In the PED, use of an IR would create an opportunity for intervention in a large number of patients who were not UTD.

Key Words: immunizations, immunization registry

Immunization delay remains a major public health issue.^{1–3} Only 69% to 72% of 2-year-olds are fully immunized.¹ Less than 80% of all preschoolers have received all of their recommended immunizations.² Healthy People 2010 notes that 300 children die of vaccine preventable diseases in the United States each year.³ This document has reset the goal of having 80% of 2-year-olds immunized by 2010 instead of the previous goal of reaching 80% by 2000.³ Taking advantage of missed opportunities to provide immunizations when patients present to the healthcare system may significantly impact immunization rates.

Pediatric emergency department (PED) visits may represent a missed opportunity to immunize at-risk patients. Pediatric patients seen in emergency departments (EDs) have been shown to be at risk for immunization delay.^{4–7} In one public, urban PED, Cunningham⁴ found as many as 59% of presenting patients had delayed immunizations. However, previous attempts to immunize patients in PEDs have had mixed results.^{4,6–9} Cunningham⁴ showed that a significant number of patients who were delayed could be immunized during PED visits. Other investigators have shown that ED immunization programs do little to increase the immunization rates of children in the long term.^{6–9} In one of these studies, almost 60% of vaccine eligible patients were not immunized while in the PED despite the fact that the program was being carried out during a measles outbreak.⁹ Experiences with adult ED patients have been more promising. It has been shown that seasonal immunizations for influenza and *Streptococcus pneumoniae* can be delivered to significant numbers of at risk patients.^{10,11}

Use of an immunization registry (IR) may allow real-time verification of immunization status and facilitate ED immunization and accurate record keeping. There are no prior reports of IR use in a PED. The Central New York (CNY) Immunization Registry is a computerized, population-based database serving 14 CNY counties. The goals of this study were to determine the prevalence of participation in a regional IR among patients presenting to a PED, to

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determine the underimmunization rate among patients presenting to the ED who are in the IR and to compare the immunization status documented in the IR to parental report.

METHODS

This study was approved by the Institutional Review Board of Upstate Medical University (Syracuse, New York).

Settings and Subjects

The setting for this study was the PED at the University Hospital in Syracuse, New York. The hospital is the regional tertiary care center serving 15 counties in Upstate New York. The PED received 17,539 of the total 44,287 ED visits in 2001 and is staffed with board-certified pediatric emergency medicine and emergency medicine physicians. Patients seen in the PED are 18 years old and younger, and present primarily from the Syracuse metropolitan service area, which has a population of 735,000. Review of previous year PED census records permitted investigators to estimate that typically over 90% of PED patients are treated between the hours of noon and 2:00 AM. The population served at the Upstate PED includes patients from all socioeconomic groups, with insurance categories in 2001 represented as follows: 40.0% Medicaid, 10.2% self-pay, and 49.8% traditional insurance. Racial demographics for 2001 include 56.8% Caucasian, 23.6% African American, 4.4% Hispanic, 1.4% Native American, 4.0% other, and 9.8% unknown.

The CNY Immunization Registry was created to help track, monitor, and promote immunization of children within 14 CNY counties. Implemented by the Onondaga County Health Department, the CNY Immunization Registry began enrolling patients in 1998 and especially targeted those born since 1996. Pediatricians and family practitioners in private, public, and academic primary care centers use the voluntary registry. During the study period, all academic and public clinics in the urban area of Syracuse were participating in the registry. There were a total of 75 participating sites including private physician practices. At the time of the study, a total of 32,316 children were enrolled in the registry.

Study Design

The study was a prospective, cohort study of immunization status and immunization registry participation from a convenience sample of PED patients age 10 and under who presented to the ED for care during a 7-week period in July and August of 2001.

Quality control checks included independent review of 100% of data sheets to screen for data entry errors. In addition, the records of all patients found to be in the registry were reviewed to ensure that written data entry records

agreed with the electronic record of immunizations. Ten percent of records identified as being enrolled in the registry were screened to be sure that this was accurate, as were 10% of records identified as not being enrolled.

Interventions

Medical students were employed to work in the PED between the hours of 10 AM and midnight each day. The parents of patients age 10 and under who registered in the PED were approached and were invited to participate in the study. After obtaining informed consent, parents were asked to respond to a short questionnaire to determine demographic information (date of birth, sex, age, ethnicity, race, primary language, and parental report of immunization status, awareness of participation in the CNY Immunization Registry, and primary care physician). The CNY Immunization Registry was then accessed via a dedicated, password-controlled desktop computer to determine whether the child was enrolled in the registry. Personal identifying information was used to identify the child in the registry, following which each child was assigned a unique identifier. In patients who were identified as participants in the registry, immunization status was verified for Hepatitis B; Hemophilus influenza-type B (HiB); Diphtheria, Tetanus and Pertussis (DTaP); Polio (IPV); and Measles, Mumps, and Rubella (MMR), based on the current Advisory Committee on Immunization Practices (ACIP) recommended guidelines. At the time of the study, recommended immunizations included DTaP, IPV, HiB, and Hepatitis B at 2 and 4 months; DTaP and possibly HiB at 6 months; MMR at 12 months; DTaP, IPV, HiB, and Hepatitis B at 15 months, and DTaP, IPV, and MMR at 4 to 6 years. Status of the Varicella and pneumococcal vaccines was not measured in this study due to an inability to determine from the registry record whether the patient had previously contracted chicken pox, thereby negating a medical indication for the Varicella vaccine and that there was a national shortage of pneumococcal vaccine. Patients were allowed to be one standard, well-child visit interval behind in immunizations and still be considered "up-to-date (UTD)." Depending on age, patients could have a 2- to 12-month period of delay in immunization before they were categorized as being deficient. Parents of patients whose immunizations were not UTD were informed of which immunizations their child was lacking and where immunizations could be obtained (eg, primary care provider or county health department).

Outcome Measures

The primary outcome measures were prevalence of patient participation in and parental awareness of the immunization registry, currency of immunization status from the IR, and parental agreement with immunization status as documented in the registry.

Analysis

Prevalence of participation was calculated as a simple proportion with 95% confidence intervals as were rates of underimmunization and parental agreement with the registry.

RESULTS

During the study period, 698 (97%) of 720 patients approached consented to participate in the study. Of these, 235 (34%, 95% CI, 30–37) were enrolled in the IR. One hundred twenty-seven (54%, 95% CI, 48–60) of those patients identified as enrolled in the CNY IR were male and 85 (36%, 95% CI, 30–42) were under age 2. Sixty-seven patients (29%, 95% CI, 23–34) received their primary care at a private practice, 146 (62%, 95% CI, 56–68) received primary care in a public or university-based clinic and the source of primary care was unknown for 22 patients (9%, 95% CI, 6–14). Only 67 (29%, 95% CI, 23–34) parents of children in the IR were aware that they were enrolled. Of the 235 IR patients, 225 (96%, 95% CI, 93–98) stated they were UTD, while only 143 (61%, 95% CI, 55–67) were documented to be so in the IR. Specific immunization deficiencies for the 92 (39%) patients documented as under-immunized are shown in Table 1.

DISCUSSION

Parental recall of immunization status during ED visits is inaccurate and often overestimates their children’s

vaccination coverage.^{4,6,9,12–14} An effective IR could be crucial in sharing immunization information between health-care providers. In our study, only 143 (61%) of patients enrolled in the IR were documented to be UTD compared with the 225 (96%) that were thought to be UTD by parental report. It has been shown that parents are more willing to accept immunizations during urgent and emergent visits if they are certain there is an immunization delay.^{4,7,13} In Cunningham’s study, if a parent had an immunization card documenting delay they were almost 5 times as likely to accept immunization in the ED.⁴ Having access to an IR in the PED could identify a significant number of under-immunized children thought to be UTD by their parent and provide the necessary documentation to the parent for them to consent to immunize their child in the PED. Several studies have provided support for the creation of and potential usefulness of IRs in PEDs.^{4–6}

Immunization registries have been shown to improve immunization rates in an adult population.¹⁵ They have also been shown to be more accurate than medical record review in determining immunization rates.¹⁶ In one study, among patients who were determined to be delayed on medical record review, 19% had additional immunizations from other sources that had been documented in an IR and 10% of patients were actually completely UTD.¹⁶ It has been proposed that IR use has a great potential for improving immunization rates among children.¹⁷ Currently, only 24% of children in this country are participants in an IR. The goal of Healthy People 2010 is to have greater than 95% participation of children 0 to 6 years in fully operational registries.^{3,18}

Linkins¹⁸ also observes that the lowest rates of immunization are in “pockets of need” found in urban areas among low-income families. In this setting, more than 20% of all children will have seen more than one primary care provider by age 2. Without a functional, accurate, and accessible IR, obtaining an accurate and complete immunization history is difficult.

Although the urban poor may be most at risk, “private practitioners” tend to overestimate the vaccine coverage in their individual (or group) practices.^{1,13} The mobile nature of our society with frequent changes in parental employment status and therefore insurance coverage put many children at risk for having inaccurate and/or incomplete immunization records and an accompanying unrecognized immunization delay. Reliance on immunization records that may be lost as a patient moves from one medical home to another is a major contributor to the problem.

Far fewer private practitioners participate in an IR than practitioners who practice in public or academic settings.³ This may make determining the immunization status of these patients more difficult even if an ED has access to an IR. One reason that has been offered by private practitioners for

TABLE 1. Missing Immunizations by Number and Type

No. Missing Immunizations	Immunizations Missing	No. Patients
1 Immunization—30 (13%)	Hep B	9
	HIB	9
	DtaP	2
	IPV	1
	MMR	9
2 Immunizations—14 (6%)	Hep B/HIB	4
	Hep B/DtaP	2
	Hep B/MMR	1
	HIB/DtaP	2
	HIB/MMR	1
	DTaP/MMR	4
3 Immunizations—8 (3%)	Hep B/HIB/DtaP	1
	Hep B/DTaP/IPV	1
	HIB/DTaP/IPV	1
	HIB/DTaP/MMR	3
4 to 5 Immunizations—40 (17%)	DTaP/IPV/MMR	2
	Hep B/HIB/DTaP/IPV	13
	Hep B/DTaP/IPV/MMR	3
	HIB/DTaP/IPV/MMR	1
	Hep B/HIB/DTaP/IPV/MMR	23

their resistance to both IR development and ED immunization programs is that these interventions may lead to a decreased rate of well-child care visits to primary caregivers. However, 2 groups have actually shown that ED immunization programs have no impact on future primary care visit rates.^{6,7}

At-risk populations often make use of EDs for minor, episodic care. Frequently, these patients are not receiving well-child care including immunizations on a routine basis. The availability of an IR may improve the chances that immunizations could be given in the ED by overcoming a major obstacle to immunization in this setting. Since it has been shown that parents are willing to have their children immunized if they are sure that they are delayed,^{4,7,13} ED access to an IR could help demonstrate to parents an immunization delay if it exists. In addition, immunizations given in the ED could be entered in the registry so that when patients do return to their source of primary care, their records would be complete and accurate. This would minimize the number of unneeded immunizations administered to patients.

Having immediate access to the accurate immunization status of ED patients is even more important today. The use of a conjugate pneumococcal vaccine has the potential to eliminate the vast majority of cases of occult bacteremia. If it is known that a patient has completed their series of pneumococcal vaccines, the approach to that patient when they present with a fever without a source may be modified. Access to this information would be particularly useful during the “phase-in” period of this vaccine and at the present time when many geographic areas are experiencing shortages of this new vaccine. In addition, in a time of increased risk of possible bioterrorism, new vaccines may be recommended for certain segments of or even the entire population. The ED may be a necessary provider of these vaccines. Immediate access to accurate information about a patient’s immunization status may take on added importance.

Our results show that of the children less than 11 years old who visited the PED during the study period, a significant number (34%) were in the IR. Interestingly, a relatively small number of parents of enrolled children (29%) were aware that their children were enrolled. This is despite the parents being given written materials describing the registry and signing a consent document in order for their child to be entered in the registry. In addition, providers sign an agreement that states that providers will: “Counsel parents/legal guardian on the purpose and voluntary nature of NYSIIS.” It is not clear what else should be done, if anything, by the registry to make parents more aware of their children’s participation.

Most children attended 1 of 3 clinics in the area. As expected from prior literature, the percentage of children whose immunizations were UTD as recorded in the IR (61%)

was far less than that reported by the parents (96%). Use of an IR to identify the large number of children who were underimmunized offers the potential for interventions in the ED. Alternatives include immunizations given in the ED or contacting the primary care provider to arrange for immunization. Use of an IR to document immunization delay could make parents more amenable to ED immunization potentially increasing the chances of success for an ED-based immunization program.

The limitations of this study include the inability to determine whether the registry accurately reflects immunizations recently received. Have children received immunizations not yet entered into the registry? This has been shown to be a problem with registries in their current state of development. We also could not use the registry, as it was currently available to determine if a patient needed varicella vaccination. Due to the important nature of these limitations, the accuracy and timeliness of the registry immunization information are the subject of ongoing investigations by our group.

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REFERENCES

- Lieberthal A. Immunization registries good for patients, pediatricians. *AAP News*. 2001;19(11):225.
- Ortega AN, Stewart DCL, Doswhen SA, et al. The impact of a pediatric home on immunization coverage. *Clin Pediatr*. 2000;39:89–96.
- Centers for Disease Control and Prevention. Immunization and infectious diseases. In: *Healthy People 2010*. Vol. 1;14:1–51.
- Cunningham SJ. Providing immunizations in a pediatric emergency department: underimmunization rates and parental acceptance. *Pediatr Emerg Care*. 1999;15:255–259.
- Bell LM, Lopez NI, Pinto-Martin J, et al. Potential of linking an emergency department and hospital-affiliated clinics to immunize preschool-age children. *Pediatrics*. 1994;93:99–103.
- Joffe MD, Luberti A. Effect of emergency department immunization on compliance with primary care. *Pediatr Emerg Care*. 1994;10:317–319.
- Rodewald LE, Szilagyi PG, Humiston SG, et al. Effect of emergency department immunizations on immunization rates and subsequent primary care visits. *Arch Pediatr Adolesc Med*. 1996;150:1271–1276.
- Szilagyi PG, Rodewald LE, Humiston SG, et al. Effect of 2 urban emergency department immunization programs on childhood immunization rates. *Arch Pediatr Adolesc Med*. 1997;151:999–1006.
- Lindgren ML, Atkinson WL, Farizo KM, et al. Measles vaccination in pediatric emergency departments during a measles outbreak. *JAMA*. 1993;270:2185–2189.
- Slobodkin D, Zielske PG, Kitlas JL, et al. Demonstration of the feasibility of emergency department immunization against influenza and pneumococcus. *Ann Emerg Med*. 1998;32:537–543.

11. Slobodkin D, Kitlas JL, Zielske PG. A test of the feasibility of pneumococcal vaccination in the emergency department. *Acad Emerg Med.* 1999;6:724–727.
12. Cetta F, Ros SP, Beck AM. Are routine immunizations in the emergency department a realistic goal? *Clin Pediatr.* 1993;32:161–162.
13. Udovic SL, Lieu TA, Black SB, et al. Parent reports on willingness to accept childhood immunizations during urgent visits. *Pediatrics.* 1998;102(4):e47.
14. Goldstein KP, Kviz FJ, Daum RS. Accuracy of immunization histories provided by adults accompanying preschool children to a pediatric emergency department. *JAMA.* 1993;270:2190–2194.
15. Klachko DM, Wright DL, Gardner DW. Effect of a microcomputer-base registry on adult immunizations. *J Fam Pract.* 1989;29:169–172.
16. Stille CJ, Christison-Lagay J. Determining immunization rates for inner-city infants: statewide registry data versus medical record review. *Am J Public Health.* 2000;90(10):1613–1615.
17. Gregorio DI, Lowery St. John TY, et al. Immunization registry: problems and prospects for boosting vaccine coverage of children. *J Public Health Manage Pract.* 1997;3(5):64–71.
18. Linkins RW. Immunization registries: progress and challenges in reaching the 2010 national objective. *J Public Health Manage Pract.* 2001;7(6):67–74.