A Reexamination of the Feasibility of the Administration of Routine Childhood Vaccines in Emergency Departments in the Era of Electronic Vaccine Registries

Jennifer J. Olson, MD,† Mark S. Mannenbach, MD,*† Brian R. Moore, MD,*† Vernon D. Smith,† Julia A. Rosekrans, MD,*† and Robert M. Jacobson, MD‡*

Objectives: To determine if electronic vaccine records facilitate successful routine childhood vaccination in the emergency department (ED).

Methods: We sampled consecutively over 2 calendar months children younger than 24 months presenting to the ED. Parents and legal guardians of eligible children were offered enrollment. Those consenting completed a parental survey after a nurse conducted an initial assessment of eligibility. Attending physicians then completed the assessment, and after the visit, the electronic vaccination records, when available, were accessed. No actual routine childhood vaccines were given during the study.

Results: Three hundred thirty-four were approached: 17 (5.1%) declined participation; 10 (3.0%) were enrolled, but the data were lost, and 7 (2.1%) were excluded. Of the 300 remaining, 235 (78.3%) had available electronic vaccine records. Only 38 (16.2%) of the 235 were late for at least 1 vaccine. Of note, physicians assessed 22 (57.9%) of the 38 as medically appropriate for vaccination in the ED. The overwhelming majority (81.8%) of the 22 parents and guardians would have assented to vaccination in the ED. Of the 38 patients found late for vaccination, 31 (81.6%) of parents incorrectly reported their children to be up-to-date on their immunizations.

Conclusions: Assuming that the electronic vaccination record performed such as an online vaccine registry, the effort to access the registry might find a substantial number of children late for a routine childhood vaccination. In this setting, we found that approximately one sixth of the children with electronic vaccine records would be found late for vaccination, and based on physician assessment and parental survey, one half of those children would receive that vaccination if available in the ED. These rates offer health care planners a sense of the magnitude of the vaccination rates in the ED as we move toward regional vaccination registries with online capabilities to be accessed by EDs.

*Department of Pediatric and Adolescent Medicine, Division of Pediatric Emergency Medicine, †Department of Emergency Medicine and ‡Department of Pediatric and Adolescent Medicine, Division of Community Pediatric and Adolescent Medicine, Mayo Clinic College of Medicine, Rochester MN.

Address correspondence and reprint requests to Robert M. Jacobson, MD, Mayo Clinic, 200 First St Southwest, Rochester, MN 55905-0001. E-mail: jacobson.robert@mayo.edu.

ISSN: 0749-5161/05/2109-0565

Key Words: medical records systems, computerized, vaccination, emergency medical services, computer communication networks, information systems

Current policy statements from the American Academy of Pediatrics regarding increasing immunization coverage do not specifically advocate the use of the emergency department (ED) as a venue; however, public health officials and vaccination delivery experts have previously recommended vaccination in EDs.[1–3] Given this change in policy recommendation, revisiting the idea of the ED as a site for vaccination seems timely. Workability issues include the need to assess the vaccine status, the maintenance of vaccine availability in the ED, the acceptability of vaccination in an acute setting, the time and personnel to conduct the vaccination, and adequate documentation of vaccination.[4]

Documentation of vaccine status in a patient at the time of presentation to the ED is a particularly troubling problem. Recall information or vaccination cards are no guarantee of an accurate vaccine status.[5–7] Data have shown that as many as 45% of parents when asked give inaccurate information regarding their children's vaccination status.[5] Another study found that 95% of patients had no vaccination records available, and parents of adolescents had particular difficulty when it came to recall of vaccinations given in infancy.[6] Given these circumstances, an information vacuum exists in which parents and clinicians are asked to make a decision whether to vaccinate a child. One investigation found vaccination in the ED ineffective at raising vaccination rates as a result of an inability to ascertain vaccination status during the ED visit combined with parental refusal to vaccinate during an acute illness.[8] Not all have found such reluctance. Surveys of parents have shown that, in general, a large majority of parents would accept vaccination if physicians would recommend it,[9,10] although the most common reason for refusal was that the child was too sick at the time of the proposed vaccination.[9]

The Healthy People 2010 report recommends that 95% of children younger than 6 years be included in a fully operational population-based immunization registry.[11] Survey data from 2000 records show only 24% of children in this age group as presently participating in such an entity.[11] Given the availability of an electronic vaccination record for

a large proportion of children presenting at the ED at St Mary's Hospital in Rochester, Minn, we have the opportunity to address the information vacuum just as a community with a regional electronic vaccine registry might be able to do. We sought to explore the acceptability of vaccination among those whose parents were aware of their status and for whom the physicians had determined at the time of the encounter that the child could proceed with vaccination. We sought to determine what percent of children might be identified by medical record to be delayed or due for vaccine and of those the proportion whose parents and ED attendants would accept vaccination in the ED.

METHODS

This study was conducted over a 2-month period from November 2003 to December 2003. The study took place in the ED at St Mary's Hospital at the Mayo Clinic in Rochester, Minn. The study consisted of an 8-question survey that elicited parental opinion of childhood vaccine availability in the ED setting. The target population included children younger than 24 months presenting to the ED.

The nursing staff in the ED identified apparently age-eligible patients presenting for initial evaluation. The nursing staff member then completed an ''Eligibility Assessment.'' The form required the recording of the date of presentation to the ED, the patient clinic identification number, the patient's initials, the patient's birth date, the patient's sex, and the patient's race. The nursing staff member would then determine the eligibility of the patient for the study based on 4 specific criteria. These criteria included the presence of a parent or legal guardian, the absence of a language barrier, the medical stability of the patient, and absence of an obviously difficult social situation. This process required a time effort on the average of less than 5 minutes.

The physician staff of the ED was made aware of any patient deemed appropriate for the study. Care was taken to wait until initial medical care had been provided to the patient before approaching the family to discuss study enrollment. After written informed consent, the survey was explained to the parent or legal guardian. Language interpreters could assist in the explanation. Those parents or legal guardians who chose to participate were provided a copy of the survey. For patient convenience, surveys were available in English, Spanish, Somali, and Arabic. Interpreters were not asked to assist families in completing the survey. Care was taken that a child was entered into the study only 1 time during the weeks of the survey.

The attending parent or guardian was surveyed with a written questionnaire as to the status of the child's vaccinations, the parent or guardian's willingness for vaccination in the ED, and their reasons if they would be unwilling, The survey also addressed the responder's relation to the child, the parent's education, the primary language used at home, and other demographics. Specifically, the respondents were asked, ''If your child is late for a vaccine, and the physician feels it is appropriate to give, would you want the vaccine given?'' For the purpose of the study, the definition of ''late'' means not being up-to-date for vaccinations or past the age the vaccine should have been received.

At the time the patient was discharged from the ED, the physician overseeing the patient was asked to determine if it would be medically appropriate for the patient, given the patient's current condition, to receive a vaccine that was either due or late in the ED. The American Academy of Pediatrics' *Red Book* served as the reference for contradictions and precautions for the interpretation of that medical appropriateness.[12] This portion of the study required a simple ''yes'' or ''no'' determination and therefore was very time-efficient.

Subjects were not considered enrolled in the study unless all 4 parts of the study were completed. Moreover, subjects were not eligible for consideration if they had, during the study period, previously participated.

The electronic medical record of the Mayo system is the primary repository for immunization histories. All patients within the Mayo system have an electronic medical record that is immediately accessible by computer. This allows the health care provider to assess a patient's immunization status at any presentation for care. Patients enrolled in this study were not required to be a part of the Mayo health care system. For those patients who did have a Mayo electronic medical record available, a copy of the immunization record was made within 24 hours of the ED visit. This time frame was set to preserve the accuracy of the patient's vaccination status at the time of presentation to the ED. The copy was then available for careful and repeat review throughout the time of the study analysis.

RESULTS

We approached parents and guardians of 334 subjects from patient encounters in the ED which occurred between November 8, 2003, and December 30, 2003, among patients younger than 24 months upon their first presentation to the ED during this time period. Seventeen (5.1%) parents and guardians declined participation in the study. For 10 (3.0%) subjects, all data were lost after the subject number was assigned. Seven (2.1%) were excluded because of eligibility concerns at the time of enrollment—3 for medical instability, 2 for substantive psychosocial issues, 1 for language barriers, and 1 for a concern not recorded.

Of the 300 eligible subjects younger than 24 months who presented to the ED during the time frame, 263 (87%) have electronic medical records indicating affiliation with the Mayo system. Two hundred thirty-five (78.3%) had electronic vaccine records available for review. Of the 65 patients who lacked electronic vaccine records, 28 were younger than 3 months and therefore would not necessarily have received any vaccines to date. (In our community, the first dose of hepatitis B vaccine was routinely given at 2 months of age up until after this study was completed.) Five of the 28 were 2 months or older, but younger than 3 months. These 5 would be due for but not late for vaccines due at 2 months of age.

Of the 235 with vaccine records, 123 (52.3%) were girls, and 119 (82.1%) were whites, 19 (8.1%) non-Hispanic

black, 7 (3.0%) Hispanic, 8 (3.4%) Asian, and 8 (3.4%) other. With regard to the language selected for the survey, 230 (97.9%) were English, 1 (0.4%) Arabic, and 4 (1.7%) Spanish. The parents were fairly well educated with 4 (1.7%) whose highest level of education was grade school, 64 (27.2%) high school, 126 (53.6%) college or technical school, and 26 (11.1%) postgraduate studies. Fifteen (6.4%) did not report a level of education.

Among the 235 children younger than 24 months with available electronic vaccination records available, 38 (16.2%) were determined to be late for 1 or more routine vaccines. Among the 38 subjects found to be late for at least 1 vaccine, upon physician assessment in the ED, 22 (57.9%) were determined to be appropriate for vaccination at that point in time. Of the 22 subjects deemed appropriate by the medical staff to receive vaccination, 18 (81.8%) had parents or legal guardians who expressed at the time willingness for the child to undergo vaccination during the encounter. Reasons cited for the 4 refusing included that the child was too ill at the time of the ED visit (1 child), the parent/guardian was concerned about side effects (1), the parent/guardian preferred to return to their primary doctor (1 child), or for other reasons not specified (1 child).

If the 38 patients found to be appropriate for vaccination are taken as a sample group, 33 (87%) of them were presented to the ED with a complaint of illness. The remaining 5 patients (13%) presented with various complaints of injury. Given the age group in the study and the time of year during which the study took place, this is not an unexpected finding.

Of note, among the 38 patients identified as late for at least 1 vaccine, 31 (81.6%) of parents reported that their children's vaccination records were up-to-date. This finding alone reiterates the need for continued efforts to establish and maintain electronic vaccination records/registries on a regional/national basis.

DISCUSSION

Although Rochester, Minn, a heavily white, highly educated sample population, cannot be held as necessarily representative of the rest of the country, our study demonstrates the ongoing potential for EDs as a site for childhood vaccination. Of the 300 patients screened for our study, 18 would ultimately have received vaccination (1/17). This group comprised those 1 of 6 children younger than 24 months who presented to the ED, had an electronic vaccine record available for review, and were found ''late'' for at least 1 vaccine. More than half of this subgroup was considered medically eligible for vaccination. Furthermore, for the overwhelming majority of these children, the parents would agree to vaccinate.

Although the return for effort might seem small, the benefit to the patients cannot be discounted. In Olmsted County, the county in which this study took place, vaccination rates are approximately 80% at 24 months of age. In a population of patients whose vaccination rates are not as high, the return could be much greater. Our study addresses the information vacuum that plagued previous evaluations of the ED setting.[5–7] Our results thus corroborate previous findings[4,13] and give health care planners estimates of the effect size that they might find in practices in which a regional immunization registry is available online in the ED.

This study does not address the other logistical problems such as stocking and storing vaccine, documenting vaccination, staffing the ED adequately to provide personnel for the time and effort involved, and training the staff. Furthermore, the study did not address those older than 24 months or the routine recommendations for influenza vaccination effective for 2004. In addition, this study only simulated the situation facing physicians and parents in that the vaccine was not actually available or offered.

The next logical step may be to plan and execute a limited controlled study in which vaccination is actually provided to a well-defined group of patients (children younger than 24 months with electronic vaccine records available for review). This study might incorporate within its parameters methods to assess personnel and patient time required to accomplish vaccination as well as cost factors regarding vaccine stocking and storage, training of personnel, and ED staffing.

ACKNOWLEDGMENTS

The authors thank the nurses, physicians, parents, and patients of the ED at St Mary's Hospital for their support. This study was funded by a grant from the Department of Pediatric and Adolescent Medicine, Mayo Clinic.

REFERENCES

1. AAP Policy Statement. Increasing immunization coverage. *Pediatrics*. 2003;112:993–996.
2. Bell L. Providing primary care to children in the emergency department: a problem or a missed opportunity? *Pediatr Emerg Care*. 1991;7:124.
3. Ad Hoc Working Group for the Development of Standards for Pediatric Immunization Practices. Standards for pediatric immunization practices. *JAMA*. 1993;269:1817–1822.
4. Bell L, Lopez N, Pinto-Martin J, et al. Potential impact of linking an emergency department and hospital-affiliated clinics to immunize preschool age children. *Pediatrics*. 1994;93:99–103.
5. Goldstein K, Kviz F, Daum R. Accuracy of immunization histories provided by adults accompanying preschool children to a pediatric emergency department. *JAMA*. 1993;270:2190–2194.
6. Cetta F, Ros S, Beck A. Are routine immunizations in the emergency department a realistic goal? *Clin Pediatr*. 1993;32:161–162.
7. Joffe M, Luberti A. Effect of emergency department immunization on compliance with primary care. *Pediatr Emerg Care*. 1994;10:317–319.
8. Rodewald L, Szilagyi P, Humiston S, et al. Effect of emergency department immunizations on immunization rates and subsequent primary care visits. *Arch Pediatr Adolesc Med*. 1996;150:1271–1276.
9. Jones K, Fasher B, Hanson R, et al. Immunization status of casualty attenders: risk factors for non-compliance and attitudes to 'on the spot' immunization. *J Paediatr Child Health*. 1992;28:451–454.
10. Cunningham S. Providing immunization in a pediatric emergency department: underimmunization rates and parental acceptance. *Pediatr Emerg Care*. 1999;15:255–259.
11. CDC. Initiative on immunization registries. *MMWR*. 2001;50(RR17):1–17.
12. American Academy of Pediatrics. *Red Book: 2003 Report of the Committee on Infectious Diseases*. 26th ed. Elk Grove Village, Ill: American Academy of Pediatrics; 2003.
13. Udovic S, Lieu T, Black S, et al. Parent reports on willingness to accept childhood immunizations during urgent care visits. *Pediatrics*. 1998;102:E47.

