Immunization Barriers In A Family Practice Residency Clinic

Debra A. Gamertsfelder, MD, Richard Kent Zimmerman, MD, MPH, and Elizabeth G. DeSensi, MS

Background: **Underimmunization was the primary cause of the 1990 measles outbreak in the United States. We examined the level and causes of underimmunization in a family practice residency clinic that received free vaccine supplies from the county health department.**

Methods: **The office computer selected 286 patients aged 2 to 3 years. From these 286 patients, 175 were sampled. Their charts were audited for immunization barriers, looking specifically for (1) valid reasons; (2) overly cautious interpretation of contraindications, especially minor illnesses; (3) missed opportunities (failure to address immunization status during acute care visits or lack of simultaneous vaccine administration); (4) parental refusal; and (5) delayed immunizations resulting from gaps in clinic attendance.**

Results: **There were 174 delayed doses; 90 were due to gaps in clinic attendance, 42 due to valid reasons, 33 due to invalid contraindications, and 25 due to missed opportunities. Some doses were delayed on more than one occasion and for more than one reason. Two parents refused initial immunizations, claiming that the children were too small.**

Conclusion: **Important causes of delayed immunizations in this residency clinic were gaps in attendance, overly cautious interpretations of contraindications, missed opportunities, and lack of simultaneous vaccine administration. (J Am Board Fam Pract 1994; 7:100-4.)**

The United States experienced a major measles epidemic in 1990 involving 27,786 cases[1] and 89 deaths,[2] despite the ready availability of an effective vaccine for its prevention. Major outbreaks of other vaccine-preventable diseases, such as pertussis and mumps, have occurred as well.[1]

According to the National Vaccine Advisory Committee (NVAC), inadequate immunization was the principal cause of the measles outbreak.[3] Almost one-half (44 percent) of the measles cases reported in 1990 occurred in unimmunized children who were old enough for immunization.[2] Childhood immunization rates at 2 years of age were low in many areas, as reflected by completion rates of 10 percent, 27 percent, 38 percent, and 38 percent for 2-year-olds in Houston, Miami, Washington, DC, and Oakland, respectively.[4] NVAC viewed the measles epidemic as a sentinel measure of the efficacy of vaccine delivery and has predicted that outbreaks of other vaccine-preventable diseases will occur.[3]

The major causes of inadequate immunization levels have included high cost,[5] lack of insurance, the number of injections, lack of access to medical care, fear of litigation, safety concerns, immunization barriers within the health care system, missed opportunities by providers to administer vaccines, and inadequate public awareness. Surveys of parents have shown the importance of physician advice in patient acceptance of polio,[6,7] measles,[8] and pertussis[8-10] vaccines. Physicians cannot directly change some barriers, such as vaccine cost, but there are areas in which physicians can make a difference. Three of these areas involve immunization barriers: overly cautious interpretation of vaccine contraindications, missed opportunities to address immunization status, and lack of simultaneous vaccine administration.

Many providers have been overly cautious in interpreting vaccine contraindications.[9,11-13] For instance, in Minnesota many physicians (30 percent and 34 percent, respectively) would not administer measles-mumps-rubella (MMR) vaccine to a child with a minor illness, such as an upper respiratory tract infection with a temperature of

Submitted, revised, 12 November 1993.

From the Family Practice Residency, Shadyside Hospital (DAG), and the Department of Family Medicine and Clinical Epidemiology (RKZ and EGD), School of Medicine, University of Pittsburgh. Address reprint requests to "Reprints," Shadyside Family Health Center, 5215 Centre Avenue, Pittsburgh, PA 15232.

37.5°C (99.5°F) or watery diarrhea with ample hydration.[13] Some physicians (40 percent) would not administer subsequent diphtheria and tetanus toxoids and pertussis vaccine (DTP) doses if the child was febrile (temperature, 39.4°C [103°F]) following the last DTP.

Missed opportunities have occurred when a child was seen by a provider for a reason other than well-child care or immunizations, but the child's immunization status was not addressed. In Rochester, New York, 422 of 515 children (82 percent) had a missed immunization opportunity; most contacts (64 percent) were due to mild acute illnesses.[14] In another study, only 3 of 53 children (6 percent) who were seen for a minor illness were immunized, although they all needed at least one immunization.[12]

A third barrier within the health care system has been lack of simultaneous vaccine administration. In Minnesota, many physicians (33 percent) were unwilling to recommend simultaneous administration of multiple immunizations.[13] Simultaneous administration of vaccines is important, because 38 percent of measles cases in an outbreak were in children who were immunized with oral polio vaccine or DTP or both at a time when MMR could also have been given.[15]

The project reported here assessed five immunization barriers in a family practice residency clinic (FPRC): (1) overly cautious interpretation of vaccine contraindications, (2) missed opportunities to address immunization status, (3) lack of simultaneous vaccine administration, (4) parental refusal out of concern about side effects, and (5) gaps in clinic attendance. Because the FPRC receives free vaccine supplies from the county, vaccine cost is not an immunization barrier at this site.

The family practice residency clinic is located in an urban area of Pittsburgh, Pennsylvania. The socioeconomic status of the patient population is diverse, but the majority of children are economically disadvantaged. The clinic population is racially diverse; 51 percent are African-American, 44 percent are white, and 5 percent are of other ethnic backgrounds.

Methods

The office computer selected 286 patients aged 2 to 3 years as of 2 October 1991. For this project, the reports of 175 of the 286 patients were sampled. The computer has a patient status report for every patient at the FPRC. The status report contains on-line data about the patient's birth date, problem list, medications, immunizations, and health maintenance information. It is updated at each patient visit, based upon the physician's dictation regarding that visit.

Printed copies of the report for each (100 percent) of the 175 children were reviewed to assess the timeliness of DTP-1, DTP-2, DTP-3, DTP-4, and MMR-1. A dose was defined as "on time" if it was given within 1 month of recommendations.[4,16] For DTP-4, 18 months was considered acceptable.[17] If a child had one or more late immunizations, the principal investigator audited the patient's personal chart. Only one discrepancy in immunization dates was found between the patient charts and the status report. For that instance, chart data were used. For each late dose, the length of delay in administration and reason(s) for the delay were recorded by hand onto preprinted forms. Reasons for delays were categorized as (1) valid (e.g., valid contraindication or awaiting transfer of immunization records from another provider to FPRC), (2) invalid, (3) immunization administered by another clinic, (4) missing data about that immunization, and (5) parental refusal. Invalid reasons were subdivided as invalid contraindications, missed opportunities (e.g., immunization status not addressed during visit for a mild, acute illness or lack of simultaneous vaccine administration), and gaps in patient attendance at the clinic. Because more than one patient visit could occur after a child was eligible for a vaccine but before the child received it, more than one invalid reason could apply per dose. Invalid contraindications were defined from published references[18,19] and typically involved a minor illness with a temperature less than 38.3°C (101.0°F) rectally or 37.8°C (100.0°F) axillary. Gaps in clinic attendance were defined as lack of attendance at the clinic during the recommended time for immunization,[16,17] with a 1-month grace period. If no immunization data were available for a particular dose in the chart or status record, that dose was labeled as missing. Generally, missing doses indicated a child who either came to the FPRC at a later age and was fully immunized or a child who left the FPRC for another clinic. Five children had only one visit to the FPRC and did not have any immunization data on record; these children were excluded from further analyses, leaving 170 for the main analyses.

For children whose immunizations were late, their ages at immunization were calculated during chart audits. Because these age distributions were skewed ($P < 0.05$),[20] median values were reported instead of mean values. Data were analyzed using the Statistical Analysis System[21] on a mainframe computer.

Results

Of the 170 children, 90 were boys and 80 were girls. Insurance coverage for the 170 children included Medicaid (75 percent), commercial insurance (17 percent), and self-pay/Hill Burton (8 percent).

The number of late immunizations for the 170 children ranged from 12 (7 percent) for DTP-1 to 56 (33 percent) for MMR-1 (Table 1). For children whose immunizations were late, the median age at DTP-3, DTP-4, and MMR-1 was 10, 24, and 18 months, respectively.

The principal causes of late immunizations, in descending order, were gaps in clinic attendance, valid reasons, invalid contraindications, and missed opportunities. Many doses were delayed more than once because of repeated invalid contraindications or lack of addressing immunization status at clinic visits (Table 2). Lack of simultaneous administration was considered a missed opportunity and occurred for 9 doses.

Immunizations for two children were delayed because of parent refusal. One parent refused DTP-1 on three occasions but later consented. Another parent did not bring in the child for the first well-child visit until 8 months of age because of concerns about vaccine safety in young infants.

Discussion

The principal cause of delayed immunizations was gaps in clinic attendance. Possible reasons for gaps in attendance include family dysfunction, lack of knowledge about the routine well-child care schedule, lack of awareness about immunizations, and transportation difficulties.

Recall or reminder systems are a solution to gaps in clinic attendance. Both mailed reminders,[22-24] similar to those used by dentists, and telephone reminders[25] are effective. Comparative studies have shown that reminders which specifically list the individual and vaccine needed are more powerful than those which generally encourage up-to-date immunizations but do not list a patient's deficiencies.[26,27]

Overly cautious interpretation of contraindications was an important immunization barrier in this study and in others.[9,12,13] Minor illnesses are not valid contraindications according to the National Vaccine Advisory Committee and the Immunization Practices Advisory Committee, but they are important times to administer vaccines.[16,19,28] User-friendly lists of valid and invalid contraindications are available in the Standards

Table 1. Age-Appropriateness of Childhood Immunizations and Reasons for Delayed Immunizations for 170 Children.

Age-Appropriatness and Reasons for Delays	Number of Vaccine Doses				
	DTP-1	DTP-2	DTP-3	DTP-4	MMR
On time	131	107	98	119	87
Late	12	34*	44*	28*	56*
Valid reason	1	9†	12‡	9	11
Invalid contraindication	2	9	9	6	7
Missed opportunity	1	1	4	9	10
Gap in clinic attendance	8	16	22	10	34
Immunization given elsewhere (child transferred into or out of clinic)	26	29	27	19	22
Missing data on immunization§	1	0	1	4	3

DTP = diphtheria and tetanus toxoids and pertussis vaccine, MMR = measles, mumps, and rubella vaccines.
*Number of reasons exceeds total number late because immunizations can be delayed on more than one occasion for diferent reasons (e.g., not seen until late, then invalid contraindication when seen).
†Includes children who received DTP-2 after 5 months of age because DTP-1 was late (DTP-2 was given within 2 months of DTP-1).
‡Includes children who received DTP-3 after 7 months of age because DTP-2 was late (DTP-3 was given within 2 months of DTP-2).
§Missing data most likely occurred when a child transferred into or out of the clinic.

Table 2. Frequency of Various Immunization Barriers in a Family Practice Residency Clinic.

Immunization Barrier	Number of Doses Late	Number of Visits in Which Immunization Delayed
Mild, acute illness with temperature < 38.3°C (101°F)	33	48
Immunization status not addressed although visited clinic and eligible for immunization	18	23
Lack of simultaneous vaccine administration	9	9

for Pediatric Immunization Practices[19] and a review article.[18]

Missed opportunities were important barriers to immunization in this study as in others.[12,14] Appointments for acute care visits are important opportunities to address immunization status and to administer vaccines, unless there is a contraindication.[19] Office staff can routinely evaluate the immunization status of patients prior to the physician seeing the patient.[29-32] This evaluation can be done at the time of registration or by nursing personnel when they obtain temperature, blood pressure, and pulse and respiratory rates. Colored stickers, checklists, computer-generated prompts, or inked rubber stamps are practical approaches to communicate the need for immunization.

Lack of simultaneous vaccine administration was only a minor problem in this study, but it has been an important barrier in other studies.[3,15] Simultaneous administration of vaccines is safe and efficacious[33] and is encouraged by the National Vaccine Advisory Committee.[19]

Parental refusal to accept immunization was a minor problem in this study. Media reports on alleged reactions to vaccines increased greatly in the late 1980s, leading a number of parents to fear certain immunizations, particularly pertussis vaccine. For instance, in Massachusetts, there has been a selective increase in the philosophical exemption from pertussis immunization (although DT has been acceptable).[34]

Vaccine cost and reimbursement have been major barriers to immunization, but they were not factors in this study because the county provided free vaccines. Surveys of Texas, Minnesota, and Washington physicians[13,35,36] found that many made referrals to public clinics because their patients were unable to afford immunizations.

A limitation of this study was our inability as a result of cost constraints to interview parents about gaps in clinic attendance and to interview physicians about immunization barriers. Because our study was conducted in a residency clinic, its generalizability could be limited. We did not include in the analyses 5 children who attended the clinic only once and who did not provide immunization histories; if these children were included, the immunization rates might be lower.

We found three important immunization barriers in a family practice residency clinic: gaps in clinic attendance, overly cautious interpretation of vaccine contraindications, and missed immunization opportunities. A concerted effort by all segments of the health care system is needed to avoid needless outbreaks of vaccine-preventable diseases.

Data analysis was conducted at the Department of Family Medicine and Clinical Epidemiology at the University of Pittsburgh.

References

1. Centers for Disease Control. Summary of notifiable diseases. MMWR 1990; 39(53):1-61.
2. *Idem.* Measles—United States, 1990. MMWR 1991; 40(22):369-72.
3. The measles epidemic. The problems, barriers, and recommendations. National Vaccine Advisory Committee. JAMA 1991; 266:1547-52.
4. Centers for Disease Control. Retrospective assessment of vaccination coverage among school-aged children — selected US cities, 1991. MMWR 1992; 41(6):103-7.
5. Zimmerman RK, Giebink GS, Street HB. Lack of money — barrier to immunization. Pediatrics 1992; 90:1007.
6. Clausen JA, Seidenfeld MA, Deasy LC. Parent attitudes toward participation of their children in polio vaccine trials. Am J Public Health 1954; 44:1526-36.
7. Glasser MA. I. A study of the public's acceptance of the Salk vaccine program. Am J Public Health 1958; 48:141-6.
8. Opinion Research Corporation. 1979 Immunization survey. Vol I. Atlanta: Department of Health, Educa-

tion, and Welfare, Public Health Service, Centers for Disease Control, Bureau of Health Education, 1979.
9. Stevens D, Baker R, Hands S. Failure to vaccinate against whooping cough. Arch Dis Child 1986; 61:382-7.
10. Peckham C. The Peckham Report: national immunisation study: factors influencing immunisation uptake in childhood. London: Department of Paediatric Epidemiology, Institute of Child Health, Action Research for the Crippled Child, 1989.
11. Langkamp DL, Langhough R. Primary care physicians' knowledge about diphtheria-tetanus-pertussis immunizations in preterm infants. Pediatrics 1992; 89:52-5.
12. Gindler JS, Cutts FT, Barnett-Antinori ME, Zell ER, Swint EB, Hadler SC, et al. Successes and failures in vaccine delivery: evaluation of the immunization delivery system in Puerto Rico. Pediatrics 1993; 91:315-20.
13. Zimmerman RK, Street HB, Giebink GS. Physician barriers to vaccine coverage: vaccine cost and overinterpretation of vaccine contraindications. In: Centers for Disease Control, editor. 25th National Immunization Conference Proceedings; 1991 June 10-14; Washington, DC. Atlanta, GA: Centers for Disease Control, 1992:170. Abstract.
14. McConnochie KM, Roghmann KJ. Immunization opportunities missed among urban poor children. Pediatrics 1992; 89(6 Pt 1):1019-26.
15. Hutchins SS, Escolan J, Markowitz LE, Hawkins C, Kimbler A, Morgan RA, et al. Measles outbreak among unvaccinated preschool-aged children: opportunities missed by health care providers to administer measles vaccine. Pediatrics 1989; 83:369-74.
16. Immunization Practices Advisory Committee. General recommendations on immunization. MMWR 1989; 38(13):205-14, 219-27. [Erratum MMWR 1989; 38(17):311]
17. Report of the Committee on Infectious Diseases. 22nd ed. Elk Grove Village, IL: American Academy of Pediatrics, 1991.
18. Zimmerman RK, Giebink GS. Childhood immunizations: a practical approach for clinicians. Am Fam Physician 1992; 45:1759-72.
19. National Vaccine Advisory Committee. Standards for pediatric immunization practices. Atlanta, GA: Printed by the CDC, US Department of Health and Human Services, Public Health Service, 1993.
20. Snedecor GW, Cochran WG. Statistical methods. 8th ed. Ames: Iowa State University Press, 1989.
21. Statistical analysis system: SAS Institute, Version 6.07. Cary, NC: SAS Institute, 1989.
22. Young SA, Halpin TJ, Johnson DA, Irvin JJ, Marks JS. Effectiveness of a mailed reminder on the immunization levels of infants at high risk of failure to complete immunizations. Am J Public Health 1980; 70:422-4.
23. Spaulding SA, Kugler JP. Influenza immunization: the impact of notifying patients of high-risk status. J Fam Pract 1991; 33:495-8.
24. McDowell I, Newell C, Rosser W. A follow-up study of patients advised to obtain influenza immunizations. Fam Med 1990; 22:303-6.
25. Reid JS, Graham-Smith HJ. Childhood immunisations: a recall system is worthwhile. N Z Med J 1984; 97:688-9.
26. Vernon TM, Conner JS, Shaw BS, Lampe JM, Doster ME. An evaluation of three techniques improving immunization levels in elementary schools. Am J Public Health 1976; 66:457-60.
27. Yokley JM, Glenwick DS. Increasing the immunization of preschool children; an evaluation of applied community interventions. J Appl Behav Anal 1984; 17:313-25.
28. Immunization Practices Advisory Committee. Diphtheria, tetanus, and pertussis: recommendations for vaccine use and other preventive measures. MMWR 1991; 40(RR-10):1-28.
29. Ratner ER, Fedson DS. Influenza and pneumococcal immunization in medical clinics, 1978-1980. Arch Intern Med 1983; 143:2066-9.
30. Nichol KL, Korn JE, Margolis KL, Poland GA, Petzel RA, Lofgren RP. Achieving the national health objective for influenza immunization: success of an institution-wide vaccination program. Am J Med 1990; 89:156-60.
31. Nichol KL. Long-term success with the national health objective for influenza vaccination: an institution-wide model. J Gen Intern Med 1992; 7:595-600.
32. Margolis KL, Nichol KL, Wuorenma J, Von Sternberg TL. Exporting a successful influenza vaccination program from a teaching hospital to a community outpatient setting. J Am Geriatr Soc 1992; 40:1021-3.
33. Deforest A, Long SS, Lischner HW, Girone JA, Clark JL, Srinivasan R, et al. Simultaneous administration of measles-mumps-rubella vaccine with booster doses of diphtheria-tetanus-pertussis and poliovirus vaccines. Pediatrics 1988; 81:237-46.
34. Etkind P, Lett SM, Macdonald PD, Silva E, Peppe J. Pertussis outbreaks in groups claiming religious exemptions to vaccinations. Am J Dis Child 1992; 146:173-6.
35. Schulte JM, Bown GR, Zetzman MR, Schwartz B, Green HG, Haley CE, et al. Changing immunization referral patterns among pediatricians and family practice physicians, Dallas County, Texas, 1988. Pediatrics 1991; 87:204-7.
36. Wright JA, Marcuse EK. Immunization practices of Washington State pediatricians — 1989. Am J Dis Child 1992; 146:1033-6.