

Family Physician Acceptance of Universal Hepatitis B Immunization of Infants

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Background. The incidence of hepatitis B infection has risen 37% over the last decade; 300,000 new infections and 5000 deaths occur annually in the United States. Because immunization programs that targeted high-risk groups failed to abate this increase, the Centers for Disease Control (CDC) recommended in November 1991 universal hepatitis B immunization of infants. Details were published in an addendum to *Morbidity and Mortality Weekly Report*. The purpose of this study was to assess (1) the effectiveness of the CDC in disseminating a new immunization recommendation to family physicians, (2) the effect of the new recommendation on clinical practice, and (3) the degree to which noneconomic barriers may affect adoption of universal hepatitis B immunization.

Methods. A random sample of 300 family physicians in North Carolina was surveyed by mail. Descriptive statistics and chi-square analysis were used to assess the relationship of variables hypothesized to predict physician awareness of, and agreement with, the new recommendation.

Results. The response rate was 78%. Overall, 48% of family physicians who administered immunizations to children were aware of the new hepatitis B vaccine rec-

ommendation. However, only 17% agreed that it was warranted for all newborns in their practice. Twenty-five percent expected more than one half of the parents to refuse three injections at a single well-child visit, a result of adding this vaccine to the current primary immunization schedule. Additionally, 42% expected nurses to resist giving three injections at one visit.

Conclusions. The CDC does not have an effective mechanism for disseminating information to all physicians who care for children. Improved coordination of recommendations between the CDC and relevant specialty societies may help to increase physician adoption of new immunization recommendations in their clinical practice. Additionally, practical concerns of physicians and their patients regarding multiple injections and other practice-relevant issues must be considered when formulating new immunization recommendations, if their implementation is to be successful. Additional research is needed to determine effective methods to disseminate immunization information and to address practical concerns of clinicians.

Key words. Vaccination; hepatitis B; immunization schedule; infant care; clinical protocols.

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The incidence of hepatitis B infection has risen by 37% over the last decade and currently results in approximately 300,000 new infections annually.¹ This increase has occurred despite an immunization program recommended by the Centers for Disease Control (CDC) that targeted those believed to be at high risk for contracting hepatitis B disease (eg, homosexuals, intravenous drug

abusers, and infants born to hepatitis B surface antigen positive women).² The apparent failure of this immunization program led the CDC to reevaluate its hepatitis B strategy. On November 22, 1991, the CDC recommended universal immunization of infants against hepatitis B virus.¹

The announcement of the universal hepatitis B vaccine recommendation was reported in a supplement to *Morbidity and Mortality Weekly Report (MMWR)*.¹ Included were epidemiologic data supporting the recommendation along with information regarding dosage, safety, and efficacy of the vaccine. Although *MMWR* is not widely distributed to private physicians who care for children, no other governmental action was initiated to

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promulgate this recommendation. Three months after the CDC announcement, the American Academy of Family Physicians (AAFP) had not issued a statement detailing its position on the recommendation, but did so on August 14, 1992. This time interval allowed for the present study of the impact of the CDC recommendation alone.

Previous research has suggested effective dissemination of new immunization recommendations, and their justification may be important in fostering their adoption.³ The purpose of this study was to assess the effectiveness of the CDC in disseminating a new immunization recommendation to family physicians and the impact of the new recommendation on clinical practice. The study also sought to determine the preferred information sources among family physicians regarding immunization recommendations, and the degree to which noneconomic barriers may affect adoption of universal hepatitis B immunization. For example, addition of the hepatitis B vaccine series (three injections) to the primary immunization series already in place likely will result in infants receiving three injections at one or more of the 2-, 4-, or 6-month well-child visits. Parental, nursing, and even physician objection to three injections administered to the infant during one office visit may be a factor in compliance with the CDC's recommendation.

Methods

A 12-item questionnaire accompanied by a personalized cover letter was mailed to a random sample of 300 family physicians licensed by the state of North Carolina in late January 1992, 2 months after the CDC announcement of the new hepatitis B vaccine recommendation. Nonrespondents received two follow-up letters and surveys within 2 weeks of each mailing. The questionnaire was designed to take less than 5 minutes to complete. A pretest was conducted with a convenience sample of physicians to ensure clarity of interpretation and ease of completion.

The survey instrument was designed to determine the percentage of family physicians who were aware of the new CDC recommendation for universal hepatitis B immunization for infants and the subset of that group who believed that the recommendation was warranted for all newborns in their practice. Additional questions explored physicians' expectations of parental and nursing acceptance of multiple injections at well-child visits. Other questions addressed strategies that individual physicians might use in the event of parental refusal of hepatitis B immunization for their children. The survey also asked physicians to name the information source

most likely to provide accurate, timely information regarding new vaccine recommendations.

Data were analyzed in several phases. Initially, variables were constructed from the data provided by the physicians in the survey and from the demographic characteristics available from the North Carolina State Board of Medical Examiners' files from which mailing lists were drawn. The primary outcome variables of interest were those measuring the extent of physician awareness of and agreement with the new hepatitis B vaccine recommendation. Variables hypothesized to be associated with, and possibly predictive of, physician awareness and agreement included a number of individual physician, practice organization, and environmental characteristics, as well as physician-expected rates of parental and nursing staff refusal for this vaccine. Practice characteristics included the scale of practice (solo and two-physician practices, group practices community health center or public health department practices) and form of employment (government, private, or medical school faculty). Environmental characteristics included the practice location (metropolitan or nonmetropolitan) and level of involvement with health maintenance organizations (HMOs).

The means or proportion of all variables were calculated, and the distribution of the values of variables were examined. Chi-square statistics were calculated to assess the significance of the bivariate association between each of the predictor variables with awareness of, and agreement with, the new recommendation, as well as with physicians' expected refusal of three immunizations at one visit by parents and nurses and with opposition to three injections by physicians themselves.

The study was approved by the Committee on the Protection of the Rights of Human Subjects at the University of North Carolina at Chapel Hill.

Results

Of the initial sample, 13 physicians had moved from the state, retired, or died. Surveys were returned by 224 of the remaining 287 family physicians, yielding an effective response rate of 78%. No significant differences could be detected when respondents and nonrespondents were compared with respect to age, metropolitan or nonmetropolitan location of practice, sex, and race. Analysis of missing data from incomplete response cards revealed no consistent pattern or nonresponse bias to individual questions. Respondents who indicated that they did not administer vaccines to children as part of their routine practice were excluded from the subsequent analyses ($n = 71$). Consequently, the maximum sample size for remaining analyses was 153. No significant differences in

Table 1. Characteristics of All Respondents (N = 224)

Variable	Percent
Physician characteristics	
Female	14
White	95
AAFP member	84
Age < 40 years	52
Practice organization	
Solo or two-physician practice	44
Group practice	30
Health department or community health center	6
Medical school faculty	12
Environment/HMO involvement	
Metropolitan location	57
No HMO patients	44
1% to 10% HMO patients	31
More than 10% HMO patients	25

AAFP denotes American Academy of Family Physicians; HMO, health maintenance organization.

responses were observed between those who responded to the first, second, or third mailing.

Demographic characteristics of the entire sample, organized by physician characteristics, practice organization, and environment or HMO involvement, are presented in Table 1. The majority of respondents were white (95%), male (86%), and members of the AAFP (84%). Physicians who practiced in solo or two-physician practices made up 44% (n = 99) of the sample; 57% (n = 128) practiced in metropolitan locations.

Overall, 48% (n = 74) of family physicians who administered immunizations to children were aware of

the new CDC universal hepatitis B vaccine recommendation for infants. However, only 17% (n = 26) agreed that the hepatitis B vaccine was warranted for all newborns in their practice.

The association of all significant predictor variables with awareness of, and agreement with, the new recommendation as identified by chi-square analysis is presented in Table 2. Members of the AAFP were more likely than nonmembers to be aware of the new recommendation (52% vs 26%, $P = .007$) but were no more likely to agree that the immunization was needed for the infants in their practice (18% vs 11%, $P = .7$). Physicians in nonmetropolitan practice settings were more likely than those in metropolitan settings to be aware of the new recommendation (26% vs 12%, $P = .02$) and more likely to agree that the hepatitis B vaccine was needed in their practice (26% vs 12%, $P = .02$).

Physician expectations regarding the addition of the hepatitis B vaccine to the primary immunization series are detailed in Table 3. Twenty-five percent of family physicians expect more than one half of parents to refuse the hepatitis B vaccine if the new immunization schedule requires that infants receive three injections (*Hemophilus influenzae*, diphtheria/pertussis/tetanus, and hepatitis B) at one well-child visit. Those practicing in metropolitan areas were more likely to anticipate parental refusal than their nonmetropolitan counterparts (31% vs 14%, $P = .02$).

In contrast, 42% (n = 64) of respondents expected their nursing staff to refuse to administer three injections

Table 2. Association of Predictor Variables with Awareness of, and Agreement with, the New Recommendation for Hepatitis B Vaccination of Infants

Variable	(N)	% Aware	P Value	% Agree	P Value	
Physician characteristics						
AAFP member	(134)	52	}	.007	}	
Non-AAFP member	(19)	26		18		.7
Male	(127)	53	}	.014	}	
Female	(26)	27		19		.3
Age ≤ 40 y	(105)	46	}	.3	}	
Age > 40 y	(48)	54		11		.01
Practice characteristics						
Solo or two-physician practice	(58)	50	}	.2	}	
Group practice (FP or multispecialty)	(58)	48		24		.5
Health department	(10)	30		12		
Medical school faculty	(24)	54		20		
Practice environment						
Metropolitan practice setting	(95)	12	}	.02	}	
Nonmetropolitan practice setting	(57)	26		12		.02
≤10% of patients in HMO	(115)	47	}	.7	}	
>10% of patients in HMO	(38)	53		19		.02

AAFP denotes American Academy of Family Physicians; HMO, health maintenance organization.

Table 3. Physicians Who Expected Resistance from Parents and/or Nurses to Three Injections at One Visit

Source of Expected Resistance	(N)	Percent	P Value
More than half of all parents			
Overall	(37)	25	.02
Metropolitan	(29/65)	31	
Nonmetropolitan	(8/56)	14	
Office nurses			
Overall	(64)	42	.03
Metropolitan	(44/95)	46	
Nonmetropolitan	(20/58)	34	

to an infant at a single office visit. Again, those practicing in metropolitan areas were more likely to expect nursing staff refusal (46% vs 34%, $P = .03$). Thirty-seven percent ($n = 57$) of respondents reported that they themselves were opposed to an infant receiving three injections at one visit. No statistically significant differences were observed between groups of physicians when respondents were stratified by individual physician, practice organization, or environmental characteristics.

The strategies chosen by family physicians for handling parental refusal, the most common of which was to schedule an additional visit for the third injection (49%) are described in Table 4. When faced with parental refusal, many respondents (41%) reported they would "strongly recommend all three injections."

The information sources cited most frequently by respondents as being most likely to provide accurate, timely information regarding new vaccine recommendations were the CDC (36%), the AAFP (32%), and the American Academy of Pediatrics (AAP) (13%). Preference for a particular information source did not correlate with an increase in awareness of, or agreement with, the new hepatitis B vaccine recommendation.

Discussion

This study evaluated the effectiveness of the CDC in disseminating a new immunization recommendation to family physicians and its short-term impact on clinical

Table 4. Strategies for Handling Parental Refusal of Three Injections at One Visit (N = 224)

Strategy	Percent*
Recommend two injections at one visit and return for third injection	49
Physician choose two "most important"	2
Not insist on hepatitis B vaccine	37
Strongly recommend all three injections	41

*Percentages total greater than 100% because some physicians chose more than one response.

practice. At the time of this study, the AAFP had not stated its position regarding the CDC recommendation. If the goal of the CDC announcement is to foster adoption of this recommendation among all physicians who care for children, assessment of the impact of the CDC's efforts on both family physicians and pediatricians is essential.

Less than half (48%) of our respondents reported that they were aware of the new CDC recommendation, and this percentage may represent a "best case" scenario. Respondents may have reported awareness of the recommendation so as not to appear out of date with current medical practices; such responses are consistent with the well-documented Hawthorne effect.⁴ That only 17% of respondents agreed the hepatitis B vaccine was warranted for the infants in their practice is a sign of a lack of effectiveness of the CDC in promoting change in clinical practice among family physicians. A recent study of pediatricians' awareness of, and agreement with, the CDC recommendation found similar results.⁵

Although a plurality of respondents reported the CDC as their preferred immunization information source, its ability to alter clinical practice was not evident in this study. Improved coordination of immunization recommendation announcement and dissemination between the CDC, AAFP, and AAP may improve rates of adoption.

The counterintuitive finding that rural family physicians are more likely to be aware of, and agree with, the CDC recommendation than their metropolitan counterparts is worth noting. It is possible that this finding resulted because infants constitute a larger portion of the medical practice of rural family physicians. In suburban and city areas, pediatricians are more available and thus care for a greater segment of the pediatric population than family physicians. Consequently, family physicians in rural communities may be more attuned to new information regarding children.

Although economic issues surrounding the hepatitis B vaccine recommendation are frequently cited as barriers to adoption, our study demonstrates that noneconomic factors, such as multiple injections at a single office visit, may impede both physician and parental acceptance of this vaccine. Anecdotal reports suggesting physician and parental concern over the "pincushion effect" of multiple injections on children have appeared in the medical literature.⁶ The quantitative data collected in this study confirm its importance. Accelerated research into the production and manufacture of combined vaccines is essential to limit the number of injections required for well-child care. Over the next several years, vaccinations for rotavirus, varicella, respiratory syncytial virus, and other diseases may be added to the primary immuniza-

tion series. Unless combined vaccines are produced, reluctance of parents to subject their children to multiple injections at a single visit will only increase, thus complicating and delaying the use of these new vaccines.

Of concern is the 49% of physicians in this study who, if faced with parental refusal, would recommend that a child receive two injections at one visit and return to the office at another time for the third vaccination. The charges associated with another office visit, added to the cost of the vaccine itself, as well as travel costs in a rural area, could further inhibit many children from receiving this vaccine in the private sector. In the public sector, additional office visits would further burden the already understaffed and overextended public health service facilities.

One limitation of this study evolves from using the North Carolina Board of Medical Examiners' lists to obtain our sample. The percentage of general practitioners in comparison with residency-trained family physicians in our sample is not known. It is possible that higher percentages of awareness exist among those who are board-certified and/or residency-trained. Additionally, this study examined only the short-term effect of the CDC dissemination efforts 3 months after the new recommendation. It is probable that more physicians have become aware of, and possibly have adopted, this recommendation following additional formal and informal dissemination efforts.

This is the first study to assess the dissemination of immunization recommendations and their resultant acceptance by family physicians. Our results demonstrate that the CDC does not have an effective mechanism for

disseminating information to physicians who care for children. Improved coordination of immunization recommendations between the CDC and relevant specialty societies such as the AAFP may help to increase physician adoption of new immunization recommendations in their clinical practice and to eliminate unnecessary duplication of efforts. Additionally, practical concerns of physicians and their patients regarding multiple injections and other issues must be considered when formulating new immunization recommendations if their implementation is to be successful. If changes in dissemination and coordination of immunization recommendations are not made, the protective benefit of the hepatitis B vaccine, as well as future vaccines, will not reach the children for whom they are intended.

References

1. Centers for Disease Control. Hepatitis B virus: a comprehensive strategy for eliminating transmission in the United States through universal childhood vaccination. MMWR 1991; 40(Suppl RR-1): 11-9.
2. Centers for Disease Control. Protection against viral hepatitis: recommendations of the Immunization Practices Advisory Committee (ACIP). MMWR 1990; 39:5-22.
3. Freed GL, Konrad TR, Lohr JA, DeFries GH. Adoption of a new *Haemophilus influenzae* type B vaccine recommendation. Am J Dis Child 1993. In press.
4. Roethlisberger FJ, Dickson WJ, Wright HA. Management and the worker. Cambridge, Mass: Harvard University Press, 1946.
5. Freed GL, Bordley WC, Clark SJ, Konrad TR. Reactions of pediatricians to a new CDC recommendation for universal immunization of infants with hepatitis B vaccine. Pediatrics 1993. In press.
6. Gorlick G. Are we turning kids into pincushions? Contemp Pediatr 1991; 23:49.