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Center for Vaccine Development

Recommended Solutions to the Barriers to Immunization in Children and Adults

by Edwin L. Anderson, MD

Health care provider barriers to immunization include lack of knowledge about indications for and contraindications to immunizations, poorly trained medical staff, and absence of a reminder system for missed vaccinations.

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Abstract

Vaccines prevent disease and mortality. They are the foremost achievement of public health programs in the United States and internationally. In the early 90s the National Vaccine Advisory Committee concluded that there were significant barriers to young children being fully immunized including inconvenient and limited clinic hours for immunization, inadequate access to health care, and vaccine administration fees. Barriers to adult immunization also have been identified. This article will discuss research addressing barriers to immunization and possible solutions.

Introduction

Vaccines are effective in preventing disease and mortality and are the premier achievement of public health programs in the United States and internationally. A recent article by Panhuis et al.[1] estimated that since 1924 vaccines have prevented over 100 million cases caused by eight contagious diseases. This estimate was arrived at by comparing incidence rates before and after vaccine licensure. Despite this remarkable success multiple resurgences of measles, rubella, mumps, and pertussis have occurred since the 1980s. These resurgences have various causes, including refusal to vaccinate, incomplete vaccination series, waning immunity, and imported cases.

This review will concentrate on barriers to immunization encountered by parents, patients, and providers and will provide recommendations for possible solutions to overcoming these barriers.

Barriers to Childhood Vaccines and Possible Solutions

Following the measles epidemics of 1989 and 1990, with 18,000 cases and 25,000 cases, respectively, the National Vaccine Advisory Committee concluded that there were significant barriers to young children being fully immunized[2]. These barriers were missed opportunities to vaccinate and impediments to immunization in the delivery system. Obstacles for parents getting their children fully immunized were identified and included inconvenient and limited clinic hours for immunization, inadequate access to health care, and vaccine administration fees. As a result, the Standards for

Pediatric Immunization Practices were published[3]. Specific recommendations were made to administer all vaccines the child was eligible for at each visit and to use all clinical encounters, including visits for mild illness, to provide needed immunization[4].

Many of the barriers to immunization found in the measles epidemics greatly reduced vaccinations provided by public health departments, where approximately 50% of all vaccines in the United States were administered. Over the next decade a survey by Taylor et al.[5] showed that there was a shift to vaccines being given in the primary care setting with about 58% administered in private practices. Their study was done to assess the association between parents' perception of barriers to vaccination and their preferences regarding specific strategies designed to reduce missed vaccination opportunities and improve the immunization status of their children. The authors surveyed parents from 177 pediatric practices. Parents of children 8 to 35 months old were asked to identify the most difficult issue about obtaining immunizations, as well as their preferences for the maximum number of vaccine injections their child should receive at one office visit. Parents were also asked whether or not their children should receive needed immunization during office visits for mild illness. Actual immunization data were collected on over 13,000 children. Two-thirds of parents who responded indicated that their children should receive no more than two immunizations at one visit. However, there was no difference in the preferred maximum number of vaccines per visit comparing between parents of children who were fully immunized at eight months of age and parents of underimmunized children (median response for both groups was two injections, $p=.62$). Also, there was no difference in vaccination coverage comparing groups with parental attitudes for or against their child receiving needed immunizations during an illness visit. The most commonly cited barrier was concern about vaccine side effects but this barrier was not associated with immunization status. Other identified barriers - including confusing vaccine schedules, the inconvenience of the vaccination process, having a child frequently too ill to vaccinate, and religious objections - were statistically associated with underimmunization. However, these barriers were identified by $<5\%$ of parents and were not thought to account for a significant number of underimmunized children. Taylor et al.[5] concluded that immunization rates could be improved by making their office-practice procedures more efficient.

A Study by Kimmel et al.[6] grouped barriers to immunization as systems barriers (eg., inadequate organization of the health care system), health care provider barriers (eg., clinicians not adequately educated about vaccines), and parent and patient barriers (eg., fear of immunization-related adverse events). The most significant systems barrier to immunization was supply and distribution. Vaccines have been in short supply at times due to inadequate manufacturing capacity. Occasionally these shortages were significant and changes had to be made in vaccination schedule, such as delaying the fourth dose in a series.[7] Currently the CDC lists certain DTaP and Tdap vaccines as being in short supply but the shortages are not great enough to warrant any changes in routine vaccination schedules (source: www.cdc.gov/VACCINes/vac-gen/shortages/).

Health care provider barriers to immunization include lack of knowledge about indications for and contraindications to immunizations, poorly trained medical staff, and absence of a reminder system for missed vaccinations. Also, there are still parents and medical staff who are uncomfortable with the number of recommended immunizations during well-child visits in the first year of life. The physician must clearly communicate to parents and office medical staff that vaccines must be given on time and according to published guidelines.

Providers face logistical barriers which include the expense of vaccines, proper vaccine storage requirements, and lack of vaccination records[6]. The MMR vaccine, live attenuated influenza vaccine, and the rotavirus vaccine have stringent storage requirements. Missed visits and failure to provide needed immunizations at every clinic visit opportunity contribute to incomplete immunization requirements. Practices with reminder systems in place can improve immunization rates. Electronic health records (EHR) may improve the efficiency of office practice by standardized record keeping, especially regarding missed visits and accurate immunization records. However, many practices have not utilized EHR systems yet.

Patient and parent barriers to immunization include: parents may lack knowledge about childhood vaccinations, have unreasonable fears about vaccine safety, or lack transportation. They may not be aware of the threat of vaccine-preventable illness or that safe and effective vaccines are available against these diseases. A study of a rural clinic showed that supportive staff, convenient office times, and limited wait time for immunizations contributed to fully immunized children[8].

Despite the many barriers described, research has shown that some interventions can improve vaccinations rates[9, 10]. For parents who are distrustful of official sources, some may be more willing to accept information from their personal physician who takes time to listen and

address their concerns about vaccine safety.[9] Studies in adults can be applicable. In adult populations one of the strongest predictors of influenza vaccination is a physician's recommendation to receive the vaccine.[10] A study of standing orders, reminders, rapid vaccination services in inner city clinics found that these steps also led to an increase in influenza immunization rates among adults.[11]

Misconceptions about vaccines exist. Some parents believe that too many immunizations will weaken their child's immune system or may cause chronic illnesses such as asthma, DM, or MS.[12] Some parents believe that vaccine-preventable diseases were already disappearing prior to the use of vaccines or that vaccines are not natural and prefer disease-induced immunity for their children. Parents who are non-vaccinators may believe they can control their child's susceptibility to infection, question the validity of vaccine information, prefer errors of omission rather than errors of commission, or believe herd immunity will protect their child from the common childhood illnesses. These and other misconceptions are addressed at the following CDC website (www.cdc.gov/vaccines/vac-en/6mishome.htm). Physicians serve as the primary source of vaccine information for most parents and patients.

Physicians must provide accurate information about the benefits and risks associated with immunization. Occasional severe adverse events do occur following vaccination but are extremely rare. Current vaccine information can be provided with CDC-supplied Vaccine Information Statements (CDC.gov/nip/publications/vis) which can be given to families or patients prior to vaccination. Time should be made available prior to vaccination for parents to express their concerns to providers.

Parents may refuse vaccination for personal, cultural and/or religious reasons, or because of a previous perceived bad experience with immunization. Physicians need to acknowledge parents' concerns and respectfully address them and attempt to correct any misconceptions.[13] Also, parents often use cognitive shortcuts to simplify complex situations and judgments and health care providers should be aware of this reasoning.[14]

Barriers to Adult Vaccination and Possible Solutions

Barriers to adult immunization have been identified to facilitate compliance with vaccine recommendations by the U.S. Public Health Service, multiple national professional healthcare, and state public health agencies. Johnson et al.[15] surveyed over 2,000 adults aged 19 to 74 years, (20 of whom were health care providers), about attitudes and knowledge regarding tetanus, influenza, and pneumococcal vaccines. Among consumers (patients), 90% to 96% were aware of the availability of influenza and tetanus vaccines. Only 65% were aware of the pneumococcal vaccine, although awareness was higher among groups for whom this vaccine was recommended (85% of respondents ≥65 years versus 50% of those <50 years, $p < 0.001$). Most consumers were aware of the tetanus vaccine but only 36% knew that adults should receive a booster every 10 years. Of the three vaccines covered in the survey, the one that most consumers (70%) remembered receiving as an adult was the tetanus vaccine.

Most consumers (79% to 85%, depending on the vaccine) indicated they were likely to receive a vaccine if their health care professional recommended it. The most consistent reason given for not receiving any of the three vaccines was the belief that a healthy person did not need to be vaccinated (60%). For tetanus vaccine, 74% believed it was necessary only when an injury occurred; for the pneumococcal vaccine, 56% said their doctor had not recommended it. Vaccine costs were not found to be a deterrent for >80% of consumers, and 83% agreed that vaccinations preventing missed days at work would be valuable.

The Johnson et al.[15] survey results of physicians and nonphysician providers (PA/NP/RN) also found some interesting differences between these provider groups, their beliefs, and their practice delivery methods. Greater than 90% of these health care professionals believed their adult patients should be vaccinated. Also, both physician and nonphysician providers claimed to discuss recommended vaccinations with their adult patients during scheduled health maintenance office visits. However, PA/NP/RN providers were more likely to discuss immunizations during sick visits (42%) than were physicians (29%, $p = 0.03$). When asked about specific vaccines, physicians and the PA/NP/RN group recommended the tetanus vaccine to all adults (85% and 88%, respectively). Recommendations were less frequent for influenza and pneumococcal immunizations and survey results showed that neither group of providers followed published recommendations for adults. Only 60% of physicians and 56% of the PA/NP/RN group stated that they used official guidelines as their source of information about adult immunizations. Most health care providers had systems in place to assure that patients got recommended vaccines while only approximately 33% actually audited rates of vaccination.

Providers were questioned about why patients might not receive tetanus, influenza, and pneumococcal immunizations.[15] Common reasons offered were failure

of patients to come in for regular well-care visits, concern about vaccine side effects, and lack of an effective reminder system in the practice. Over 50% of health care professionals acknowledged that they did not always remind patients of the consequences of missing vaccinations. The PA/NP/RN providers were significantly more likely to routinely talk to patients about the consequences of missing tetanus, influenza, and pneumococcal vaccinations.

In the U.S. pneumonia and influenza are major causes of death in the elderly. It has been estimated that the pneumococcal polysaccharide vaccine (PPV) and the influenza vaccine prevent thousands of deaths each year and yet vaccination rates in 2002 among adults 65 years and older for PPV and influenza vaccine were 55% and 66%, respectively.[9] Vaccinations rates for Hispanic and African Americans were even lower. A study from the University of Pittsburg by Nowalk et al.[16] identified patient beliefs, facilitators, and barriers to PPV and influenza vaccinations in elderly patients across a range of socioeconomic levels. This study was conducted by telephone interview of patients 66 years and older from the metropolitan Pittsburg area and included patients from several inner city clinics and suburban practices.

A total of 557 participants completed the interviews with regard to the PPV vaccination.[16] Seventy percent of respondents reported receiving this vaccine but there were significant differences by race, practice location, marital status, and physician recommended vaccination. Whites were more likely to have received PPV than African Americans (74% versus 57%, p=.005). Widowed individuals, when compared to other marital categories, were more likely to be vaccinated (76% vs 73% married, 53% single, and 50% divorced, p=.0008). A high proportion (87%) of those vaccinated reported that someone in their doctors' offices recommended PPV compared with 24% of the unvaccinated (p=.0002). Additional questions were asked to assess barriers and facilitators to vaccination. Receipt of PPV was associated with the perception that obtaining the vaccine was wise, a willingness to be given PPV at the same time as the influenza vaccination, and a specific physician recommendation. In logistic regression analyses, a doctor's recommendation for PPV was significantly related to pneumococcal vaccination status [OR, 95% CI, 4.9[0.6-42.6)], p=<.001).

Seventy-six percent of respondents were vaccinated against influenza with a greater proportion from suburban (81%) than from inner-city practices (71%; p=.006). Married persons were more likely to have received influenza vaccine than those in other marital categories (83% vs 73% widowed, 66% single, 62% divorced/separated; p<.05). More men than women (81% vs 73%; p=.03), and more whites than blacks (79% vs 61%; p=.003) were vaccinated against influenza. Individuals with incomes >$40,000 (88%) and those attending vocational or technical school (94%) had high rates of vaccination. Beliefs and attitudes found in the survey indicated that vaccinees were more likely to report that their doctor, family and/or friends recommended vaccination and they were also more likely to receive PPV if they received influenza vaccine at the same visit. Factors preventing immunization were faulty recall by the patient and failure of the physician to discuss vaccination with their patients.

Pneumococcal disease continues to cause severe illness in the elderly and in those with underlying medical conditions.[17] Despite prompt antibiotic treatment the mortality varies from 15% to 40% depending on risk factors. Therefore, it is very surprising that although the 23 valent PPV has 56% to 81% efficacy preventing invasive disease, vaccination rates continue to be 60% or less for those older than 65 years. Because 36% to 70% of patients hospitalized for pneumococcal bacteremia have been patients in the same institution during the previous five years, PPV vaccination during hospitalization as institutional policy has been a way of improving immunization rates.

Experience at Veterans' Affairs institutions has found that a Standing Orders Program (SOP) that allows clinical personnel such as nurses and pharmacists to vaccinate inpatients with PPV without a specific physician's order can improve vaccination rates in this at risk population.[17] In 2003 hospitals that were part of the University of Pittsburg Medical Center Health System initiated such institutional policies for PPV. Over the next 24 months medical personnel encountered a number of barriers to the implementation of the vaccination SOPs. Middleton and colleagues[18] identified these impediments and provided recommendations for overcoming these barriers. They found barriers related to patients, providers, and institutions. The major patient barriers were inaccurate PPV history, and patient/family concerns about safety and the actual need for vaccination. Providers' barriers included fear of increased workload, lack of information about the institutional policy, reluctance of staff to administer a vaccine without a physician order, attending physician resistance to vaccination, and PPV not being available after hours. Institutional barriers included inertia, cost-benefit questions, and determining the PPV status of hospitalized patients. Their recommendations for increasing the effectiveness of these vaccination policies included institution-wide education about the importance of PPV in high risk populations, collecting accurate information

Table 1
Recommendations for Improving Vaccination Among Adults

1. Education of potential vaccine recipients
2. Publicity promoting vaccines
3. Increased access to vaccination services such as workplaces, pharmacies
4. Reminder-recall systems and internal audits of practice vaccination rates
5. Standing order programs
6. Audit vaccination rates in practices
7. Health-care provider recommendation to patients
8. Routine assessment of vaccinations incorporated into clinical practice
9. Medical office staff trained to routinely assess vaccination needs of patients

Table 2
Recommendations for Improving Vaccination Rates Among Children

1. Increase knowledge about importance of vaccination for disease prevention
2. Stay up-to-date on latest vaccination recommendations
3. Become familiar with new vaccines
4. Assure office staff are friendly and supportive of families and encourage vaccination at every opportunity, including mild illness visits
5. Reminder/recall systems for patients, families and providers
6. Reduce out-of-pocket costs
7. Standing orders for immunizations
8. Assessment of immunization rates for individual providers

about PPV status at admission, education of staff, patients and families about the safety of vaccination, continuous education of new medical staff about the vaccination policy, and designated champions at each institution to continuously and effectively promote the vaccination program.

Conclusion

The successful prevention of severe infectious diseases by vaccination is without question. Despite this success, there is room for improvement among adults and children. Coverage rates for pneumococcal and influenza vaccines are substantially below the Healthy People targets of 90%.[19, 20] Recommendations for improving vaccines rates among adults are shown in Table 1. Recommendations for maintaining and improving vaccination rates among young children are shown in Table 2. The Center for Vaccine Development at Saint Louis University of Medicine has been involved in vaccine research for over 20 years. The work, involving a collaboration of experienced and dedicated physicians, basic researchers, nurses, laboratory, and support staff, has contributed greatly to the development of new vaccines and developing the basic science necessary for vaccines of the future. Additional research seeking to determine how to accomplish the optimal vaccination coverage of targeted populations must also continue.

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Disclosure

None reported.

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