

Immunization 1967–2006: Implementation Keeping Pace with Invention?

John D Grabenstein

The good news: Science has provided dozens of vaccines that can be used to prevent dangerous infections. The challenge: Millions of Americans of all ages are still susceptible to these infections because they have not been vaccinated. Are the inventors working harder than the clinicians? Not really. But *The Annals'* 40th anniversary provides a good time to reflect on how the state of immunization has advanced during the previous 4 decades.

See also *Ann Pharmacother* 2006;40:2247.
DOI 10.1345/aph.140051

Parents of a child born in 1967 in the US could fulfill the national immunization recommendations in a few visits. Well-baby visits at 2, 4, and 6 months of age delivered diphtheria/tetanus/pertussis and oral poliovirus vaccines. In the second year of life, a dose of measles vaccine was given. Routine childhood smallpox vaccination was waning in 1967, to be discontinued a few years later.¹

However, the next 4 decades saw a gradual accumulation of vaccines to vanquish microbes, averaging about 2 new preventable diseases per decade. The late 1960s brought live-virus vaccines against mumps and rubella. The 1970s introduced meningococcal and pneumococcal polysaccharide vaccines. In the 1980s, it was hepatitis B and *Haemophilus influenzae* type b. Hepatitis A and varicella were the pair for the 1990s. More recently, the pace is quickening, with protein-conjugated vaccines superseding their polysaccharide predecessors. And 2006 set a record, with the licensing of rotavirus, human papillomavirus, and zoster vaccines within a few months of each other.¹

Today, the childhood immunization schedule is much more complicated, which is a good thing. In 1967, vaccines protected children against 5 diseases. But today, children are shielded against 15 dangerous diseases. In 1967, 11 vaccine doses were given by entry into first grade. Today, it takes up to 30 doses to complete the schedule by that age. Fortunately, combination vaccines can reduce the number of injections and office visits. Even so, preschoolers live in a relatively simple world. Parents routinely schedule well-child visits for their loved ones. Public health officials envy this focus on prevention, before acute care becomes necessary, wishing that they could reach adolescents and adults with the same degree of success.

Adolescent immunization was largely unheard of in 1967. Today, valuable vaccines to protect against hepatitis B, meningococcal disease, papillomavirus, pertussis, and other infections are licensed, but just beginning to be widely used. These vaccines have potential value when they sit in a refrigerator and, of course, have actual value only when administered to a patient.

Adult immunization in 1967 concentrated on booster doses of tetanus-diphtheria toxoids. Influenza vaccine was administered to military personnel and relatively few others. Military personnel and people traveling overseas received "exotic" vaccines (eg, yellow fever). Rabies vaccine was available in emergencies. Today, annual routine influenza immunization reaches approximately 70% of the elderly, with pneumococcal vaccine coverage at about 64% for this population.^{2,3} The remainder are vulnerable.

Some population segments are more likely to be at risk of infectious disease. Immunization needs of African American adults are greater than for other ethnic groups. Large portions of the people we serve who are younger than 65 and have chronic diseases will need to be vaccinated if the US is to reach its Healthy People 2010 goals of 60% for these vaccines.

Ann Pharmacother 2007;41:119-20.
Published Online, 5 Dec 2006, www.theannals.com
DOI 10.1345/aph.1H476
Author information provided at the end of the text.

Millions of elderly people have not been encouraged to get influenza and pneumococcal vaccines.^{2,3} Tens of millions of adolescents (and their parents) need to be informed about the new vaccines that can save their lives. Although childhood immunization rates reach 95% at entry into grade school, the rates sag to 80% among preschoolers.^{4,5} Tens of millions of children need to be brought up to date today, while they are most susceptible, rather than later, when it is administratively convenient.

What good is it for inventors to invent life-saving, life-protecting vaccines if millions of people go unvaccinated? Today, too many clinicians are caught up in the acuity of the present illness and overlook vital preventive measures. Likewise, reimbursement dynamics still favor therapy over prevention. The only way our patients get access to vaccines is through licensed professionals; vaccines are not over-the-counter drugs. Our patients depend on their clinicians to provide the vaccines that will keep them healthy. How much time do you devote to preventing infections?

Fortunately, vaccines are available in more locations today than ever before. In the 1960s, pharmacy's involvement included little more than putting up posters to encourage people to be vaccinated against poliomyelitis and measles by physicians or in health clinics. But in the last decade, pharmacies have hosted millions of adult immunizations. Over 25 000 pharmacists have been trained to perform vaccinations without diverting adults from other sources of immunization.⁶⁻⁹ In other words, pharmacists have not been vaccinating people who used to be in the physician "slice of the pie." Instead, pharmacists have been converting people from the unvaccinated slice into the vaccinated slice.

Unfortunately, pharmacists are too heavily focused on influenza vaccine. The next stage for pharmacy's development as a vaccine provider should involve offering more vaccines to more categories of people on more days of the year. Curiously, pharmacy's main contributions to the public health have been in the ambulatory sector rather than among inpatients. But all pharmacists who serve patients need to attend to their patients' vaccine needs instead of simply selecting optimal antibiotics. As just one example, pharmacists who specialize in cardiology or diabetes are well positioned to prevent infections among their patients. Once an infection is underway, the chance to prevent it has obviously been squandered.

The same prescription for progress could be offered to other clinicians. If the US wants to control cervical cancer, shingles, pertussis, meningococcal meningitis, invasive pneumococcal disease, and other infections that still plague the population, a wider menu of vaccines needs to be available in more settings at more convenient times. This means that practitioners (including more pharmacists) must routinely offer vaccines to both adolescents and adults. The best preventive services are local.

In 1967, average Americans probably feared contagious diseases more than they do today. Memories of smallpox, tuberculosis, and poliomyelitis were fresher at that time compared with today. Although public doubts about vaccine safety are expressed in a louder voice today than in earlier times, recent scientific work and public advocacy together have yielded the safest vaccines ever known, with more objective evidence than ever confirming the safety profile of these vaccines.

In addition, our understanding of immunology and molecular biology is far more sophisticated today than in 1967. Recent basic research promises yet more sophisticated applied research in the near future. Even so, we must be humble. The development of vaccines for the prevention of malaria, tuberculosis, HIV, and many other infectious killers still eludes us. On the other hand, we may soon see vaccines reach beyond their infectious disease roots when they can be used to treat cancers, nicotine dependence, or other conditions.

Nonetheless, we can be confident that inventors will continue to invent valuable new vaccines. Will clinicians take up the challenge to protect each of their adolescent and adult patients, offering more vaccines more often, by taking on prevention as a personal mission? I am confident that they will.

John D Grabenstein BSP Pharm PhD FAPhA FASHP, Senior Director, Scientific Affairs, Merck Vaccine Division, WP97-A261, 770 Sumneytown Pike, West Point, PA 19486-0004, fax 215/993-1848, john_grabenstein@merck.com

Reprints: Dr. Grabenstein

References

1. Grabenstein JD. *ImmunoFacts: vaccines & immunologic drugs 2007*. St. Louis: Wolters Kluwer Health, 2006.
2. Influenza vaccination levels among persons aged >65 years and among persons aged 18–64 years with high-risk conditions—United States, 2003. *MMWR Morb Mortal Wkly Rep* 2005;54:1045-9.
3. Influenza and pneumococcal vaccination coverage among persons aged >65 years and persons aged 18–64 years with diabetes or asthma—United States, 2003. *MMWR Morb Mortal Wkly Rep* 2004;53:1007-12.
4. National, state, and urban area vaccination coverage among children aged 19–35 months—United States, 2004. *MMWR Morb Mortal Wkly Rep* 2005;54:717-21.
5. Vaccination coverage among children entering school—United States, 2003–04 school year. *MMWR Morb Mortal Wkly Rep* 2004;53:1041-4.
6. Grabenstein JD. Pharmacists and immunization: increasing involvement over a century. *Pharm Hist* 1999;41:137-52.
7. Grabenstein JD, Guess HA, Hartzema AG, Koch GG, Konrad TR. Effect of vaccination by community pharmacists among adult prescription recipients. *Med Care* 2001;39:340-8.
8. Grabenstein JD, Guess HA, Hartzema AG, Koch GG, Konrad TR. Attitudinal factors among adult prescription recipients associated with choice of where to be vaccinated. *J Clin Epidemiol* 2002;55:279-84.
9. Hogue MD, Grabenstein JD, Foster S, Rothholz M. Pharmacist-administered immunizations: a decade of professional advancement. *J Am Pharm Assoc* 2006;46:168-82. Erratum 308.