

Immunization and the Prevention of Influenza and Pneumococcal Disease in People With Diabetes

AMERICAN DIABETES ASSOCIATION

RATIONALE FOR IMMUNIZATION

— The rationale for the use of influenza and pneumococcal vaccine in patients with diabetes is reviewed in the American Diabetes Association technical review “Use of Influenza and Pneumococcal Vaccine in People with Diabetes” (1) and can be summarized as follows:

- Patients with diabetes may have abnormalities in immune function and presumed increased morbidity and mortality from infection.
- Epidemiological studies support the fact that patients with diabetes (in particular those with end organ complications of cardiac and renal disease) are at high risk for complications, hospitalization, and death from influenza and pneumococcal disease.
- There is sufficient evidence that people with diabetes generally have appropriate humoral immune responses to vaccination.
- There are few clinical trials of vaccine efficacy specifically in patients with diabetes.
- Subgroup analysis of patients with diabetes reported in clinical narrative and case-control studies support the fact that vaccination against influenza has been effective in reducing hospital admissions during influenza epidemics.
- Although the question of the efficacy of pneumococcal vaccination in preventing nonbacteremic disease remains unresolved, many studies have shown that the vaccine is effective in reducing life-threatening bacteremic disease.

- Immunization against influenza and pneumococcal disease is an important part of preventive services for many chronic diseases such as diabetes.

According to the Advisory Committee on Immunization Practices (ACIP), the American College of Physicians, the American Academy of Pediatrics, and the American Academy of Family Physicians, vaccinating individuals at high risk before influenza season each year is the most effective measure for reducing the impact of influenza (2). The effective implementation of immunization can reduce the cost of human suffering and health care expenditures in people with diabetes.

The recommendations that follow are based in large part on observational studies with high potential for bias. The narrative review (1) supports expert opinion that immunization intervention is low risk, is low cost, and may have a moderate to substantial impact on the care of people with diabetes.

INFLUENZA

VACCINATION — Consistent with the recommendations of the ACIP, the influenza vaccine should be recommended for patients with diabetes, age ≥ 6 months, beginning each September (2). It is strongly suggested that specific systematic intervention strategies be considered for patients with diabetes who are >64 years of age, residents of nursing homes or other chronic care facilities, require regular medical follow-up or hospitalization, or have additional secondary chronic disorders of

the cardiopulmonary system. Intramuscular dosage and type of influenza vaccine (split or whole virus) vary based on the patient's age (2).

Each year, a trivalent vaccine is constituted with strains of influenza A and B, which are most likely to circulate in the U.S. during the winter. Because the vaccine consists of egg-grown viruses, it should not be administered to individuals known to have anaphylactic hypersensitivity to chicken eggs or additional components of the influenza vaccine. Because immunity from influenza vaccination declines in the year after vaccination, yearly vaccination is recommended. Although antibody responses to repeat immunization have been reported to be greater in some people with diabetes, repeated immunization within the same season is not recommended (3). The ACIP does recommend two doses of influenza vaccine administered at least 1 month apart (the last administered before December) for children <9 years of age who have never been vaccinated (2).

Because infection with influenza virus can be transmitted from person to person, vaccination of health care workers and family of patients with diabetes may be justified. Influenza is a universal illness occurring throughout the year in the tropics and primarily from April to September in the Southern Hemisphere (2). Patients traveling to these areas should consider influenza vaccination before travel.

The influenza vaccine contains only noninfectious viruses and cannot cause influenza or other respiratory disease. The side effect most frequently experienced from vaccination is mild soreness at the vaccination site. In individuals with chicken egg allergy, immediate allergic reactions have been reported. In these patients, chemoprophylaxis with amantadine/rimantadine or immunization using a protocol as reported by Murphy and Strunk (4) should be considered. A recent

The recommendations in this paper are based on the evidence reviewed in the following publication: Smith SA, Poland GA: Use of influenza and pneumococcal vaccines in people with diabetes (Technical Review). *Diabetes Care* 23:95–108, 2000.

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Abbreviations: ACIP, Advisory Committee on Immunization Practices.

study reported a slight increased risk of Guillain-Barré syndrome in the 6 weeks after influenza vaccination during the 1992–1993 and 1993–1994 flu seasons (5). For this reason, it is recommended not to administer the influenza vaccine to individuals known to have developed Guillain-Barré syndrome within 6 weeks of a previous influenza vaccination.

PNEUMOCOCCAL

IMMUNIZATION — The current pneumococcal vaccine includes 23 purified capsular polysaccharide antigens representing 85–90% of the serotypes of *Streptococcus pneumoniae* that cause invasive pneumococcal infections among children and adults in the U.S. (6). People with diabetes are susceptible to pneumococcal infection and are at increased risk for the morbidity and mortality of bacteremia from this organism (1). Additional risk is associated with being age ≥ 65 years and having chronic cardiovascular, pulmonary, and renal disease.

According to the ACIP, pneumococcal vaccination is indicated to reduce invasive disease from pneumococcus in people with diabetes (6). Special efforts in implementation strategies for immunization should include the same target groups as for influenza. Additional emphasis has been suggested for Native American groups who have a high incidence of diabetes and invasive pneumococcal disease (7,8). There is insufficient evidence to support revaccination of people with diabetes unless other special circumstances exist.

A one-time revaccination is recommended for individuals >64 years of age previously immunized when they were <65 years of age if the vaccine was administered more than 5 years ago. Other indications for repeat vaccination potentially relevant to patients with diabetes include nephrotic syndrome, chronic renal disease, and other immunocompromised states, such as post-organ transplantation (6).

Approximately one-third to one-half of individuals receiving pneumococcal vaccine develop mild local side effects similar to influenza (lasting <48 h). Severe local or systemic reactions are rare, and neurologic syndromes such as Guillain-Barré syndrome have not been causally associated with pneumococcal vaccine administration (6). Pneumococcal vaccine may be administered with other vaccines (by a separate injection in another anatomic site) without an increase in side effects or decrease in efficacy.

IMMUNIZATION

STRATEGIES — Effective immunization strategies have combined education for health care workers with publicity and education targeted toward recipients. In addition, a plan for identifying a likely point of encounter and minimizing administrative and financial barriers for the patient appears to be the most successful strategy. Studies suggest that staff empowerment is very effective in increasing vaccination rates (9–12). In addition, tracking systems and record keeping are essential in successful programs (13–19).

While there have been initiatives to increase immunization rates, the Healthy People 2000 goals for the public are not consistently being reached (20,21). This appears to be especially true for people with diabetes, particularly those <65 years of age. A major barrier to immunization at a national level includes the lack of vaccine delivery systems in all aspects of the public and private sectors. Hospitalization is a marker for patients at increased risk for pneumococcal and influenza disease and its complications (22–24) and is an opportunity for national efforts in immunization strategies at the time of discharge. In addition, there needs to be continued support of proven community-based implementation strategies, particularly strategies that target the underserved (20,21).

Specific strategies for those patients with diabetes cared for by a health system could include the following:

- Educate staff/patients to increase the awareness of the risks of influenza and pneumococcal disease among people with diabetes and the efficacy of vaccine in reducing disease.
- Educate staff/patients to reduce the fears and misperceptions concerning adverse events associated with vaccination.
- Create a diabetes registry, systematic tracking system, and effective reminder system as part of a successful implementation strategy (13–19).
- Health care providers in episodic or acute care settings should offer vaccination to all individuals with diabetes. If vaccine is not available at the clinical point of encounter, then written information on the reasons for immunization and how to obtain the vaccine should be provided.
- Empower staff (to include the medical and administrative health care team) to identify people with diabetes. This

empowerment could include a standing order to offer vaccination to all patients with diabetes during their outpatient visits (especially during the fall), with minimal waiting time and at the lowest possible cost.

- During the fall, notify those individuals with diabetes without appointments (via mail, telephone, e-mail, etc.) of the need for vaccination.
- Empower staff to offer vaccination to residents of nursing homes and other residential care settings and to those hospitalized (in particular from September to March). Special consideration should be given for influenza vaccination of relatives, friends, and others who will have contact with the patient(s) with diabetes.

CONSIDERATIONS FOR EFFECTIVE IMMUNIZATION PROGRAMS FOR PATIENTS WITH DIABETES

— Successful implementation of chronic disease management is complex and requires a team approach by the provider, patient, and health system. This complexity can be overwhelming for the team (both in terms of data collection and implementation), as health systems attempt to respond to the many benchmarking standards requested from such groups as the Diabetes Quality Improvement Project and the American Diabetes Association/National Committee on Quality Assurance Provider Recognition Program. Equally overwhelming for the patient is the interpretation of the information reported by benchmarking organizations.

Despite national goals, immunization rates for targeted at-risk patient groups (to include patients with diabetes) remain low, and the burden of vaccine-preventable disease remains high. National efforts in support of diabetes disease management should help to build the necessary infrastructure within health systems to allow for effective data collection, implementation, and reporting of immunization rates. As an alternative to merely requesting reports on multiple performance indicators, a national effort to improve immunization rates could begin with a systematic approach in support of chronic disease management strategies that have proven efficacy. Successful immunization strategies for people with diabetes could be considered a model for 1) health systems to develop the infrastructure in support of the health care team in chronic disease management, 2) bench-

marking organizations to understand how the process of requesting data on health system performance can support the development of the necessary infrastructure in chronic disease management, and 3) national health care initiatives that have immediate short-term rewards of reducing the cost of disease and long-term implications of health services delivery and research.

CONCLUSIONS — Influenza and pneumococcal immunization in patients with diabetes has the potential for significant reduction in morbidity and mortality related to influenza and pneumococcal disease. Effective immunization strategies will require implementation strategies that are multidimensional and target the patient, provider, support staff/family/friends, and health system. The goal should be to immunize all patients with diabetes, particularly those with complicating factors such as cardiac or renal disease or those who are or have been recently hospitalized. The Healthy People 2000 public health goals include a minimum target goal for influenza and pneumococcal immunization of 60% for all people with diabetes. Targeted educational interventions using immunization opportunities and staff empowerment are all effective clinical strategies.

Identification of patients, creation of registries, and effective recall and reminder systems have all proven efficient in improving immunization rates.

Benchmarking organizations and national policy should emphasize guideline implementation strategies for improving immunization rates as one of the initial efforts in chronic disease management. Lastly, organizational strategies for immunization of patients with diabetes could serve as a model for national efforts in chronic disease management.

References

- Smith SA, Poland GA: The use of influenza and pneumococcal vaccines in people with diabetes (Technical Review). *Diabetes Care* 23:95–108, 2000
- Advisory Committee on Immunization Practices (ACIP): Prevention and control of influenza: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 46 (No. RR-9):1–25, 1997
- Gross PA, Weksler ME, Quinnan GV Jr, Douglas RG Jr, Gaerlan PF, Denning CR: Immunization of elderly people with two doses of influenza vaccine. *J Clin Microbiol* 25:1763–1765, 1987
- Murphy KR, Strunk RC: Safe administration of influenza vaccine in asthmatic children hypersensitive to egg proteins. *J Pediatr* 106:931–933, 1985
- Lasky T, Terracciano GJ, Magder L, Koski CL, Ballesteros M, Nash D, Clark S, Haber P, Stolley PD, Schonberger LB, Chen RT: The Guillain-Barre syndrome and the 1992–1993 and 1993–1994 influenza vaccines. *N Engl J Med* 339:1797–1802, 1998
- Advisory Committee on Immunization Practices (ACIP): Prevention of pneumococcal disease: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 46 (No. RR-8):1–25, 1997
- Davidson M, Parkinson AJ, Bulkow LR, Fitzgerald MA, Peters HV, Parks DJ: The epidemiology of invasive pneumococcal disease in Alaska, 1986–1990: ethnic differences and opportunities for prevention. *J Infect Dis* 170:368–376, 1994
- Cortese MM, Wolff M, Almedio-Hill J, Reid R, Ketcham J, Santoshain M: High incidence rates of invasive pneumococcal disease in the White Mountain Apache population. *Arch Intern Med* 152:2277–2282, 1992
- Gyorkos TW, Tannenbaum TN, Abrahamowicz M, Bedard L, Carsley J, Franco E, Delage G, Miller MA, Camping DL, Grover SA: Evaluation of the effectiveness of immunization delivery methods. *Can J Public Health* 85:S14–S30, 1994
- Crouse BJ, Nichol K, Peterson DC, Grimm MB: Hospital-based strategies for improving influenza vaccination rates. *J Fam Pract* 38:258–261, 1994
- Klein RS, Adachi N: An effective hospital-based pneumococcal immunization program. *Arch Intern Med* 146:327–329, 1986
- CDC: Increasing pneumococcal vaccination rates: United States. *MMWR* 44:741–744, 1993
- Hershey CO, Karuza J: Assessment of preventive health care: design considerations. *Prev Med* 26:59–67, 1997
- Buffington J, Bell KM, LaForce FM: A target-based model for increasing influenza immunizations in private practice. *J Gen Intern Med* 6:204–209, 1991
- Cheney C, Ramsdell JW: Effect of medical records' checklists on implementation of periodic health measures. *Am J Med* 83:129–136, 1987
- Cohen DI, Littenberg B, Wetzel C, Neuhauser D: Improving physician compliance with preventive medicine guidelines. *Med Care* 20:1040–1045, 1982
- Clancy CM, Gelfman D, Poses RM: A strategy to improve the utilization of pneumococcal vaccine. *J Gen Intern Med* 7:14–18, 1992
- Barton MB, Schoenbaum SC: Improving influenza vaccination performance in an HMO setting: the use of computer-generated reminders and peer comparison feedback. *Am J Public Health* 80:534–536, 1990
- Klachko DM, Wright DL, Gardner DW: Effect of a microcomputer-based registry on adult immunizations. *J Fam Pract* 29:169–172, 1989
- U.S. Department of Health and Human Services: Healthy People 2000: National Health Promotion and Disease Prevention Objectives. Washington, DC, Public Health Service, 1991
- CDC: Influenza and pneumococcal vaccination levels among adults aged >65 years: United States, 1997. *MMWR* 47:797–802, 1998
- Fedson DS: Improving the use of pneumococcal vaccine through a strategy of hospital-based immunization: a review of its rationale and implications. *J Am Geriatr Soc* 33:142–150, 1985
- Fedson DS, Harward MP, Reid RA, Kaiser DL: Hospital-based pneumococcal immunization: epidemiologic rationale from the Shenandoah Study. *JAMA* 264:1117–1122, 1990
- Barker WH, Mullooly JP: Pneumonia and influenza death during epidemics: implications for prevention. *Arch Intern Med* 142:85–89, 1992