Preparing for Pandemic Influenza: The Need for Enhanced Surveillance

Epidemic influenza, an age-old infectious disease, kills approximately 20,000 men and women in the United States every year. The emergence of influenza viruses bearing novel surface antigens in 1918 (A/H1N1), 1957 (A/H2N2), and 1968 (A/H3N2) led to three worldwide pandemics of disease and more than 600,000 deaths in the United States. During the influenza pandemic of 1918-19, 500,000 deaths were reported, with persons younger than 65 years of age accounting for 99% of all influenza-related deaths (1).

Because it establishes the scientific foundation for a public health response, surveillance is the single most important tool for identifying new or reemerging infectious diseases with potential to cause serious public health problems. Surveillance can be useful in rapidly identifying and monitoring persons at highest risk, changes in disease rates, modes of transmission, and groups at risk. Surveillance can help in planning and evaluating disease prevention and control programs and can improve capacity to control annual epidemics as well as the next influenza pandemic. The outbreak of human infection with H5N1 (avian) influenza in Hong Kong in 1997 highlighted the potential of new and lethal pathogens to emerge unexpectedly and questioned the capacity of local and state health agencies to expand surveillance activities in response to a possible pandemic influenza strain.

In 1993, a Working Group on Influenza Pandemic Preparedness and Emergency Response (GrIPPE), which included influenza experts from the public and private sectors, began to develop an updated, comprehensive blueprint for an action plan for pandemic influenza for the United States (2). GrIPPE identified surveillance as a key component of the pandemic plan. The group has also recognized that to effectively address the threat of an influenza pandemic, measures to reduce the impact of influenza must be in place and operational at the state and local level now, during the prepandemic period. Because more influenza-related illness and death occur in the aggregate during regularly recurring influenza epidemics than during the pandemics themselves, GrIPPE has attempted to link its plan to other relevant public health initiatives such as those related to emerging infections and adult immunization.

In 1994, the Council of State and Territorial Epidemiologists (CSTE) was asked by GrIPPE to participate in the national pandemic influenza planning process. As part of this effort, CSTE conducted a survey of state epidemiologists in March 1995 to assess current influenza surveillance systems; all 50 states and the District of Columbia responded. Questions sought to determine the source and type of illness reports received, the type of virologic surveillance activities performed, the state's perceived preparedness for a pandemic, obstacles in detecting a new pandemic strain, the need for a pandemic plan specific to the state's jurisdiction, whether more influenza surveillance would be conducted if additional resources were made available, and how much increased surveillance would cost.

All 51 respondents reported at least one source of influenza surveillance information, and 39 (77%) identified sentinel physicians as the primary source of disease reports. Forty-eight (94%) states had the capability, through some private or public health laboratory, to identify influenza viruses isolated in tissue culture. Of 47 laboratories that indicated to what degree they could characterize influenza viruses, 37 (79%) could subtype the viruses, while 10 (21%) could identify viruses only as influenza A or B. Another 1995 survey by the Association of State and Territorial Public Health Laboratory Directors of its membership was more specific in defining influenza virologic resources available at each state's public health laboratory, with 10 (20%) states indicating no state public health laboratory capacity to isolate viruses and 13 (25%) state public laboratories reporting no ability to subtype influenza isolates (A. Di Salvo, pers. comm.).

In the CSTE survey, 34 (67%) states responded that their laboratory surveillance system would be adequate to detect a new pandemic virus, with 29 (57%) states indicating that their disease surveillance system would be adequate. Among the reasons given for the difficulty in detecting a new pandemic strain were inadequate financial resources (20 [83%]), inadequate personnel (19 [79%]), and low disease priority (10 [42%]).

Only 29 (59%) states reported that an influenza pandemic plan specific for their jurisdiction was needed. Reasons for not developing a state pandemic plan included lack of resources 4 (31%), insufficient interest 4 (31%), and the perception that pandemic influenza did not pose an immediate threat 3 (23%). However, if targeted resources were made available, 44 (86%) respondents indicated that they would increase laboratory surveillance for influenza, and 39 (76%) indicated they would increase disease surveillance activities. The estimates provided for increasing surveillance activities were $2,000 to $100,000 (mean $37,602) for laboratory surveillance and $2,000 to $100,000 (mean $40,914) for disease surveillance.

In the United States, public health services (including surveillance) are provided most directly by municipal, county, and state health departments, or a combination of all three. The 1995 CSTE survey found that many states lacked surveillance activities dedicated to influenza; however, many states would expand virologic and disease-based surveillance systems if nominal resources were made available, despite the lack of urgency given to any pandemic planning effort at the state level.

Several efforts have been undertaken at the national level to respond to the states' needs and to promote enhanced preparedness for pandemic influenza. A Pandemic Influenza Planning Guide for State and Local Health Officials was developed as a result of these efforts. The guide provides a checklist or set of guidelines for states to develop their own pandemic plan. A draft guide was pilot-tested in six sites during February-March 1998.

The surveillance component of the planning guide calls for enhancements in virologic and disease-based surveillance and improvements in surveillance information systems. Specifically, the planning guide recommends that during the prepandemic period 1) virologic surveillance capability be improved by ensuring that at least one laboratory in each state or major metropolitan area can isolate and subtype influenza viruses; 2) disease-based surveillance capability be improved by expanding the existing sentinel physician network, with the aim of establishing a population-based system of approximately one sentinel physician per 250,000 population; 3) contingency plans be developed for enhancing state and local virologic and disease-based surveillance systems in the event of a novel virus alert or pandemic alert; and 4) electronic and telecommunications capability with neighboring jurisdictions and with the Centers for Disease Control and Prevention (CDC) be enhanced.

Because the antigenic properties of influenza viruses change constantly, surveillance to monitor the changes and their impact is necessary. One type of surveillance information without the other is of limited value.

Although a disease-based surveillance system for influenza is in place in the United States, the system is in jeopardy because of the misperception that influenza is no longer an important public health problem and because of continued erosion of resources supporting the public health infrastructure at the state and local levels. Moreover, influenza surveillance is compromised because influenza is not a nationally notifiable disease.

One component of the existing surveillance system is weekly reports to CDC's national notifiable disease system from each state epidemiologist designating the level of influenza activity during the preceding week. Levels of estimated activity are reported as widespread, regional, sporadic, or nonexistent. The validity of these estimates has long been questioned, since they may primarily reflect local interest or availability of resources. Data on associated disease incidence are only rarely collected.

Many states lack the financial resources for influenza virologic surveillance, which is critical for monitoring antigenic drift and shift of influenza viruses circulating among humans and is the basis for each year's vaccine formulation. State public health laboratories that perform virologic surveillance have a continuing need to culture and characterize isolates on a timely basis. Submissions of specimens for virus isolation are expected to decrease as rapid antigen test kits are improved and become more widely available. Having fewer isolates for characterization is a potential public health problem.

The demands of pandemic planning have prompted CDC and CSTE to begin changing influenza surveillance. The premise of changes is that a solid surveillance infrastructure must be in existence during the prepandemic period. Disease- and laboratory-based surveillance is being reinforced and other databases are explored as potential sources of additional qualitative or quantitative data. Efforts are under way to upgrade the sentinel physician network by enlisting and retraining more participants, integrating influenza reporting with other state-based systems, standardizing reporting procedures, and developing a semiautomated data management system to provide rapid feedback. Twenty-eight states and the District of Columbia pilot-tested steps to revise the existing sentinel physician surveillance system during the 1997-98 influenza season. One benefit of such efforts may be to increase the public's, medical providers', and public health practitioners' understanding of influenza as a potentially preventable disease.

A national plan is an important first step in highlighting the public health problem posed by influenza and the need to identify ways in which the federal, state, and local public health community can combine efforts to address the problem.

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