

Chapter 19: Enhancing Surveillance

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I. Surveillance Activities

Surveillance activities are critical to detecting vaccine-preventable diseases and gaining information to help control or address a problem. However, complete and accurate reporting of cases is dependent on many factors, such as reporting source, timeliness of investigation, and completeness of data. In addition, various methods for conducting surveillance are used to collect information, depending on disease incidence, specificity of clinical presentation, available laboratory testing, control strategies, public health goals, and the stage of the vaccination program. For vaccine-preventable diseases, passive surveillance is the most common method, although active surveillance may be needed in special surveillance situations. Active surveillance is often short-term and usually requires more funding than passive surveillance.

Common systems used for disease surveillance include national notifiable disease reporting; physician, hospital, or laboratory-based sentinel surveillance; and population-based surveillance.¹ Sentinel surveillance involves a limited number of recruited participants, such as healthcare providers or hospitals, who report specified health events that may be generalizable to the whole population.²

The National Notifiable Diseases Surveillance System (NNDSS)³ is a passive surveillance system that includes all the diseases and conditions under national surveillance. Efforts are being made to integrate and enhance surveillance systems for national notifiable diseases. The Centers for Disease Control and Prevention (CDC) and state and local health departments are collaborating to enhance surveillance system capabilities with the focus on development of harmonized messages supported by interoperable standards (e.g., PHIN, LOINC, SNOMED) and shared services rather than specific electronic systems. Electronic reporting, case notification, data management, and analysis can provide timely access to the demographic, epidemiologic, laboratory, and other public health data for information on each case notification in NNDSS.

Enhancing the surveillance system is only one part of improving surveillance data; data for notifiable diseases are still dependent on reporting, timeliness, and completeness. This chapter outlines activities that may be useful at the state and local levels to improve reporting for vaccine-preventable diseases. Some are recommended for routine use (encouraging provider reporting), while others, such as searching laboratory or hospital records, may be most helpful under specific circumstances.

II. Encouraging Provider Reporting

Most infectious disease surveillance systems rely on receipt of case reports from healthcare providers and laboratories.^{4,5} These data may not be complete and may not be representative of certain populations; completeness of reporting has been estimated to vary from 6% to 90% for many common notifiable diseases.⁶ However, when the level of completeness is consistent, these data provide an important source of information regarding disease trends and characteristics of the persons affected. Some mechanisms to encourage healthcare provider reporting are described here.

Promoting awareness of the occurrence of vaccine-preventable diseases

Some healthcare providers may be particularly likely to encounter patients with vaccine-preventable diseases. For example, they may see immigrants and travelers returning from areas where vaccine-preventable diseases are endemic.

Promoting awareness of reporting requirements

Although there is a list of diseases designated as nationally notifiable by the Council of State and Territorial Epidemiologists (CSTE) in conjunction with CDC,^{5,7} each jurisdiction has laws or regulations stipulating which diseases are reportable.⁵ Efforts should be made to increase healthcare providers' awareness of their responsibility to report suspected cases.⁸⁻¹²



The list of reportable diseases with detailed instructions explaining how, when, and to whom to report cases should be widely distributed within each jurisdiction. Mailings, email listservs, websites, in-service and other continuing education courses, and individual provider interaction may be used to accomplish this goal. However, while these are all examples of possible methods to raise awareness of reporting requirements, studies of interventions have demonstrated that telephone and other personal contact with individual healthcare providers, rather than groups, is most effective.¹³ For example, interaction with healthcare providers in the Vaccines for Children program offers an opportunity to promote awareness of reporting requirements. Face-to-face communication is the most direct and dynamic means of communication, allowing feedback and responses to overcome objections and concerns.¹⁴ A study on mandatory chronic disease reporting by physicians suggests that public health should emphasize both the legal and public health bases for reporting.¹⁵

Giving frequent and relevant feedback

Providing regular feedback to healthcare providers and others who report cases of vaccine-preventable diseases reinforces the importance of participating in public health surveillance.¹⁶ Feedback should be timely, informative, interesting, and relevant to the provider's practice. Ideally, feedback should include information on disease patterns and disease control activities in the area. Some examples of methods of providing feedback are monthly newsletters, email listservs, regular oral reports at clinical conferences such as hospital grand rounds, or regular reports in local or state medical society publications.

Contact with individual providers may be most effective. Examples of positive individual interaction for giving feedback on disease reporting include the following:

- Providing feedback to the provider on the epidemiologic investigations conducted for their patients;
- Providing feedback to the provider (in addition to the laboratory) for any cases that were first reported to the health department by a laboratory (or other source);
- Using every professional interaction with the provider to at least briefly discuss surveillance issues.

Simplifying reporting

Reporting should be as simple and as efficient as possible for the healthcare provider. Health department personnel should be easily accessible and willing to receive telephone reports and answer questions. Reporting instructions should be simple, clear, and widely distributed to those who are responsible for disease reporting.

III. Ensuring Adequate Case Investigation

Detailed and adequate case information is crucial to prevent continued spread of a disease or to change current disease control programs. The following steps are essential to ensuring adequate case investigation.

Obtaining accurate clinical information

During a case investigation, clinical information (e.g., date of symptom onset, signs and symptoms of disease) about a case-patient is often obtained from a retrospective review of medical records and interviews with the case-patient, family, friends, caretakers, and other close associates of the case-patient. Detailed and accurate information (e.g., date of onset, laboratory results, duration of symptoms) may indicate the source of the infection and possible contacts, allowing interventions to prevent the spread of disease. This clinical information also may be aggregated by disease to study other aspects of the disease (e.g., trends, incidence, prevalence). For vaccine-preventable diseases, vaccination history is particularly important for determining whether the case represents a vaccine failure or a failure to vaccinate. In addition to medical and school records, the state's immunization registry can be used to provide the most complete vaccination history information.

Obtaining appropriate laboratory specimens

Efforts should be taken to ensure that healthcare providers obtain necessary and appropriate laboratory specimens. For example, specimens for bacterial cultures should be taken before administering antibiotics, and paired sera are often required for meaningful serologic testing. For more information on laboratory support for vaccine-preventable disease surveillance, see Chapter 22, "Laboratory Support for the Surveillance of Vaccine-Preventable Diseases."

Ensuring access to essential laboratory capacity

The availability of laboratory testing needed to confirm cases of vaccine-preventable diseases must be assured. Additional testing—such as serotype, serogroup, and molecular testing—provides epidemiologically important information that can support disease control and prevention activities. Healthcare providers should be encouraged to contact the local or state health department for assistance in obtaining appropriate laboratory testing.

Laboratory testing needed to confirm diagnoses of public health significance is a public responsibility and should be made available at no cost to the patient. For information on laboratory support available in individual states, contact the state health department.

Investigating contacts

Identification of all case contacts and follow-up of susceptible persons may reveal previously undiagnosed and unreported cases. This investigation will also reveal persons eligible for any indicated prophylaxis, thereby facilitating disease control efforts.¹⁷

IV. Improving the Completeness of Reporting

Complete reporting involves accounting for as many cases of vaccine-preventable diseases as is possible. Completeness of reporting can be enhanced in many ways,¹⁸ including using electronic laboratory reporting,^{19–25} searching hospital and laboratory records, using administrative datasets, and expanding sources of reporting.

Searching hospital and laboratory records

For some vaccine-preventable diseases, a regular search of laboratory records for virus isolations or bacterial cultures may reveal previously unreported cases.⁹ Likewise, hospital discharge records may also be reviewed for specific discharge diagnoses,^{8,23} such as *Haemophilus influenzae* meningitis, tetanus, and other vaccine-preventable diseases. Such searches may assist in evaluating completeness of reporting and may help improve reporting in the future.^{16,26} Identifying the source of missed cases may lead to modifications that make the surveillance system more effective and complete. Although not a substitute for timely reporting of suspected cases, such searches can supplement reporting when resources for more active surveillance are unavailable.

Using administrative datasets

Administrative datasets, such as Medicare or Medicaid databases or managed care organization databases, may be useful for surveillance; when linked to immunization records, administrative records have been useful for monitoring rare adverse events following vaccination.^{27,28} However, unless extensive efforts are made to validate diagnoses, misclassification is likely.²⁹ Most vaccine-preventable diseases are now rare, and data quality may be insufficient for these datasets to be useful adjuncts to vaccine-preventable disease surveillance.³⁰

Expanding sources of reporting

Notifiable disease reporting has traditionally relied on reporting by physicians. Other healthcare personnel, such as infection control practitioners, school nurses, employee health nurses, laboratories, and childcare center personnel may be underutilized yet appropriate sources of case reports and surveillance information.^{16,26,31–34} These professionals often give the first indication that a health event is occurring that affects more than one person. In general, the most complete surveillance systems at the state and local levels involve multiple sources of reporting.

V. Strengthening Surveillance Infrastructure

Arrangements and procedures for public health surveillance and reporting may differ from department to department at both state and local levels. To ensure an effective national surveillance system, reporting institutions and organizations need to maintain and strengthen independent reporting mechanisms. Some methods for maintaining a strong surveillance infrastructure are described here.

Making technical assistance available

Training and written guidance should be available to health department personnel participating in surveillance activities and should include such topics as reporting requirements, epidemiologic methods, case finding, and investigation. Likewise, the health department should make this information readily available to healthcare providers and others who are required to participate in disease reporting and surveillance.

Creating networking opportunities

Meetings, conferences, and other professional interactions between public health professionals where practices and plans for surveillance are discussed can validate the importance of surveillance activities. In addition, those attending these meetings gain knowledge and strengthen professional interactions. These functions can help establish strong, professional links between public health professionals and private healthcare providers.

Monitoring surveillance indicators

Surveillance activities have many measurable components (surveillance indicators), including timeliness of reporting, completeness of reporting, and the ability to obtain all the information needed during case investigation. Regular monitoring of surveillance indicators may identify specific areas of the surveillance and reporting system that need improvement. For more information on this topic see Chapter 18, “Surveillance Indicators.”

VI. Special Surveillance Activities

Special surveillance activities include contacting providers under active surveillance and using sentinel surveillance systems and active laboratory-based surveillance. The following provides a brief overview of these special surveillance systems.

Contacting providers in active surveillance catchment areas

Active surveillance, such as when the health department initiates contact with a healthcare provider to identify cases, involves regular (e.g., weekly) contact with healthcare providers.^{10, 13, 16, 31, 35, 36} This regular contact with individual providers promotes increased awareness of reporting responsibilities and increased cooperation with the health department. Active surveillance may be limited to short-term disease control activities, such those implemented during outbreaks, or to seasonal activities, such as those during influenza season, because of the expense of sustaining an active system and the low yield when disease incidence is low. However, long-term active surveillance systems may also be put into place to determine the incidence and epidemiologic and laboratory characteristics of specific pathogens or conditions of public health concern.

Using sentinel surveillance systems

Sentinel surveillance,^{13, 20, 31} in which a network of healthcare providers or hospitals are recruited by the health department to regularly report specified health events, is useful for some vaccine-preventable diseases (e.g., influenza) in which the goal of surveillance is information on disease trends rather than individual case investigation. Sentinel surveillance systems may also be based in schools, childcare centers, hospitals, or other institutions serving specific populations. When targeted toward communities with a high risk of disease, sentinel surveillance may be a useful adjunct to other reporting sources and may supplement disease reporting when resources for more active surveillance are unavailable.

Using active laboratory-based surveillance

Active laboratory-based surveillance, in which a group of laboratories is recruited by the health department to regularly report specified laboratory results, is useful for the surveillance of vaccine-preventable diseases for which diagnosis and/or case confirmation requires laboratory testing (e.g., *Haemophilus influenzae* invasive disease). Laboratory-based surveillance systems may include both public and private laboratories; when targeted to include laboratories most likely to provide testing for vaccine-preventable diseases, laboratory-based surveillance may be a useful adjunct to other reporting sources and may supplement disease reporting when resources for other surveillance activities are scarce.^{37, 38}

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