

V. The Selection and Definition of Targeted Work-Related Conditions for Surveillance under SENSOR

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Introduction

Current efforts to prevent work-related illness in the United States are hampered by a lack of adequate systems for monitoring the occurrence of, and targeting interventions for, occupational diseases of public health importance.¹ As part of an overall strategy to improve surveillance of occupational illness and injury in this country,² a conceptual model for active occupational disease surveillance based among health care providers is described in chapter IV of this monograph. This proposed system (SENSOR) is intended to serve as a model for state-based programs.

As part of this initiative, the National Institute for Occupational Safety and Health (NIOSH) is recommending that each participating state target a selected list of work-related conditions that are important problems in the state and that are appropriate for surveillance under the SENSOR model. NIOSH has developed a list of work-related conditions that are of public health importance and that will be appropriate for targeting in many state-based SENSOR systems. For these conditions, NIOSH is developing surveillance case definitions for use by state health departments to facilitate standardized data collection and to assist in setting priorities for follow-up of individual case reports. In addition, NIOSH is recommending adapting case definitions for use as educational reporting guidelines to assist providers in recognizing and reporting suspected cases of occupational illness. In this chapter, three appendices illustrate this NIOSH approach for one target condition, work-related carpal tunnel syndrome (see Appendices I, II, and III).

This chapter focuses on the historic role of the Centers for Disease Control (CDC) and the current role of NIOSH in targeting conditions for surveillance, the criteria for selecting target conditions for SENSOR, and the rationale and proposed uses of epidemiologic case definitions.

Selecting Target Conditions

There are three principal reasons for recommending a list of conditions to target for surveillance under SENSOR. First,

it is desirable to focus the efforts of SENSOR projects on certain conditions that lend themselves to worksite intervention activities.

Second, a defined list will clarify reporting requirements for providers and foster increased recognition and reporting. Just as a lack of knowledge about what conditions are reportable may explain some underreporting of communicable diseases by physicians,³ a vague encouragement to report "any occupational disease" may not be sufficient guidance for potential reporters.

A third rationale for recommending a list of target conditions for SENSOR is to promote state-based surveillance of occupational health problems of national importance. In its efforts to monitor the occurrence of selected communicable diseases nationally, CDC has recognized that national surveillance data must come from local and state health officials who can mobilize resources for timely investigations of individual cases (where appropriate) and apparent outbreaks. A recommended national list of notifiable diseases has helped to address national surveillance priorities while maintaining the autonomy of state-based surveillance systems. Accumulation of representative national data is not a primary, short-term objective of the SENSOR proposal. However, success in case recognition and intervention for specific occupational diseases may improve recognition and reporting to the extent meaningful trends can be monitored for reportable conditions. It is, therefore, important to examine the traditional role of CDC in selection of notifiable diseases to understand how the list of conditions targeted for surveillance under SENSOR relates to that role.

The determination of which diseases should be reported to CDC has been the responsibility of state and territorial epidemiologists since 1951. During the annual national meeting of the Council of State and Territorial Epidemiologists (CSTE), proposals for changing morbidity reporting and surveillance practices in states are considered and, in some cases, endorsed by CSTE. Proposals may include revisions to the list of diseases that should be reported to CDC. CDC's role in this process has been to recommend changes in the reportable list based on changing national needs.⁴ This process has had some success in achieving a balance between national public health priorities and differing state situations with respect to endemic diseases, public health law, and

NOTE: Author affiliations and addresses are listed on p. 7.

resource availability.

As the institute within CDC charged with promoting occupational safety and health, NIOSH has assumed this role of promoting surveillance for occupational diseases. A 1984 NIOSH proposal to CSTE for a state-based pilot reporting system for silicosis, asbestosis, and coal workers' pneumoconiosis was in keeping with this role. Additional recommendations to the states will result from NIOSH review of state projects that include SENSOR-type surveillance systems as well as that of states using various existing data sets and more traditional, provider-reporting systems. Recommendations to the states may include what conditions to target for surveillance efforts and what methods work best for different types of work-related health problems. Because SENSOR pilot projects may have implications for future recommendations by NIOSH to state health departments, national occupational health priorities were considered in developing the initial list of target conditions for SENSOR.

The criteria used to select the initial list of target conditions for SENSOR will be used to revise and expand the list on an ongoing basis. These criteria are as follows:

- The work-related condition should be one of national public health importance, based on its frequency of occurrence and severity. In this regard, the 1990 objectives for the nation⁵ and the 10 leading work-related illnesses and injuries⁶ were considered in choosing conditions. Conditions meeting this criterion are also likely to be perceived as important by clinicians.
- The condition can be attributed to work on an individual basis with reasonable reliability, based on current knowledge. Some conditions, such as silicosis, meet this criterion because their clinical manifestations are usually sufficiently unique to distinguish them as work-related. For certain systemic poisonings, as with lead or pesticides, a reliable laboratory test is available to establish the presence of hazardous levels of a toxicant, such levels being most often due to exposure at work. Another class of occupational illnesses may not have manifestations or laboratory findings that distinguish them as work-related, but may be attributable in the presence of an appropriate exposure history. An example of such a condition would be work-related carpal tunnel syndrome (CTS). Although work-related cases of CTS may have the same signs and symptoms as non-work-related cases, certain manual tasks are associated with a high relative risk (hence a high attributable risk percentage) for this condition. In the presence of an appropriate occupational history, then, such cases can be attributed to work with sufficient confidence for surveillance purposes.
- Priority should be given to surveillance of conditions with short to medium latencies. Such conditions are likely to be recognized at a time when workplaces where exposures occurred are still operational and causal exposures are still present. However, for some conditions (e.g., silicosis), hazardous workplace conditions may persist even though the exposures contributing to the case at hand occurred many years earlier. Thus, in areas of the country where old, inadequately controlled facilities exist, detection of conditions with a relatively long latency may be useful in targeting workplaces that require focused control efforts.
- Conditions not under surveillance through other data sources should receive priority for provider-based reporting. For example, occupational asthma may be recognized and treated by a physician without resulting in a hospitalization, death, or compensation claim; thus, provider reports of this condition will provide data not obtainable from other sources.
- Conditions that are potentially reversible should receive higher priority for surveillance since control of exposure will benefit both the reported case and co-workers.
- Availability of a feasible preventive strategy should be considered in choosing conditions for reporting. Workplace or work practice changes useful in reducing the risk of certain occupational diseases (e.g., lead poisoning) are well established. Identification of cases of such conditions will be relatively more useful than identifying cases of conditions (such as stress-related symptoms) for which preventive strategies are more complex or difficult to implement.

These criteria were used to develop an initial list of target conditions: occupational asthma, lead poisoning, acute pesticide poisoning, silicosis, work-related carpal tunnel syndrome, and noise-induced hearing loss. Additional conditions will be identified using a similar process. Some of the target conditions will not meet every criterion, but will be high priorities when all criteria are weighed. We anticipate that state surveillance programs will identify additional conditions that meet the above criteria and have particular importance in their states.

The use of a reportable disease list should not preclude providers from less formal reporting of suspicious disease clusters, symptoms, or exposures. Indeed, the infectious disease surveillance experience suggests that an important by-product of reporting notifiable conditions is the informal network it creates between providers and public health officials. Thus, the SENSOR concept has a potential, though secondary, role in identifying new causes of occupational illness.

Epidemiologic Case Definitions and Reporting Guidelines

Purpose of Case Definitions

The central importance of nomenclature in monitoring disease occurrence was recognized by William Farr, the "founder of modern concepts of surveillance."⁷ Operational definitions help to focus surveillance efforts and facilitate reliable monitoring of geographic and temporal patterns of disease. Case definitions are also essential for interpretation and dissemination of surveillance data. In this country, changing criteria for defining endemic malaria cases played a key role in recognizing that endemic malaria had disappeared from the southern states, probably before a DDT spraying program had begun.⁸ A 1984 survey of state epidemiologists showed substantial variations in case definitions used for reportable diseases and revealed that nearly all state epidemiologists would find standardized case definitions useful in their surveillance efforts.⁹ In a proposed approach to evaluating an existing surveillance system,¹⁰ stating the case definition(s) for the health event(s) under surveillance is listed as an early step in the process.

In considering potential sources of occupational disease data, Rose¹¹ points out that, in current provider-reporting laws, much interpretation and decision-making about what constitutes an occupational disease is left up to the physician.

He implies that this may account for the fact that many such laws are considered inoperative. Some of the strategies developed by NIOSH and the Association of Schools of Public Health for occupational illness and injury prevention^{12,13} have recognized the importance of standard case definitions, and a proposed comprehensive plan for national surveillance of occupational diseases² lists the development of standard case criteria as a major part of the plan.

Occupational diseases present some unique features that must be considered in the development and application of standard case definitions for surveillance. Diagnosing an occupational disease often requires a physician to make an etiologic diagnosis using the occupational history, a consideration of nonoccupational risk factors for an illness, and a knowledge of known effects of occupational exposures. This process is difficult to translate into objective, simple criteria. Furthermore, labeling an individual as having an occupational disease may have profound implications. In some instances, the individual is at risk of losing his or her job. In other situations, a diagnosis may affect the involvement of the worker and physician with the workers' compensation system. Given the scientific, social, and economic issues related to occupational disease definition, it is essential that close attention be paid to the specific purpose of the standardized criteria being proposed.

Different criteria for the same disease may be used, depending on their intended use. For example, before the etiology of toxic shock syndrome was recognized, investigators developed a highly specific case definition using manifestations present in nearly all severe cases that had been seen.^{**14} In this way, the investigators minimized misclassification errors in case-control studies that used cases found through surveillance. The use of this specific case definition for determining clinical case management, legal compensation, or disability would have been inappropriate, since it was never intended for any of those purposes. Similarly, NIOSH surveillance case definitions for occupational illnesses are intended for a specific application, i.e., the use of state health departments to facilitate standardized counting of cases and to help set priorities for follow-up of reported cases, and may differ from case definitions used in clinical medicine. Typically, since medical treatment may entail risk to the patient (and at times legal liability for the practitioner), practitioners tend to resist making diagnoses until a high degree of certainty is present. Such delay may act to the disservice of the patient and co-workers in cases in which the disorder may be accompanied by continued exposure to hazardous conditions. Thus, criteria applied to epidemiologic surveillance for prevention efforts may not be as "strict" (i.e., specific) as those used in clinical medicine or in epidemiologic studies of disease etiology. Likewise, our proposed epidemiologic case definitions may differ from criteria used to determine compensability (which depends on state laws) and disability.

Structure and Validity of Case Definitions

A case definition may include signs, symptoms, diagnostic tests, exposure history, and evaluation of possible nonoccupational causes of an illness. The relative importance of each of these components will, of course, vary among conditions. Because surveillance case definitions must be practical for use in a variety of states, they should not require

the use of specialized diagnostic tests available only at referral centers.

Case definitions for surveillance should have at least moderate specificity and sensitivity. Ideally, the validity of case definitions would be assessed directly against appropriate "gold standards." Unfortunately, relatively few gold standards exist for occupational diseases, and those that do (e.g., lung tissue pathology) cannot be ethically applied to large numbers of living patients. Furthermore, the performance of case definitions in an actual surveillance system, as measured by their predictive value, will also depend on the prevalence of real occupational disease among reported suspect cases. NIOSH will, therefore, design case definitions that are generally consistent with the current clinical understanding of the conditions of interest, and that are practical for wide application by state health departments. NIOSH will also evaluate the performance of the case definitions and revise them as necessary, based on experience with their use in state surveillance programs.

The NIOSH surveillance case definition for work-related carpal tunnel syndrome is presented in Appendix I.

Application of Case Definitions in SENSOR Programs

The manner in which case definitions are used by state health departments will depend on the nature of the provider network, which may vary according to state and target condition. When the network of reporting providers is informal and not highly specialized, individual providers may encounter a given work-related condition infrequently. Case definitions should not be used to discourage such providers from reporting "non-cases." Providers instead should be encouraged to report any suspect cases of a target condition via a simple and convenient process. If additional data are needed to apply the case definition and determine the need for follow-up, they should be collected through follow-up contacts with the provider, patient, and, if appropriate, the employer. A similar process has been used for certain communicable diseases such as toxic shock syndrome and AIDS.⁴ An example of the kinds of data that would be useful to describe cases and determine priority for follow-up of work-related carpal tunnel syndrome is provided in Appendix II.

This approach is designed to encourage reporting by otherwise reluctant providers. However, less specialized providers may lack knowledge needed to recognize possible cases of a target condition. To remedy this, we are recommending that states disseminate reporting guidelines to potential providers using state health department bulletins, state medical journals, and/or direct mail. These guidelines may be simplified and less specific versions of case definitions, intended to further clarify the provider's role in the surveillance effort and to aid in recognition of confirmed and suspect cases. By describing sentinel health events (occupational) (SHE[O]s) in clinical terms, reporting guidelines enhance the utility of the SHE(O) concept as a ". . . method for increasing physicians' awareness of occupational diseases. . . ."¹⁵ Reporting guidelines may include text describing a given occupational disorder and explaining the procedure and rationale for reporting it. An example of reporting guidelines for work-related carpal tunnel syndrome is provided in Appendix III.

More formal networks may involve highly specialized providers that encounter a given target condition frequently. Such providers may be given detailed reporting forms or computer software for reporting case information. For con-

**Davies JP, personal communication, August 1986.

ditions with simple criteria, providers may be given the case definition to be used directly to identify reportable cases. For example, clinical laboratories may be asked to report all cases with blood lead levels exceeding a specified threshold.

Summary

Lists of reportable conditions and case definitions are important tools for epidemiologic surveillance. As part of an initiative to encourage occupational disease surveillance systems linked to intervention at the state level, we have proposed a list of target conditions and are developing a set of standard epidemiologic case definitions. Experience gained from state health department pilot projects using SENSOR and other surveillance approaches will be used to promote effective condition-specific surveillance strategies on a wider scale.

APPENDIX I

Surveillance Case Definition for State Health Departments: Work-Related Carpal Tunnel Syndrome

State health departments should encourage providers to report diagnosed or suspected cases of work-related carpal tunnel syndrome. The surveillance case definition can be used to classify reported cases. The surveillance case definition includes meeting criteria A, B, and C below. In certain settings, such as workplace surveys, a case definition consisting of criteria A and C may be useful.

A) Symptoms suggestive of carpal tunnel syndrome are present.

One or more of the following symptoms are sufficient: paresthesia, hypoesthesia, pain or numbness affecting at least part of the median nerve distribution of the hand(s). The median nerve distribution generally includes palmar side of thumb, index finger, middle finger, and radial half of ring finger; dorsal (back) side of same digits above PIP (proximal interphalangeal) joint; and radial half of palm. Pain and paresthesia may radiate proximally into the arm. Symptoms should have lasted at least one week or, if intermittent, have occurred on multiple occasions. Other causes of hand numbness or paresthesia, such as cervical radiculopathy, thoracic outlet syndrome, and pronator teres syndrome, should be excluded by appropriate clinical evaluation.

B) Objective findings consistent with carpal tunnel syndrome are present in the affected hand(s) and wrist(s):

EITHER

1) Physical examination findings.

One or more of the following findings should be present: 1) Tinel's sign (paresthesia elicited or accentuated by gentle percussion over the carpal tunnel), 2) present or positive Phalen's test (paresthesias are elicited or accentuated by maximal passive flexion of the wrist for one minute), or 3) decreased or absent sensation to pin prick in the median nerve distribution of the hand.

OR

2) Electrodiagnostic findings of median nerve dysfunction across the carpal tunnel.

Criteria for abnormal electrodiagnostic findings are generally determined by the individual laboratories.

C) Evidence of work-relatedness—a history of a job involving activities that increase the risk of carpal tunnel syndrome prior to the development of symptoms.

One or more of the following activities may be present:

- Frequent, repetitive use of the same or similar movements of the hand or wrist on the affected side(s).
- Regular tasks requiring the generation of high force by the hand on the affected side(s).
- Regular or sustained tasks requiring awkward hand positions, such as use of a pinch grip (as when holding a pencil), extreme flexion or extension of the wrist, or use of the fingers with the wrist flexed on the affected side(s).
- Regular use of vibrating hand tools.
- Frequent or prolonged pressure over the wrist or base of the palm on the affected side(s).

A temporal relationship of symptoms to work or an association with cases of carpal tunnel syndrome in co-workers performing similar tasks is also evidence of work-relatedness.

APPENDIX II

Recommended Core Surveillance Data for Reported Cases: Work-Related Carpal Tunnel Syndrome

The data items listed below should be collected on reported cases of work-related carpal tunnel syndrome in order to describe reported cases, set priorities for workplace investigations, and apply the surveillance case definition.

Demographic Information

Name	Age
Home address	Sex
Phone number	Race

Provider Information

Name	Specialty
Address	Type of Practice
Phone number	

Workplace Information

Employer name	Department or work area of case
Address	Case occupation and most important activities or duties
Phone	Number of employees with similar job duties as case
Type of business or industry	Number of other workers with similar symptoms as case
Number of employees	Electrodiagnostic tests results (if performed)
Date case began current job	Job task factors described by case (repetitive hand motion, high hand force, awkward hand position, vibrating hand tool use, mechanical pressure over wrist or palm)

Clinical Information

Date of symptom onset	Temporal association between symptoms and work
Symptoms (quality, location, duration, number of episodes)	
Physical findings (Tinel's sign, Phalen's test, objective sensory loss)	

APPENDIX III

Reporting Guidelines for Providers: Work-Related Carpal Tunnel Syndrome

Definition and Clinical Features

Carpal tunnel syndrome is a constellation of symptoms and signs caused by compression of the median nerve as it passes through the carpal tunnel. In work-related carpal tunnel syndrome the cumulative effect of biomechanical stresses on the hands and wrist encountered in certain occupations has contributed to or has caused the condition. No reliable national data exist on the incidence of work-related carpal tunnel syndrome, but surveys of selected workplaces indicate that 5 percent or more of workers in some jobs may have carpal tunnel syndrome attributable to work.

Patients suffering from carpal tunnel syndrome usually complain initially of sensory symptoms, including pain, numbness, and tingling affecting part or all of the sensory distribution of the median nerve in the hand, often radiating proximally. Onset is usually gradual, but symptoms may be episodic, typically worsening at night or with strenuous activity involving the wrist and hand. Physical examination may reveal objective evidence of decreased sensation in

*State health departments may wish to adapt this material for dissemination to providers by including information on how to report a case and statutes or regulations, if any, governing disease reporting and confidentiality of case reports in their state.

the sensory distribution of the median nerve in the hand, a tingling sensation in the nerve distribution with percussion over the median nerve in the wrist (Tinel's sign), or pain or tingling sensations with sustained, passive wrist flexion (Phalen's test). However, physical examination may be normal in cases of carpal tunnel syndrome. Weakness of the muscles supplied by the median nerve in the hand, especially the abductor pollicis brevis, generally occurs after sensory symptoms have persisted for some time. Electrodiagnostic studies may show evidence of median nerve dysfunction with sensory and motor conduction velocity being slowed across the wrist.

Other conditions that may present like carpal tunnel syndrome include cervical nerve root compression, generalized peripheral neuropathy, thoracic syndrome, and the pronator syndrome (entrapment of the median nerve by the pronator teres muscle).

Jobs predisposing workers to carpal tunnel syndrome are common and include those requiring hand movements that are repetitive, forceful, or involve certain awkward hand positions. These positions include extreme flexion or extension and use of a pinch grip (used to hold a pen, as opposed to a power grip that is used to hold a hammer). In addition, the use of vibrating hand tools and direct external pressure over the carpal tunnel, as from a poorly fitting wrist band, are both occupational risk factors for developing carpal tunnel syndrome. Especially prone to developing carpal tunnel syndrome are workers whose jobs involve combinations of risk factors. Examples of high-risk jobs include garment workers, assemblers of electronic components, and painters.

Nonoccupational risk factors for developing carpal tunnel syndrome include rheumatoid arthritis, diabetes, hypothyroidism, gout, female gender, pregnancy, oral contraceptive use, and bilateral oophorectomy. However, the presence of one or more of these risk factors does not exclude the possibility that occupational factors have contributed to a case of carpal tunnel syndrome.

Recognition

Recognition of work-related cases of carpal tunnel syndrome is important because job redesign or reassignment may be beneficial to affected workers. Recognition of work-related carpal tunnel syndrome requires taking an occupational history as part of the evaluation of any patient presenting with symptoms suggestive of carpal tunnel syndrome. The occupational history should focus on assessing the patient's job for the presence of hand movements or other factors described above which might predispose to developing carpal tunnel syndrome. The patient should be asked about the timing of onset of symptoms in relation to any occupational risk factors identified and about similar symptoms in co-workers.

Reporting

Suspect cases of work-related carpal tunnel syndrome should be reported to public health officials, because a single case may be a sentinel for the presence of biomechanical stresses shared by a number of workers. Therefore, reporting cases to public health officials may provide the opportunity to prevent additional cases from occurring or progressing.

Physicians should report all suspected or diagnosed cases of work-related carpal tunnel syndrome. The reporting guidelines that follow are intended to assist providers recognizing such cases.

Cases meeting criteria A and B should be reported:

- A) Symptoms or signs compatible with carpal tunnel syndrome are present.
- B) The occupational history elicits one or more of the following:
 - 1) Job tasks involving repetitive or forceful movements or awkward postures of the affected hand(s) or wrist(s).
 - 2) Frequent use of vibrating hand tools with the affected hand(s).
 - 3) Frequent or prolonged pressure over the wrist(s) or base of the palm(s) on the affected side(s).
 - 4) Similar symptoms in co-workers performing similar job tasks as the patient.
 - 5) Symptoms are worsened on workdays or relieved on days away from work.

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