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Revised U.S. Surveillance Case Definition for Severe Acute Respiratory
Syndrome (SARS) and Update on SARS Cases --- United States and
Worldwide, December 2003

During the 2003 epidemic of severe acute respiratory syndrome (SARS), CDC and the Council of State and Territorial Epidemiologists (CSTE) developed surveillance criteria to identify persons with SARS. The surveillance case definition changed throughout the epidemic as understanding of the clinical, laboratory, and transmission characteristics of SARS-associated coronavirus (SARS-CoV) increased (1--5). On June 26, CSTE adopted a position statement to add SARS-CoV disease to the National Notifiable Disease Surveillance System (NNDSS). The position statement included criteria for defining a SARS case for national reporting. On November 3, CSTE issued a new interim position statement* with a revised SARS case definition. This report summarizes the new U.S. surveillance case definition for SARS and updates reported cases of SARS worldwide and in the United States.

Summary of Changes to Case Definition

The revised SARS case definition (Box) modifies the clinical, epidemiologic, laboratory, and case-exclusion criteria in the U.S. surveillance case definition used during the 2003 epidemic. In the clinical criteria, "early" illness replaces "asymptomatic" or "mild" illness. The epidemiologic criteria include the following new categories: 1) possible exposure to SARS-CoV and 2) likely exposure to SARS-CoV. Laboratory criteria for evidence of SARS-CoV infection reflect advances in testing technology. The case-exclusion criteria have been changed to allow for exclusion when a serum sample collected >28 days after onset of symptoms is negative for antibody to SARS-CoV.

The revised case definition also classifies each SARS case as either a SARS report under investigation (SARS RUI) or SARS-CoV disease. SARS RUI is a sensitive, nonspecific case classification based solely on clinical or epidemiologic criteria and includes cases classified previously as probable or suspect. SARS-CoV disease is a more specific case classification based on selected clinical and epidemiologic criteria or laboratory confirmation. SARS RUIs might subsequently meet the definition for SARS-CoV disease based on results from laboratory testing (Tables 1 and 2).

Update on SARS Cases

During November 2002--July 2003, a total of 8,098 probable SARS cases were reported to the World Health Organization (WHO) from 29 countries, including 29 cases from the United States; 774 SARS-related deaths (case-fatality rate: 9.6%) were reported, none of which occurred in the United States (6). Eight U.S. cases had serologic evidence of SARS-CoV infection; these eight cases have been described previously (7--10). A total of 156 reported U.S. SARS cases from the 2003 epidemic remain under investigation, with 137 (88%) cases classified according to previous surveillance criteria as suspect SARS and 19 (12%) classified as probable SARS. Because convalescent serum specimens have not been obtained from the 19 probable and 137 suspect cases that remain under investigation, whether these persons had SARS-CoV disease is unknown.

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Editorial Note:

The revised surveillance case definition for SARS reflects an improved understanding of the clinical and laboratory characteristics of SARS-CoV. The revision differentiates patients with nonspecific clinical illness or less definitive epidemiologic associations (i.e., SARS RUIs) from those with laboratory-confirmed SARS-CoV infection or more definitive epidemiologic links (i.e., cases of SARS-CoV disease). Local and state health departments will monitor SARS RUIs to ensure implementation of prompt public health measures for preventing disease transmission if SARS-CoV is confirmed subsequently. Numerous SARS RUIs probably will be excluded as SARS cases as laboratory results become available during the course of illness. Surveillance data for cases meeting the SARS-CoV disease case definition will be reported to NNDSS and included in the weekly statistical summary of notifiable infectious diseases in the United States published in MMWR (Table 1. Summary of provisional cases of selected notifiable diseases, United States).

Reporting of cases meeting previous SARS definitions ended in late July 2003. However, case numbers continue to change as new clinical information or results of additional laboratory testing on cases reported previously become available. Updated case counts reflecting these changes are available from CDC at <http://www.cdc.gov/od/oc/media/sars/cases.htm>.

Efforts are under way to prepare for a possible reappearance of SARS-CoV. CDC, in collaboration with other federal partners, state and local health officials, professional organizations and societies, and representatives of the health-care industry, has developed a guidance document to help public health and health-care officials detect the reappearance of SARS-CoV in the United States quickly and implement a decisive and effective public health response. The document, "Public Health Guidance for Community-Level Preparedness and Response to Severe Acute Respiratory Syndrome (SARS)," is available at <http://www.cdc.gov/ncidod/sars/sarsprepplan.htm>.

References

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- 5.CDC. Update: severe acute respiratory syndrome---worldwide and United States, 2003. MMWR 2003;52:664--5.
- 6.World Health Organization. Summary table of SARS cases by country, November 1, 2002--August 7, 2003. Available at http://www.who.int/csr/sars/country/2003_08_15/en/.
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* The interim position statement must be ratified by the entire membership at the 2004 annual CSTE meeting. The statement is available from CSTE at

<http://www.cste.org/ps/2003pdfs/2003finalpdf/cstesarscasedefrevision2003-10-30.pdf>.

BOX. Revised Council of State and Territorial Epidemiologists surveillance case definition for severe acute respiratory syndrome (SARS), December 2003

Clinical Criteria

Early illness

- Presence of two or more of the following features: fever (might be subjective), chills, rigors, myalgia, headache, diarrhea, sore throat, or rhinorrhea

Mild-to-moderate respiratory illness

- Temperature of $>100.4^{\circ}\text{F}$ ($>38^{\circ}\text{C}$)* **and**
- One or more clinical findings of lower respiratory illness (e.g., cough, shortness of breath, or difficulty breathing)

Severe respiratory illness

- Meets clinical criteria of mild-to-moderate respiratory illness **and**
- One or more of the following findings:
 - Radiographic evidence of pneumonia, **or**
 - Acute respiratory distress syndrome, **or**
 - Autopsy findings consistent with pneumonia or acute respiratory distress syndrome without an identifiable cause

Epidemiologic Criteria

Possible exposure to SARS-associated coronavirus (SARS-CoV)

One or more of the following exposures in the 10 days before onset of symptoms:

- Travel to a foreign or domestic location with documented or suspected recent transmission of SARS-CoV[†] or
- Close contact[§] with a person with mild-to-moderate or severe respiratory illness and history of travel in the 10 days before onset of symptoms to a foreign or domestic location with documented or suspected recent transmission of SARS-CoV[†]

Likely exposure to SARS-CoV

One or more of the following exposures in the 10 days before onset of symptoms:

- Close contact[§] with a person with confirmed SARS-CoV disease or
- Close contact[§] with a person with mild-to-moderate or severe respiratory illness for whom a chain of transmission can be linked to a confirmed case of SARS-CoV disease in the 10 days before onset of symptoms

Laboratory Criteria

Tests to detect SARS-CoV are being refined and their performance characteristics assessed[‡]; therefore, criteria for laboratory diagnosis of SARS-CoV are changing. The following are general criteria for laboratory confirmation of SARS-CoV:

- Detection of serum antibody to SARS-CoV by a test validated by CDC (e.g., enzyme immunoassay), or
- Isolation in cell culture of SARS-CoV from a clinical specimen, or
- Detection of SARS-CoV RNA by a reverse transcription polymerase chain reaction test validated by CDC and with subsequent confirmation in a reference laboratory (e.g., CDC).

Information about the current criteria for laboratory diagnosis of SARS-CoV is available at <http://www.cdc.gov/ncidod/sars/labdiagnosis.htm>.

Exclusion Criteria

A case may be excluded as a SARS report under investigation (SARS RUI), including as a CDC-defined probable SARS-CoV case, if any of the following apply:

- An alternative diagnosis can explain the illness fully**, or
- Antibody to SARS-CoV is undetectable in a serum specimen obtained >28 days after onset of illness^{††}, or
- The case was reported on the basis of contact with a person who was excluded subsequently as a case of SARS-CoV disease; then the reported case also is excluded, provided other epidemiologic or laboratory criteria are not present.

Case Classification

SARS RUI

Reports in persons from areas where SARS is not known to be active

- SARS RUI-1: Cases compatible with SARS in groups likely to be first affected by SARS-CoV^{§§} if SARS-CoV is introduced from a person without clear epidemiologic links to known cases of SARS-CoV disease or places with known ongoing transmission of SARS-CoV

BOX. (Continued) Revised Council of State and Territorial Epidemiologists surveillance case definition for severe acute respiratory syndrome (SARS), December 2003*Reports in persons from areas where SARS activity is occurring*

- SARS RUI-2: Cases meeting the clinical criteria for mild-to-moderate illness and the epidemiologic criteria for possible exposure (spring 2003 CDC definition for suspect cases⁴⁵)
- SARS RUI-3: Cases meeting the clinical criteria for severe illness and the epidemiologic criteria for possible exposure (spring 2003 CDC definition for probable cases⁴⁵)
- SARS RUI-4: Cases meeting the clinical criteria for early or mild-to-moderate illness and the epidemiologic criteria for likely exposure to SARS-CoV

SARS-CoV disease

- Probable case of SARS-CoV disease: meets the clinical criteria for severe respiratory illness and the epidemiologic criteria for likely exposure to SARS-CoV
- Confirmed case of SARS-CoV disease: clinically compatible illness (i.e., early, mild-to-moderate, or severe) that is laboratory confirmed

* A measured documented temperature of >100.4° F (>38° C) is expected. However, clinical judgment may allow a small proportion of patients without a documented fever to meet this criterion. Factors that might be considered include patient's self-report of fever, use of antipyretics, presence of immunocompromising conditions or therapies, lack of access to health care, or inability to obtain a measured temperature. Initial case classification based on reported information might change, and reclassification might be required.

† Types of locations specified will vary (e.g., country, airport, city, building, or floor of building). The last date a location may be a criterion for exposure is 10 days (one incubation period) after removal of that location from CDC travel alert status. The patient's travel should have occurred on or before the last date the travel alert was in place. Transit through a foreign airport meets the epidemiologic criteria for possible exposure in a location for which a CDC travel advisory is in effect. Information about CDC travel alerts and advisories and assistance in determining appropriate dates are available at <http://www.cdc.gov/ncidod/sars/travel.htm>.

§ Close contact is defined as having cared for or lived with a person with SARS or having a high likelihood of direct contact with respiratory secretions and/or body fluids of a person with SARS (during encounters with the patient or through contact with materials contaminated by the patient) either during the period the person was clinically ill or within 10 days of resolution of symptoms. Examples of close contact include kissing or embracing, sharing eating or drinking utensils, close (i.e., <3 feet) conversation, physical examination, and any other direct physical contact between persons. Close contact does not include activities such as walking by a person or sitting across a waiting room or office for a brief time.

§ The identification of the etiologic agent of SARS (i.e., SARS-CoV) led to the rapid development of enzyme immunoassays and immunofluorescence assays for serologic diagnosis and reverse transcription polymerase chain reaction assays for detection of SARS-CoV RNA in clinical samples. These assays can be very sensitive and specific for detecting antibody and RNA, respectively, in the later stages of SARS-CoV disease. However, both are less sensitive for detecting infection early in illness. The majority of patients in the early stages of SARS-CoV disease have a low titer of virus in respiratory and other secretions and require time to mount an antibody response. SARS-CoV antibody tests might be positive as early as 8–10 days after onset of illness and often by 14 days after onset of illness, but sometimes not until 28 days after onset of illness. Information about the current criteria for laboratory diagnosis of SARS-CoV is available at <http://www.cdc.gov/ncidod/sars/labdiagnosis.htm>.

** Factors that may be considered in assigning alternate diagnoses include the strength of the epidemiologic exposure criteria for SARS-CoV disease, the specificity of the alternate diagnostic test, and the compatibility of the clinical presentation and course of illness with the alternative diagnosis.

†† Current data indicate that >95% of patients with SARS-CoV disease mount an antibody response to SARS-CoV. However, health officials may choose not to exclude a case on the basis of lack of a serologic response if reasonable concern exists that an antibody response could not be mounted.

§§ Consensus guidance is in development between CDC and CSTE on which groups are most likely to be affected first by SARS-CoV if it reemerges. SARS-CoV disease should be considered at a minimum in the differential diagnoses for persons requiring hospitalization for pneumonia confirmed radiographically or acute respiratory distress syndrome without identifiable etiology and who have one of the following risk factors in the 10 days before the onset of illness:

- Travel to mainland China, Hong Kong, or Taiwan, or close contact with an ill person with a history of recent travel to one of these areas, or
- Employment in an occupation associated with a risk for SARS-CoV exposure (e.g., health-care worker with direct patient contact or worker in a laboratory that contains live SARS-CoV), or
- Part of a cluster of cases of atypical pneumonia without an alternative diagnosis.

Guidelines for the identification, evaluation, and management of these patients are available at <http://www.cdc.gov/ncidod/sars/absenceofsars.htm>.

¶¶ During the 2003 SARS epidemic, CDC case definitions were the following:

Suspect case

- Meets the clinical criteria for mild-to-moderate respiratory illness and the epidemiologic criteria for possible exposure to SARS-CoV but does not meet any of the laboratory criteria and exclusion criteria or
- Unexplained acute respiratory illness that results in death of a person on whom an autopsy was not performed and that meets the epidemiologic criteria for possible exposure to SARS-CoV but does not meet any of the laboratory criteria and exclusion criteria

Probable case

- Meets the clinical criteria for severe respiratory illness and the epidemiologic criteria for possible exposure to SARS-CoV but does not meet any of the laboratory criteria and exclusion criteria.

TABLE 1. Severe acute respiratory syndrome–associated coronavirus (SARS-CoV) case classification before laboratory testing, by clinical and epidemiologic criteria

| Epidemiologic criteria | Clinical criteria for degree of illness | | |
|------------------------|---|------------------|-----------------------------------|
| | Early | Mild to moderate | Severe |
| Unknown | — | — | SARS RUI ^{*-1} |
| Possible | — | SARS RUI-2 | SARS RUI-3 |
| Likely | SARS RUI-4 | SARS RUI-4 | Probable case of SARS-CoV disease |

* Report under investigation.

TABLE 2. Severe acute respiratory syndrome–associated coronavirus (SARS-CoV) case classification after laboratory testing, by initial report category

| Initial report category | Laboratory testing results | | |
|--------------------------------------|----------------------------|------------------------------------|-----------------------------------|
| | Negative [*] | Positive | Not performed |
| SARS RUI ⁻¹ to SARS RUI-4 | Excluded | Confirmed case of SARS-CoV disease | Undetermined [§] |
| Probable case of SARS-CoV disease | Excluded | Confirmed case of SARS-CoV disease | Probable case of SARS-CoV disease |

* Negative test as defined by negative antibody titer taken >28 days after the onset of symptoms. A negative polymerase chain reaction result does not rule out SARS-CoV disease.

[†] Report under investigation.

[§] Collection and/or laboratory testing of specimen was not completed.