09-ID-28

Committee: Infectious

Title: Public Health Reporting and National Notification for West Nile Virus Disease

I. Statement of the Problem

CSTE position statement 07-EC-02 recognized the need to develop an official list of nationally notifiable conditions and a standardized reporting definition for each condition on the official list. The position statement also specified that each definition had to comply with American Health Information Community recommended standards to support "automated case reporting from electronic health records or other clinical care information systems." In July 2008, CSTE identified sixty-eight conditions warranting inclusion on the official list, each of which now requires a standardized reporting definition.

II. Background and Justification

Background[1]

West Nile virus (WNV) was first detected in North America in 1999. In subsequent years, it spread along the East Coast, then throughout the continental US. This mosquito-borne flavivirus now appears to be firmly established with seasonal outbreaks in late summer. WNV is now the most important cause of arboviral infection in the US. Approximately 3600 cases of WNV disease were reported in 2007. Most infections are asymptomatic or subclinical. Neurological illness may range from mild aseptic meningitis to paralysis or encephalitis. The elderly are at higher risk for developing neuroinvasive WNV disease. Approximately 10% of patients with WNV neuroinvasive disease die. Ongoing surveillance is necessary to monitor the occurrence of disease and the effectiveness of prevention strategies.

Justification

WNV disease meets the following criteria for a nationally and **standard** notifiable condition, as specified in CSTE position statement 08-EC-02:

- A majority of state and territorial jurisdictions—or jurisdictions comprising a majority of the US population—have laws or regulations requiring **standard** reporting of WNV disease infections to public health authorities
- CDC requests **standard** notification of WNV disease infections to federal authorities
- CDC has condition-specific policies and practices concerning the agency's response to, and use of, notifications.

[1] Much of the material in the background is directly quoted from the CDC's WNV website. See the references for further information on this source.

III. Statement of the desired action(s) to be taken

CSTE requests that CDC adopt this standardized reporting definition for WNV disease to facilitate more timely, complete, and standardized local and national reporting of this condition.

IV. Goals of Surveillance

To provide information on the temporal, geographic, and demographic occurrence of WNV disease to facilitate its prevention and control.

V. Methods for Surveillance

Surveillance for WNV disease should use the sources of data and the extent of coverage listed in table V.

Table V. Recommended sources of data and extent of coverage for ascertaining cases of WNV disease.

	Coverage	
Source of data for case ascertainment	Population-wide	Sentinel sites
clinician reporting	X	
laboratory reporting	X	
reporting by other entities (e.g., hospitals, veterinarians, pharmacies)	X	
death certificates	X	
hospital discharge or outpatient records	X	
extracts from electronic medical records	X	
telephone survey		
school-based survey		
other _____		

VI. Criteria for Reporting

Reporting refers to the process of healthcare providers or institutions (e.g., clinicians, clinical laboratories, hospitals) submitting basic information to governmental public health agencies about cases of illness that meet certain reporting requirements or criteria. Cases of illness may also be ascertained by the secondary analysis of administrative health data or clinical data. The purpose of this section is to provide those criteria that should be used by humans and machines to determine whether a specific illness should be reported.[2]

A. Narrative description of criteria to determine whether a case should be reported to public health authorities

Report any illness to public health authorities that meets any of the following criteria:

1. Any person with laboratory evidence of recent WNV infection and a current history of acute fever and neurological illness in the absence of a more likely clinical explanation for the illness.

2. Any person with laboratory evidence of recent WNV infection and a current history of acute fever but no neurological illness in the absence of a more likely clinical explanation for the illness.

3. A person whose healthcare record contains a diagnosis of WNV infection.

4. A person whose death certificate lists WNV infection as a cause of death or a significant condition contributing to death.

Other recommended reporting procedures

- All cases of WNV disease should be reported.
- Reporting should be on-going and routine.
- Frequency of reporting should follow the state health department's routine schedule.

[2] "Human-based" criteria (described below under "A. Narrative") can be applied by medical care providers and laboratory staff based on clinical judgment and clinical diagnosis. Machine-based criteria (described below under "B. Table") can be applied using computerized algorithms that operate in electronic health record systems, including computerized records of laboratory test orders and laboratory test results; other clinical data systems (e.g., hospital discharge data systems serving multiple hospitals); or administrative data (e.g., healthcare provider billing data, vital records, and EMS data).

B. Table of criteria to determine whether a case should be reported to public health authorities

Table VI-B. Proposed Table of criteria to determine whether a case should be reported to public health authorities. Note: The following criteria are proposed for evaluation before general implementation. For purposes of currently implementing reporting the narrative description in VI-A, should be used.

Criterion	Reporting	
Clinical Presentation		
Fever	N	
Headache	C	
Stiff Neck	C	
Aseptic Meningitis	C	
Encephalitis	C	
Myelitis	C	
Disorientation	C	
Obtundation	C	
Stupor	C	
Coma	C	
Paresis	C	
Paralysis	C	
Nerve Palsies	C	
Sensory Deficit	C	
Abnormal Reflexes	C	
Abnormal movements	C	
Convulsions	C	
Healthcare record contains a diagnosis of West Nile Virus infection		S
Death certificate lists West Nile Virus infection as a cause of death or a significant condition contributing to death		S
Laboratory findings		
CSF Pleocytosis	C	
Four-fold or greater change in WNV -specific serum antibody titer	O	
Elevated WNV -specific immunoglobulin G (IgG) antibodies in the acute or convalescent serum specimen as measured by VN or HI or IgG enzyme immunoassay (EIA)	O	
WNV -specific immunoglobulin M (IgM) antibodies demonstrated in serum by IgM antibody-capture enzyme immunoassay (EIA)	O	

Isolation of WNV from tissue, blood, CSF, or other body fluid	O	
Demonstration of WNV - specific nucleic acid by PCR in a clinical specimen	O	
WNV -specific immunoglobulin M (IgM) antibodies demonstrated in CSF by IgM antibody-capture enzyme immunoassay (EIA)	O	
Stable (less than or equal to a two-fold change) but elevated titer of WNV virus-specific serum antibodies	O	

Notes:
S = This criterion alone is sufficient to report a case
N = This criterion in conjunction with all other "N" and any "O" criteria in the same column is required to report a case.
O = At least one of these "O" criteria in each category in the same column (e.g., clinical presentation and laboratory findings)—in conjunction with all other "N" criteria in the same column—is required to report a case.
C = This finding corroborates (i.e., supports) the diagnosis of—or is associated with—West Nile virus disease, but is not required for reporting.

C. Disease Specific Data Elements:

Disease-specific data elements to be included in the initial report are listed below.

Clinical Information
Underlying chronic illness
Immune suppression
Blood transfusion in past 30 days
Blood donation in past 30 days
Organ transplant recipient in past 30 days
Organ donor
Pregnant
Prenatal exposure
Breast fed
Laboratory exposure to WNV
Hospitalized
Fatality

Epidemiological Risk Factors
Occupation
Travel in 5-15 days prior to onset of illness
County and State where infection was presumably contracted
Mosquito exposure

VII. Case Definition for Case Classification

A. Narrative description of criteria to determine whether a case should be classified as confirmed or probable (presumptive).

Clinical description

Arboviral infections may be asymptomatic or may result in febrile illnesses of variable severity sometimes associated with central nervous system (CNS) involvement. When the CNS is affected, clinical syndromes include aseptic meningitis, myelitis and encephalitis, which are clinically indistinguishable from similar syndromes caused by other viruses. Arboviral meningitis is usually characterized by fever, headache, stiff neck, and pleocytosis in cerebrospinal fluid. Arboviral myelitis is usually characterized by fever and acute bulbar or limb paresis or flaccid paralysis. Arboviral encephalitis is usually characterized by fever, headache, and altered mental status ranging from confusion to coma with or without additional signs of brain dysfunction. Less common neurological syndromes can include cranial and peripheral neuritis or other neuropathies, including Guillain-Barré syndrome.

Non-neuroinvasive syndromes caused by these usually neurotropic arboviruses can rarely include myocarditis, pancreatitis, or hepatitis. In addition, they may cause febrile illnesses (e.g., West Nile fever [WNF]) that are non-localized, self-limited illnesses with headache, myalgias, arthralgias, and sometimes accompanied by skin rash or lymphadenopathy. Laboratory-confirmed arboviral illnesses lacking documented fever can occur, and overlap among the various clinical syndromes is common.

Clinical criteria for diagnosis

Cases of arboviral disease are classified either as neuroinvasive or non-neuroinvasive, according to the following criteria:

Neuroinvasive disease requires the presence of fever and at least one of the following, as documented by a physician and in the absence of a more likely clinical explanation:

- Acutely altered mental status (e.g., disorientation, obtundation, stupor, or coma), or
- Other acute signs of central or peripheral neurologic dysfunction (e.g., paresis or paralysis, nerve palsies, sensory deficits, abnormal reflexes, generalized convulsions, or abnormal movements), or
- Pleocytosis (increased white blood cell concentration in cerebrospinal fluid [CSF]) associated with illness clinically compatible with meningitis (e.g., headache or stiff neck).

Non-neuroinvasive disease requires, at minimum, the presence of documented fever, as measured by the patient or clinician, the absence of neuroinvasive disease (above), and the absence of a more likely clinical explanation for the illness. Involvement of non-neurological organs (e.g., heart, pancreas, liver) should be documented using standard clinical and laboratory criteria.

Laboratory criteria for diagnosis

Cases of arboviral disease are also classified either as confirmed or probable, according to the following laboratory criteria:

Confirmed case:

- Four-fold or greater change in virus-specific serum antibody titer, or
- Isolation of virus from or demonstration of specific viral antigen or genomic sequences in tissue, blood, CSF, or other body fluid, or
- Virus-specific immunoglobulin M (IgM) antibodies demonstrated in CSF by antibody-capture enzyme immunoassay (EIA), or
- Virus-specific IgM antibodies demonstrated in serum by antibody-capture EIA and confirmed by demonstration of virus-specific serum immunoglobulin G (IgG) antibodies in the same or a later specimen by another serologic assay (e.g., neutralization or hemagglutination inhibition).

Probable case:

- Stable (less than or equal to a two-fold change) but elevated titer of virus-specific serum antibodies, or
- Virus-specific serum IgM antibodies detected by antibody-capture EIA but with no available results of a confirmatory test for virus-specific serum IgG antibodies in the same or a later specimen.

Case definition

A case must meet one or more of the above clinical criteria and one or more of the above laboratory criteria.

Comment

Because closely related arboviruses exhibit serologic cross-reactivity, positive results of serologic tests using antigens from a single arbovirus can be misleading. In some circumstances (e.g., in areas where two or more closely related arboviruses occur, or in imported arboviral disease cases), it may be epidemiologically important to attempt to pinpoint the infecting virus by conducting cross-neutralization tests using an appropriate battery of closely related viruses. This is essential, for example, in determining that antibodies detected against St. Louis encephalitis virus are not the result of an infection with West Nile (or dengue) virus, or vice versa, in areas where both of these viruses occur. Because dengue fever and West Nile fever can be clinically indistinguishable, the importance of a recent travel history and appropriate serologic testing cannot be overemphasized. In some persons, West Nile virus-specific serum IgM antibody can wane slowly and be detectable for more than one year following infection. Therefore, in areas where West Nile virus has circulated in the recent past, the co-existence of West Nile virus-specific IgM antibody and illness in a given case may be coincidental and

unrelated. In those areas, the testing of serially collected serum specimens assumes added importance.

The seasonality of arboviral transmission is variable and depends on the geographic location of exposure, the specific cycles of viral transmission, and local climatic conditions. Reporting should be etiology-specific (see below; the six diseases printed in bold are nationally reportable to CDC):

- **St. Louis encephalitis virus disease**
- **West Nile virus disease**
- **Powassan virus disease**
- **Eastern equine encephalitis virus disease**
- **Western equine encephalitis virus disease**
- **California serogroup virus disease** (includes infections with the following viruses: California encephalitis, Jamestown Canyon, Keystone, La Crosse, snowshoe hare, and trivittatus)

Note: Due to the continued risk of unintentional or intentional introduction of exotic arboviruses into the United States (e.g., Venezuelan equine encephalitis virus), or the reemergence of indigenous epidemic arboviruses (e.g., St. Louis encephalitis and western equine encephalitis viruses), physicians and local public health officials should maintain a high index of clinical suspicion for cases of potential exotic or unusual arboviral etiology, and consider early consultation with arboviral disease experts at state health departments and CDC.

B. Classification Tables

Table VII-B lists the criteria that must be met for a case to be classified as confirmed or probable (presumptive).

Table VII-B. Proposed table of criteria to determine whether a case is classified. Note: The following criteria are proposed for evaluation before general implementation. For purposes of current notification, the narrative description in VII-A, should be used.

	Case Definition											
Criterion	Confirmed						Probable					
Clinical Presentation	Non-Neuroinvasive		Neuroinvasive				Non-Neuroinvasive		Neuroinvasive			
Fever	N	N	N	N	N	N	N	N	N	N	N	N
Headache	C	C	C	C	O	O	C	C	C	C	O	O
Stiff Neck	A	A	C	C	O	O	A	A	C	C	O	O
Aseptic Meningitis	A	A	C	C	O	O	A	A	C	C	O	O

Encephalitis	A	A	O	O			A	A	O	O		
Disorientation	A	A	O	O			A	A	O	O		
Myelitis	A	A	O	O			A	A	O	O		
Obtundation	A	A	O	O			A	A	O	O		
Stupor	A	A	O	O			A	A	O	O		
Coma	A	A	O	O			A	A	O	O		
Paresis	A	A	O	O			A	A	O	O		
Paralysis	A	A	O	O			A	A	O	O		
Nerve Palsies	A	A	O	O			A	A	O	O		
Sensory Deficit	A	A	O	O			A	A	O	O		
Abnormal Reflexes	A	A	O	O			A	A	O	O		
Abnormal movements	A	A	O	O			A	A	O	O		
Convulsions	A	A	O	O			A	A	O	O		
Laboratory findings												
CSF Pleocytosis	A	A	C	C	N	N	A	A	C	C	N	N
Four-fold or greater change in WNV -specific serum antibody titer	O		O		O		A	A	A	A	A	A
Elevated WNV -specific immunoglobulin G (IgG) antibodies in the acute or convalescent serum specimen as measured by VN or HI or IgG enzyme immunoassay (EIA)		N		N		N		A		A		A
WNV -specific immunoglobulin M (IgM) antibodies demonstrated in serum by IgM antibody-capture enzyme immunoassay (EIA)		N		N		N	A	N	A	N	A	N
Isolation of WNV from tissue, blood, CSF, or other body fluid	O		O		O		A	A	A	A	A	A
Demonstration of WNV -specific nucleic acid genomic sequences from tissue, blood, CSF or other body fluid.	O		O		O		A	A	A	A	A	A
WNV -specific immunoglobulin M (IgM) antibodies demonstrated in CSF by IgM antibody-capture enzyme immunoassay (EIA)	O		O		O		A	A	A	A	A	A

Stable (less than or equal to a two-fold change) but elevated titer of WNV virus-specific serum antibodies							N	A	N	A	N	A

Notes:
N = This criterion in conjunction with all other "N" and any "O" criteria in each category in the same column is required to classify a case.
O = At least one of these "O" criteria in each category in the same column (e.g., clinical presentation and laboratory findings)—in conjunction with all other "N" criteria in the same column—is required to classify a case.
A = This criterion must be absent (i.e., NOT present) for the case to meet the case definition.
C = This finding corroborates (i.e., supports) the diagnosis of—or is associated with—West Nile virus disease, but is not included in the case definition.

VIII. Period of Surveillance

Surveillance should be on-going.

IX. Data sharing/release and print criteria

Notification to CDC of confirmed and probable cases of West Nile Virus is recommended.

CDC Division of Vector Borne Infectious Diseases (DVBID) staff review, analyze, and summarize the national data weekly. Provisional state-specific arboviral disease case counts are provided weekly in the MMWR nationally notifiable diseases tables and posted on EpiX. Tables and maps are also provided on the CDC DVBID and U.S. Geologic Survey (USGS) websites. These provisional data are used to 1) Monitor the epidemiology and geographic spread of arboviral diseases; 2) Provide timely information regarding regional and national trends in arboviral diseases to public health officials and others; and 3) Identify geographic areas where additional prevention and control efforts may be needed. In circumstances where there is a potential for an international health impact, data from these notifications may be shared with international partners (e.g., PHAC, ECDC, WHO, PAHO).

Final data are published annually in the MMWR Summary of Notifiable Diseases, posted on the CDC DVBID website, and presented or published at scientific meetings and in peer-reviewed literature. Additional tables and limited use datasets are available to researchers, pharmaceutical companies, media, and the general public upon request from CDC DVBID. These final data are used to 1) Monitor the epidemiology, incidence, and geographic spread of arboviral diseases; 2) Identify geographic areas in which it may be appropriate to conduct analytic studies of important public health issues; and 3) Evaluate arboviral disease funding needs and allocate resources.

All cases are verified with the state health departments before publication. Individual case notifications are made to state and local health departments depending on circumstances. For

example, possible viremic blood donors or transplant or transfusion-associated cases require rapid notification and investigation.

To facilitate access to ArboNET data while maintaining patient confidentiality, and to ensure that users understand the limitations of the data, the CDC Arboviral Diseases Branch has developed data sharing and release guidelines, a data request form and a data use agreement. These policies and procedures are consistent with those developed by CDC and the Council of State and Territorial Epidemiologists (CSTE) for the release and sharing of data reported to the Nationally Notifiable Diseases Surveillance System (NNDSS).

Additional tables are available that include a) Total counts of a particular nationally notifiable arboviral disease reported to ArboNET by state, month, and year, or b) Total counts of a particular nationally notifiable arboviral disease reported to ArboNET by county and year (but not month). Upon request, CDC DVBID will provide a limited use data set that contains a line-listing of case-specific data for any of the particular nationally notifiable arboviral diseases reported to ArboNET. The variables in the data file may include clinical syndrome (neuroinvasive or non-neuroinvasive), state, year, month, age group (<1 yr, 1-4 yrs, and by 5 year intervals thereafter), sex, race, and ethnicity. If the total number of cases in a state in a year for a given arboviral disease is $\leq$3, then race and ethnicity will be suppressed for all cases in that state in that year. To receive a case-specific data set, the investigator must complete a data request form and data use agreement confirming that they have read and understand the data release policies.

X. References

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