POLIOMYELITIS
Report Immediately

✓DISEASE AND EPIDEMIOLOGY

Clinical Description:

The severity of the clinical manifestations of poliovirus infection can be highly variable.

- *Clinically unapparent* disease accounts for nearly 95% of poliovirus infections.
- *Abortive poliovirus* occurs in 4-8% of cases and is characterized by non-specific viral symptoms that resolve within a week. The three syndromes most commonly observed are upper respiratory tract infections, gastrointestinal disturbances, and influenza-like illness.
- *Nonparalytic aseptic meningitis* develops in 1-5% of infected persons. The symptoms usually follow a mild prodrome and may last 2-10 days before complete recovery.
- *Paralytic poliomyelitis* is characterized by asymmetric, acute flaccid paralysis with loss of reflexes in the involved limbs. It occurs in only 0.1-2% of cases and usually presents with fever.

Paralytic symptoms usually begin 1-10 days after prodromal symptoms and will progress for 2-3 days. Usually, no further paralysis occurs after the temperature subsides. After the acute episode, many patients recover at least some muscle function. Weakness or paralysis still present 12 months after onset is usually permanent. Risk factors for paralytic disease include larger inoculum of poliovirus, increasing age, pregnancy, strenuous exercise, tonsillectomy, and intramuscular injections administered while the patient is infected with poliovirus.

25-40% of persons infected with paralytic poliomyelitis will develop post-polio syndrome 30-40 years later. This syndrome is characterized by muscle pain, exacerbation of existing weakness, and/or development of new paralysis or weakness. Risk factors for developing this syndrome include increasing time since acute polio infection, the presence of permanent residual impairment after recovery of the acute illness, and being female.

Causative Agent:

Polioviruses are enteroviruses. There are three serotypes of polioviruses that cause disease. All are capable of causing paralysis, however type 1 is most frequently isolated from paralytic cases and is the cause of most epidemics. Types 2 and 3 viruses are more likely to be associated with vaccine-associated paralytic poliomyelitis (VAPP) than type 1.

Differential Diagnosis:

Differential diagnosis includes Guillain-Barré syndrome, tick paralysis, paralytic rabies, acute transverse myelitis, diphtheria, buckthorn poisoning, botulism, myasthenia gravis, neuroinvasive West Nile virus, and acute brachial neuritis.

Laboratory identification:

Viral Culture:

Virus isolation is the most common and optimal test for poliovirus infection. Samples should be collected as soon as possible, ideally within 14 days of symptom onset. To increase the probability of isolating poliovirus, two or more samples should be collected at least 24 hours apart. Stool specimens collected two or more months after onset of paralytic manifestations are unlikely to yield poliovirus. If poliovirus is isolated, it must be tested further at the CDC to determine if the virus is wild-type or vaccine type. A stool specimen is the most likely source to isolate poliovirus, followed by throat swabs and CSF. Submission to CDC should be coordinated through UDOH epidemiologist.

RT-PCR:

RT-PCR can also be used to identify poliovirus and to determine if the virus is wild-type or vaccine type. RT-PCR is sensitive and specific, and results are available earlier than with viral culture. Throat swabs, CSF, serum, urine and stool have all been used to isolate poliovirus.

Serology:

Serologic methods are not the preferred method for diagnosing poliovirus infection. Serologic test results can be difficult to interpret, cannot distinguish between wild-type and vaccine type infections, and may produce false-negative results because neutralizing antibodies appear early in the course of infection and may already be at high levels by the time sera are collected, and titers may not change. A four-fold rise in neutralizing antibody between the acute and convalescent specimens (collected 3-4 weeks apart) is suggestive of acute poliovirus infection. Other serologic methods include neutralization, complement fixation, and IFA.

> **USL:PH:** The Utah Public Health Laboratory can provide culture for enteroviruses.

Treatment:

There is no specific treatment for poliovirus.

Case fatality:

Case-fatality rates for paralytic polio are estimated to be 2-5% for children and 15-30% for adults.

Reservoir:

Humans are the only known hosts of poliovirus.

Transmission:

Poliovirus is primarily transmitted from person-to-person via the fecal-oral route, though oral-oral transmission has been documented. In rare instances, the virus has been transmitted by contaminated sewage or water. All infected persons, regardless of clinical manifestation, are capable of spreading disease.

Susceptibility:

Thanks to the Global Polio Eradication Program, polio no longer occurs in many parts of the world. The last documented indigenous transmission of wild poliovirus in the United States was in 1979. The Western hemisphere was certified polio-free in 1994. However, poliovirus infection may still occur in the United States among unimmunized persons who are exposed to poliovirus in areas of the world with active circulation, or are linked to a case with imported poliovirus. Infection with poliovirus results in life-long, serotype-specific immunity. However, infection with one serotype does not protect against infection with another. In temperate climates, poliovirus infections are most common in the summer and in fall.

Incubation period:

The incubation period for paralytic poliomyelitis is usually 6-20 days, with a range of 3–35 days. In persons developing asymptomatic or mild poliovirus infection, the incubation period is typically 3–6 days.

Period of communicability:

Persons infected with poliovirus are most infectious from 7 to 10 days before and after the onset of symptoms, but poliovirus may be present in the stool from 3 to 6 weeks. In recipients of oral (live) polio vaccine (OPV), the virus persists in the throat for 1–2 weeks and is excreted in feces for several weeks, although in rare cases, excretion for more than two months can occur.

Epidemiology:

Prior to the widespread use of polio vaccine, poliomyelitis occurred worldwide. Polio was epidemic in the US for the first half of the 20th century with over 57,000 cases of paralytic disease in 1952. After the introduction of vaccination, the reported number of cases of poliomyelitis in the U.S. dropped to less than 100 in 1965 and less than 10 in 1973. The last case of wild-type polio disease in the Western Hemisphere was detected in Peru in 1991. The Western Hemisphere was declared free from indigenous wild-type poliovirus transmission in 1994. However, importation of wild-type poliovirus from areas that still have endemic disease can occur among under-immunized tourists, immigrants, or even unimmunized US residents regardless of travel history. The last two outbreaks of poliomyelitis in the U.S. were reported among groups opposed to immunization due to their religious beliefs.

✓PUBLIC HEALTH CONTROL MEASURES

Public health responsibility:

- Investigate all suspect cases of disease and fill out and submit appropriate disease investigation forms.
- Provide education to the general public and clinicians regarding disease transmission and prevention.
- Identify clusters or outbreaks of this disease.
- Identify sources of exposure and stop further transmission.

Prevention:
Vaccination is the best way to prevent infection with poliovirus.

Chemoprophylaxis:
Appropriate vaccination of all close contacts can prevent further disease spread. However, often by the time one case is recognized, the virus has already infected susceptible contacts.

Vaccine:
All children should receive four doses of inactivated poliovirus (IPV) prior to school entry. IPV is recommended to be given at 2 months, 4 months, 6–18 months, and 4–6 years of age. Children who have previously been vaccinated with only oral polio virus (OPV) should receive one dose of IPV before entering school.

If the poliovirus vaccines are administered according to their licensed indications for minimum ages and intervals between doses, administration of four doses of IPV or OPV in any combination by 4–6 years of age is considered a complete poliovirus vaccination series. A child must have at least one IPV dose prior to school entry.

The primary series of IPV for adults consists of three doses of IPV. The second dose should follow the first by 4-8 weeks, and the third should follow the second by 6–12 months.

In circumstances where accelerated protection is needed, the minimum interval between doses of poliovirus vaccine is 4 weeks. Previously vaccinated persons who are considered to be at increased risk of exposure to poliovirus (e.g., travelers to polio-endemic areas, laboratory workers) should receive a single additional dose of IPV.

At least 90% of IPV vaccine recipients develop immunity to all three polioviruses after two doses of vaccine. At least 99% of vaccine recipients will develop protective antibodies after three doses. The duration of immunity after a full series of IPV is not completely known, but it is thought to provide protection for many years.

Vaccine-associated paralytic poliomyelitis (VAPP) is a rare adverse reaction following live OPV vaccine. It is thought to occur through a mutation or reversion in the vaccine virus to a form similar to wild-type virus. VAPP is more likely to occur in persons 18 years of age and older and immunodeficient children. OPV has not been used in the US since 2000; the last case of VAPP acquired in the US occurred in 1999.

Immunization during pregnancy should be avoided because of the theoretical risk, although no effects on developing fetuses have been documented. If immediate protection is needed, IPV vaccine is recommended.

Isolation and quarantine requirements:

Isolation: Persons infected with paralytic poliomyelitis should remain isolated for six weeks after the onset of symptoms or until poliovirus can no longer be recovered from feces. The UDOH will determine the number of negative specimens needed on a case-by-case basis. Additionally, all throat discharges, feces, and articles soiled with either should be properly disinfected or disposed of. Isolation is not required for persons with nonparalytic poliovirus.
Hospital: Standard and contact precautions for six weeks after onset of symptoms or until poliovirus can no longer be recovered from feces The UDOH will determine the number of negative specimens needed on a case-by-case basis.
Quarantine: Contacts with an unknown or incomplete immunization history must remain quarantined until appropriate immunization.

✓CASE INVESTIGATION

Reporting:

If paralytic poliomyelitis is at all suspected, it should be reported immediately to the local health department or the Utah Department of Health. Nonparalytic poliovirus infections should be reported to a public health entity within 3 working days.

CSTE Reporting Swimlanes

Criterion	Reporting		
Clinical Presentation			
Acute onset, flaccid paralysis	N	N	
Trauma to affected limb			
Spinal cord injury			
Laboratory findings			
Isolation of poliovirus from a clinical specimen			S
Order of a culture for poliovirus	O		S
Order for acute and convalescent serum anti-polio IgG antibodies	O		
Epidemiological risk factors			
Resident of or international travel to country using OPV in past 30 days		O	
Receipt of oral polio vaccine in last 30 days		O	
Contact with person who has received oral polio vaccine in the last 75 days		O	
0 doses of polio vaccine (IPV or OPV)		O	

Notes:
[1]"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.

A= This criterion can NOT be present for the case to meet the case definition.
S = This criterion alone is sufficient to report or confirm a case
N = This criterion in conjunction with all other "N" and any "O" criteria in the same column is required to report or confirm a case. A number following an "N" indicates that this criterion is only required for a specific clinical presentation.
O = At least one of these "O" criteria in each category (e.g., clinical presentation and laboratory findings)—in conjunction with all other "N" criteria in the same column—is required to report or confirm a case. A number following an "O" indicates that this criterion is only required for a specific clinical presentation.
*A requisition for any of the "S" or "N" laboratory tests is sufficient to meet the reporting criteria
+International travel excludes countries that are free of polio and use only inactivated polio vaccine.

Case Definition:
Poliomyelitis (2010):

1. ***Paralytic poliomyelitis***

Probable: Acute onset of a flaccid paralysis of one or more limbs with decreased or absent tendon reflexes in the affected limbs, without other apparent cause, and without sensory or cognitive loss.

Confirmed: Acute onset of a flaccid paralysis of one or more limbs with decreased or absent tendon reflexes in the affected limbs, without other apparent cause, and without sensory or cognitive loss; AND in which the patient

- has a neurologic deficit 60 days after onset of initial symptoms; or
- has died; or
- has unknown follow-up status.

2. ***Nonparalytic poliovirus infection***

Confirmed: Any person without symptoms of paralytic poliomyelitis in whom a poliovirus isolate identified in an appropriate clinical specimen (e.g., stool, cerebrospinal fluid, oropharyngeal

secretions), with confirmatory typing and sequencing performed by the CDC Poliovirus Laboratory, as needed.

Comment

All suspected cases of paralytic poliomyelitis are reviewed by a panel of expert consultants before final classification occurs. Confirmed cases are then further classified based on epidemiologic and laboratory criteria (11). Only confirmed cases are included in Table I in the *MMWR*. Suspected cases are enumerated in a footnote to the *MMWR* table.

CSTE Case Classification Swimlanes

	Paralytic Poliomyelitis			**Non-paralytic Poliovirus**
Criterion	**Confirmed**		**Probable**	**Confirmed**
Clinical Presentation				
Acute onset, flaccid paralysis	N	N	N	A
Decreased tendon reflexes	N	N	N	
Sensory deficit in affected limb(s)	A	A	A	
Cognitive deficit	A	A	A	
Paralysis present 60 days after onset		O		
Death		O		
Follow-up status unknown		O		
Other apparent cause of paralysis (e.g., trauma to affected limb, spinal cord injury)	A	A	A	
Laboratory findings				
Isolation of poliovirus from a clinical specimen				S

Notes:
S = This criterion alone is sufficient to classify a case
N = This criterion in conjunction with all other "N" and any "O" criteria 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.

*A requisition or order for any of the "S" or "N" laboratory tests is sufficient to meet the reporting criteria. A requisition or order for any of the "O" laboratory tests—in conjunction with all other "N" criteria in the same column AND at least one of any

"O" criteria in the other non- laboratory categories in the same column—is sufficient to meet the reporting criteria.

Epidemiologic classification:

Confirmed cases are further classified based on epidemiologic and laboratory criteria.

Indigenous case:

Any case which cannot be proved to be imported.

Imported case:

A case which has its source outside the United States. A person with poliomyelitis (United States resident or other) who has entered the United States and had onset of illness within 30 days before or after entry.

Case Investigation Process:

- Fill out a morbidity form
- Assure that all case contacts are identified and appropriately managed
- Assure that appropriate laboratory testing and characterization occurs

Outbreaks:

A single case of paralytic poliomyelitis is considered an outbreak. Identify all close contacts and define population groups at specific risk and immunize.

Identification of case contacts:

Close contacts are people who have the following contact with the case patient during the infectious period (10 days before symptom onset to 6 weeks after symptom onset):

- Household and immediate family members (those who spend many hours together or sleep under the same roof);
- Those who have direct contact with throat secretions or feces;
- Healthcare workers with face-to-face contact with a patient;
- Caretakers who handle materials soiled with throat secretions or feces; and
- Those who share confined space during the communicable period. Such contacts may include:
    - Core groups of close friends, social contacts, boyfriends, girlfriends,
    - Students within the same kindergarten class or grade level,
    - Contacts at church activities and employment,
    - Participants in extracurricular activities (such as fieldtrips),
    - Children attending after-school care or a playgroup.

Case contact management:

- Assess immunity. Contacts must be able to produce documentation of vaccination – a verbal history of vaccination is not sufficient.
- Vaccinate susceptible contacts.
- Provide educational materials informing of exposure and recommending vaccination.

✓REFERENCES

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