Six Cases of Acute Flaccid Myelitis in Children — Minnesota, 2018

Heidi Moline, MD1; Anupama Kalaskar, MD2; William F. Pomputius III, MD2; Adriana Lopez, MHS3; Janell Routh, MD3; Cynthia Kenyon, MPH4; Jayne Griffith, MA, MPH4

During September 14–October 1, 2018, the Minnesota Department of Health (MDH) was notified of six children hospitalized in the Minneapolis-St. Paul region with symptoms consistent with acute flaccid myelitis (AFM). A confirmed case of AFM is defined as acute onset of flaccid limb weakness with magnetic resonance image indicating spinal cord lesions largely restricted to gray matter and spanning one or more vertebral segments (1). All six cases were confirmed by CDC. After a cluster of three cases occurred in 2014, an average of fewer than one AFM case per year had been reported to MDH.

Among the six patients, the median patient age was 6.0 years (range = 1.3–9.2 years). All children resided in different Minnesota counties, and all experienced fever and upper respiratory signs and symptoms (e.g., rhinorrhea and cough) beginning a median of 8 days (range = 5–11 days) before weakness onset; none had a history of being immunocompromised. In addition, four patients experienced neck pain or headache, and two experienced diarrhea before weakness onset. Four patients had marked weakness of proximal muscle groups in one arm, although distal motor function was largely preserved.

The other two patients initially had weakness in one leg, which became bilateral and rapidly ascended during hospitalization; both of these patients required endotracheal intubation and mechanical ventilation. In all six patients, limb weakness was first noted after waking in the morning. No epidemiologic links among patients were identified.

All six patients were hospitalized. Three patients were discharged home, and two were discharged to inpatient rehabilitation facilities. One patient remains hospitalized with complete paralysis of all voluntary muscles, including the diaphragm, at the time of this report. All discharged patients had residual weakness at time of discharge; among these patients, the median duration of hospitalization was 8 days (range = 1–14 days).

Magnetic resonance imaging (MRI) indicated spinal cord gray matter involvement in all six patients, largely in the anterior horns. The extent of gray matter involvement did not always correlate with deficits seen on physical exam; in three patients with only single limb weakness, multisegment gray matter involvement was apparent. Among all patients, three had anterior nerve root and facial nerve enhancement, and two had basilar and brainstem involvement. Three patients had normal MRI findings early in the illness course, but demonstrated extensive gray matter involvement on a subsequent MRI.

Cerebrospinal fluid (CSF) was collected in five patients, with pleocytosis (white blood cell count >5 cells/mm3) present in two patients (Table). One CSF specimen (patient B) was positive for enterovirus (not typed) by reverse transcription–polymerase chain reaction (RT-PCR) at a commercial reference laboratory. Serum, CSF, stool, and nasopharyngeal specimens from five patients were tested at CDC. One nasopharyngeal swab (patient D) was positive for enterovirus-D68 (EV-D68) by real-time RT-PCR. One nasal wash specimen from patient B was positive for EV-D68 and a second specimen for EV-D68 and parechovirus A6 by real-time RT-PCR; CSF from this patient also was positive for EV-D68. The remaining specimens were negative, including those from three patients who had no positive specimens. All stool specimens were negative for poliovirus.

Five of six patients received some form of immunomodulatory treatment (Table). One patient was treated with steroids and plasmapheresis followed by intravenous immune globulin (IVIG), one with steroids followed by IVIG, three with only IVIG, and one with supportive care only.

This AFM cluster, the largest identified in Minnesota, occurred during a period of increased reporting of AFM nationally and is consistent with the epidemiologic and clinical characteristics of previously described AFM clusters (2–6). Despite report of upper respiratory tract signs and symptoms in all patients, testing for viruses that commonly cause upper respiratory tract infections was positive from nonsterile specimens in only two cases. EV-D68 in the CSF of patient B is considered the cause of AFM in this patient. Detection of a pathogen in the CSF might be related to the severity and prolonged nature of illness in this patient; however, host or other factors contributing to illness severity are unknown.

AFM is a rare but serious cause of sudden onset limb weakness, especially in children, and should be considered in the differential diagnosis. Diagnosis and care of patients with AFM includes early collection of specimens, including CSF, for laboratory testing, MRI scans, and consultation with neurology and infectious disease experts. Potential cases should be reported to public health departments in a timely manner. Public health classification of AFM cases involves expert review of clinical and imaging findings; however, it is important that clinical care not be delayed pending case classification.

Corresponding author: Heidi Moline, hmoline@umn.edu.
TABLE. Demographic characteristics, clinical findings and evaluation, hospital course, and outcome among six patients with acute flaccid myelitis — Minnesota, September–October 2018

| Characteristic                                      | Patient A | Patient B | Patient C | Patient D | Patient E | Patient F |
|----------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| **Age**                                            | 7 yrs     | 7 yrs     | 16 mos    | 3 yrs     | 9 yrs     | 5 yrs     |
| **Sex**                                            | Male      | Female    | Female    | Female    | Female    | Female    |
| **Previous/Underlying medical conditions**          | None      | None      | Cerebral palsy, seizure disorder | Congenital cataract | None | None |
| **Viral prodrome period**                          | Sep 9–11  | Sep 9–13  | Sep 17–19 | Sep 16–18 | Sep 17–21 | Sep 21–26 |
| **Other symptoms preceding weakness onset**         | Headache, vomiting, body aches | Headache | Headache | Diarrhea | Headache, neck ache, vomiting, diarrhea |  |
| **Weakness onset date**                             | Sep 14    | Sep 19    | Sep 22    | Sep 23    | Sep 24    | Sep 29    |
| **Weakness site**                                   | Left arm  | Left leg  | Left leg  | Left arm  | Right arm | Right arm |
| **Hospital admission date**                         | Sep 20    | Sep 19    | Sep 22    | Sep 25    | Sep 28    | Oct 1     |
| **Magnetic resonance Imaging findings**             | HD 1: Normal | HD 1: Normal | HD 1: Normal | HD 3: Extensive enhancement of cervical and brainstem gray matter | HD 1: Enhancement of gray matter in cervical and thoracic cord | HD 2: Enhancement of cervical and brainstem gray matter |
| **Cerebrospinal fluid test results**                | HD 1: No pleocytosis; no virus detected | HD 1: Pleocytosis; no virus detected | HD 1: Pleocytosis; no virus detected | HD 1: No pleocytosis; no virus detected | Not collected | HD 1: No pleocytosis; no virus detected |
| **Nasopharyngeal swab test results**                | HD 7: No virus detected | HD 3: EV-D68 positive | HD 10: EV-D68 positive; PEV-A6 positive | HD 1: No virus detected | Not collected | HD 1: No virus detected |
| **Treatment**                                       | Steroids, IVIG | Plasmapheresis, steroids, IVIG | IVIG | IVIG | None | IVIG |
| **Hospital course**                                 | Left arm and left facial weakness noted at admission; facial weakness improved; arm weakness with minimal improvement at discharge | Rapidly ascending paralysis; respiratory failure; loss of all voluntary motor function; pupillary response intact; cognitively intact; no clinical improvement | Ascending paralysis; respiratory failure; gradual improvement of weakness; persistent left leg weakness and dysphagia at discharge | Left arm and left facial weakness at admission; resolution of facial weakness; improved arm weakness at discharge | Right arm weakness at admission; mild improvement of weakness at discharge | Right arm and neck weakness at admission; improvement in neck weakness; minimal improvement of arm weakness at discharge |
| **Discharge date**                                  | Oct 3     | Not applicable | Oct 4     | Oct 3     | Sep 29    | Oct 10    |
| **No. of days hospitalized**                        | 14        | >90 (ongoing) | 12        | 9         | 1         | 9         |
| **Discharge location**                              | Home      | Inpatient rehabilitation | Home | Home | Inpatient rehabilitation  |  |

**Abbreviations:** EV = enterovirus; HD = hospital day; IVIG = intravenous immunoglobulin; PEV = parechovirus.

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1Department of Pediatrics, University of Minnesota Masonic Children’s Hospital, University of Minnesota Medical School, Minneapolis, Minnesota; 2Division of Infectious Disease, Children’s Hospitals and Clinics of Minnesota, Minneapolis, Minnesota; 3National Center for Immunization and Respiratory Diseases, CDC; 4Infectious Disease Epidemiology, Prevention and Control Division, Minnesota Department of Health.
References

1. CDC. Acute flaccid myelitis (AFM) 2018 case definition. Atlanta, GA: US Department of Health and Human Services, CDC; 2018. https://wwwn.cdc.gov/nndss/conditions/acute-flaccid-myelitis/case-definition/2018/

2. Messacar K, Schreiner TL, Van Haren K, et al. Acute flaccid myelitis: a clinical review of US cases 2012–2015. Ann Neurol 2016;80:326–38. https://doi.org/10.1002/ana.24730

3. Maloney JA, Mirsky DM, Messacar K, Dominguez SR, Schreiner T, Stence NV. MRI findings in children with acute flaccid paralysis and cranial nerve dysfunction occurring during the 2014 enterovirus D68 outbreak. AJNR Am J Neuroradiol 2015;36:245–50. https://doi.org/10.3174/ajnr.A4188

4. Iverson SA, Ostdiek S, Prasai S, et al.; AFM Investigation Team. Notes from the field: cluster of acute flaccid myelitis in five pediatric patients—Maricopa County, Arizona, 2016. MMWR Morb Mortal Wkly Rep 2017;66:758–60. https://doi.org/10.15585/mmwr.mm6628a4

5. Bonwitt J, Poel A, DeBolt C, et al. Acute flaccid myelitis among children—Washington, September–November 2016. MMWR Morb Mortal Wkly Rep 2017;66:826–9. https://doi.org/10.15585/mmwr.mm6631a2

6. Sejvar JJ, Lopez AS, Cortese MM, et al. Acute flaccid myelitis in the United States, August–December 2014: results of nationwide surveillance. Clin Infect Dis 2016;63:737–45. https://doi.org/10.1093/cid/ciw372