La Crosse Viral Infection in Hospitalized Pediatric Patients in Western North Carolina

abstract

OBJECTIVE: La Crosse infection, caused by a rare mosquito-transmitted virus, is endemic in Western North Carolina. Given the large number of cases at our institution, our goal was to describe the presentation, management, and clinical course for pediatric patients with this disease.

METHODS: We retrospectively reviewed medical records from pediatric patients with antibody-confirmed La Crosse infection admitted to Mission Hospital July 2004 through August 2009. Demographics, clinical characteristics, management methods, length of hospital stay, and complications were analyzed. Regression analysis was used to assess relationships between presentation and clinical course.

RESULTS: Forty-seven pediatric patients were identified with antibody-confirmed La Crosse infection. Seventy percent were male, and the median age was 8 years. Admission signs and symptoms included fever (43%), headache (94%), vomiting (78%), altered mental status (58%), and seizures (61%). All patients had pleocytosis on cerebrospinal fluid studies (range 10–1063 cells/mm³). Median length of stay was 5 days. Seizure at admission was associated with an increased length of stay (2.4 additional days, 95% confidence interval 0.7–4.1). Eighteen patients (38%) received intensive care, 7 (19%) received parenteral or enteral (via nasogastric tube) nutrition, and 4 (9%) received mechanical ventilation. No statistically significant associations between presenting signs and symptoms and complications were found. Treatments included antibiotics (87%), antiviral medication (55%), seizure prophylaxis (47%), and isotonic fluids (98%).

CONCLUSIONS: Our data reflect few indicators to predict clinical course during hospital stay. Management strategies should include attention to development of seizure activity and preventive measures for syndrome of inappropriate antidiuretic hormone.

La Crosse viral infection, although relatively rare, is one of the most commonly reported causes of neuroinvasive arboviral diseases in the United States and the most commonly reported among children. The Appalachian region reports the majority of cases with the top reporting states for 2010 including North Carolina, Ohio, Tennessee, and West Virginia. The arboviral group of viruses found in the United States includes West Nile, St Louis, Eastern equine, Western equine, Powassan, and California serogroup. La Crosse virus, a member of the genus Bunyavirus, is the most frequently isolated member of the California serogroup.

La Crosse virus is a mosquito-transmitted virus, maintained in a cycle between treehole mosquitoes (most commonly Aedes triseriatus, also referred to as
Ochlerotatus triseriatus) and vertebrate hosts (typically chipmunks and squirrels) in deciduous forest habitats. Humans are considered “dead-end” or incidental hosts. Infected individuals often show no apparent symptoms. When symptoms do occur, they can range from a mild flulike illness to more severe meningitic and/or encephalitic neuroinvasive symptoms, including seizure, vomiting, syndrome of inappropriate antidiuretic hormone (SIADH), mental status changes, and coma. More severe symptomatology is most common in children <16 years of age. Fatalities are rare (<1%). An estimated 20% of reported neuroinvasive cases are found to have neurologic sequelae associated with high economic and social burdens.

In an effort to share our experiences with clinical course and disease management, and to improve communication of expectations with affected families, we conducted a retrospective review of all hospitalized pediatric patients who tested positive for La Crosse viral infection from 2004 to 2009 at Mission Hospital. Patient demographics, presenting symptoms, length of hospital stay, and hospital stay outcomes were reviewed to identify correlations that may predict clinical course during hospital stay and identify management strategies to prevent complications of La Crosse illness. Description of clinical management and treatment strategies are included in the results.

METHODS

Study Participants

Participants included all pediatric patients admitted to the hospital with laboratory-confirmed La Crosse viral infections from 2004 to 2009. Patients were considered to be positive for La Crosse infection if, during the acute or convalescent (2–4 weeks after initial symptoms) phases, serum, or cerebrospinal fluid (CSF) titers of IgM antibody to La Crosse were at least 1:64 or 1:16, respectively, as detected by an indirect fluorescent antibody test (Arbovirus IFA panel, Focus Diagnostics, Cypress, CA); or if either sample was positive for La Crosse IgM based on an antibody-capture enzyme immunoassay (Centers for Disease Control and Prevention [CDC]); or if antibodies were detected by plaque reduction neutralization testing (PRNT) (CDC). Samples were sent to the North Carolina State Laboratory of Public Health in Raleigh, North Carolina, for assessment, with PRNT performed at the CDC as needed (Fort Collins, CO). This study was approved by the hospital’s Institutional Review Board and the North Carolina Department of Health and Human Services. Patient identification remained confidential.

Measurements of Variables and Outcomes of Interest

Patient information was gathered retrospectively by using electronic medical records. Signs and symptoms present at admission, including headache, vomiting, nuchal rigidity, altered mental status, and seizure, were recorded based on patient or parent report. Initial serum and CSF analyses were performed by the hospital laboratory. Charts were also reviewed to determine neurologic and radiographic findings and hospital course and interventions for each patient. Inpatient complications were defined as receiving parenteral or enteral (via nasogastric tube) nutrition, having a seizure, developing hyponatremia (sodium <132 mmol/L), receiving mechanical ventilation, or receiving intensive care.

Statistical Analysis

Descriptive statistics, including median, ranges, and percentages, were assessed and reported. Associations between signs and symptoms present at hospital admission and the length of stay (LOS) were estimated by using linear regression with corresponding 95% confidence intervals. A multivariable model was assessed to account for potentially confounding variables. Associations between symptoms present at hospital admission and inpatient visit complications were assessed by estimating odds ratios with corresponding 95% confidence intervals by the use of exact logistic regression methods. Exact methods were used to provide a more conservative estimate because of low sample numbers. All analyses were performed by using SAS 9.2 (SAS Corporation, Cary, NC).

RESULTS

Patient Characteristics

From 2004 to 2009, 47 pediatric patients with laboratory-positive IgM or PRNT tests for La Crosse viral infection were admitted to the hospital (Table 1). The median age at presentation was 8 years (range 1–17 years) with a male predominance (70%). Most patients were white, non-Hispanic (85%), reflecting the population of Western North Carolina. Approximately one-third of the patients (36%) resided in Buncombe County at the time of hospitalization; the other patients came from 11 surrounding counties or other states. The majority of patients had government-sponsored insurance or no insurance, with 43% of the patients covered by private insurance. Most cases occurred between the months of July and October (96%). The hospital saw on average 7 cases of laboratory-confirmed pediatric
La Crosse viral infection per year, accounting for a large proportion of all cases, pediatric or adult, recorded in North Carolina (Fig 1).

**Presenting Signs and Symptoms**

Patients presented for hospital admission on average 3 days (range 0–7 days) after symptom onset. Patients with private insurance tended to present 1 day earlier than those without private insurance (3 vs 4 days). However, this association was not statistically significant ($P = .06$). The predominant presenting signs and symptoms were headache (94%), vomiting (78%), and seizures (61%) (Table 1). Although most patients (96%) had a fever ($\geq 100.4^\circ F$) during the course of illness, only 43% had a fever at hospital admission. Half of the patients (58%) showed alterations in mental status, including decreased alertness, somnolence, and disorientation. Other signs of altered mental status included slurred speech, gait disturbances, and hallucinations. A portion of patients presented with nuchal rigidity (19%) or hyponatremia (15%). No patients presented with a rash.

Initial complete blood cell counts revealed an elevated median white blood cell count of $14 \times 10^3$ cells/μL (range 7–36 $\times 10^3$ cells/μL) with a neutrophil predominance (75%), range 48%–87% (Table 2). Initial serum sodium levels were mildly diminished (mean 136.3 mmol/L, range 127–146 mmol/L). Frank hyponatremia was present in 7 patients on presentation (15%) (Table 1).

Initial CSF testing revealed a median white blood cell count of 160 cells/mm³ (range 10–1063 cells/mm³) with a higher lymphocyte percentage than that of the serum measurements (median 44%, range 0%–98%) (Table 2). The lymphocyte proportion of the CSF white blood cells increased with increasing time after symptom onset.

### TABLE 1 Demographic and medical characteristics for pediatric patients with laboratory-confirmed La Crosse infection admitted to Mission Hospital, 2004–2009

<table>
<thead>
<tr>
<th>Demographics</th>
<th>N = 47</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, median in years (range)</td>
<td>8 (1–17)</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>33</td>
<td>70.2</td>
</tr>
<tr>
<td>Female</td>
<td>14</td>
<td>29.8</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White, non-Hispanic</td>
<td>40</td>
<td>85.1</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>14.9</td>
</tr>
<tr>
<td>Insurance status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>20</td>
<td>42.6</td>
</tr>
<tr>
<td>Nonprivate</td>
<td>27</td>
<td>57.4</td>
</tr>
<tr>
<td>Symptoms at presentation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Headache</td>
<td>43</td>
<td>93.5</td>
</tr>
<tr>
<td>Fever $&gt;100.4^\circ F$</td>
<td>20</td>
<td>42.6</td>
</tr>
<tr>
<td>Altered mental status</td>
<td>27</td>
<td>57.5</td>
</tr>
<tr>
<td>Seizure</td>
<td>28</td>
<td>60.9</td>
</tr>
<tr>
<td>Vomiting</td>
<td>36</td>
<td>78.3</td>
</tr>
<tr>
<td>Nuchal rigidity</td>
<td>9</td>
<td>19.2</td>
</tr>
<tr>
<td>Serum Na $&lt;132$ mmol/L</td>
<td>7</td>
<td>14.9</td>
</tr>
<tr>
<td>Hospital stay outcomes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stay, median days (range)</td>
<td>5 (1–15)</td>
<td></td>
</tr>
<tr>
<td>Parenteral/enteral nutrition</td>
<td>7</td>
<td>14.9</td>
</tr>
<tr>
<td>Seizure in hospital</td>
<td>9</td>
<td>19.2</td>
</tr>
<tr>
<td>Serum Na $&lt;132$ mmol/L</td>
<td>10</td>
<td>21.3</td>
</tr>
<tr>
<td>Intensive care received</td>
<td>18</td>
<td>38.3</td>
</tr>
<tr>
<td>Mechanical ventilation</td>
<td>4</td>
<td>8.5</td>
</tr>
<tr>
<td>Mortality</td>
<td>1</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Na, sodium.

*a Other includes American Indian, Asian, Hispanic, or unstated.

*b Number with symptom or outcome present.

c Forty-five of 47 patients had fever either at admission or at some point during hospital stay.

d Of the 9 patients with seizures during hospital stay, 7 had seizures at admission.

e Seven patients had hyponatremia at admission; 3 developed hyponatremia during hospital stay.

f Thirteen patients were admitted to the PICU; 5 patients were transferred during hospital stay.
TABLE 2 Clinical Laboratory Values at Admission For Pediatrics With Laboratory Confirmed La Crosse Infection Admitted to Mission Hospital, 2004–2009

<table>
<thead>
<tr>
<th></th>
<th>Median</th>
<th>Range</th>
<th>10th</th>
<th>25th</th>
<th>50th</th>
<th>75th</th>
<th>90th</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Serum</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White cell count, ×10³/mL</td>
<td>14</td>
<td>7–36</td>
<td>9</td>
<td>11</td>
<td>14</td>
<td>19</td>
<td>23</td>
</tr>
<tr>
<td>Lymphocytes, %</td>
<td>16</td>
<td>5–35</td>
<td>7</td>
<td>9</td>
<td>16</td>
<td>19</td>
<td>25</td>
</tr>
<tr>
<td>Neutrophils, %</td>
<td>75</td>
<td>48–87</td>
<td>64</td>
<td>69</td>
<td>75</td>
<td>84</td>
<td>84</td>
</tr>
<tr>
<td>Sodium, mmol/L</td>
<td>136</td>
<td>127–146</td>
<td>131</td>
<td>134</td>
<td>136</td>
<td>139</td>
<td>141</td>
</tr>
<tr>
<td><strong>Cerebrospinal fluid</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White blood cell count, per mm³</td>
<td>160</td>
<td>10–1063</td>
<td>31</td>
<td>66</td>
<td>160</td>
<td>242</td>
<td>438</td>
</tr>
<tr>
<td>Lymphocytes, %</td>
<td>44</td>
<td>0–98</td>
<td>4</td>
<td>22</td>
<td>44</td>
<td>76</td>
<td>83</td>
</tr>
<tr>
<td>Neutrophils, %</td>
<td>26</td>
<td>0–94</td>
<td>1</td>
<td>9</td>
<td>26</td>
<td>58</td>
<td>78</td>
</tr>
<tr>
<td>Glucose, mg/dL</td>
<td>66</td>
<td>47–109</td>
<td>53</td>
<td>57</td>
<td>66</td>
<td>73</td>
<td>82</td>
</tr>
<tr>
<td>Protein, mg/dL</td>
<td>39</td>
<td>23–86</td>
<td>26</td>
<td>29</td>
<td>39</td>
<td>54</td>
<td>65</td>
</tr>
</tbody>
</table>

Every additional day between symptom onset and hospital admission was associated with a 5.2 percentage point increase in CSF lymphocytes ($P = .01$) and, relatedly, a decrease in CSF neutrophils by 4.4 percentage points ($P = .05$) (Fig 2). The initial CSF glucose level was normal with a median of 66 mg/dL (range 47–109 mg/dL). The median CSF protein level was also within normal limits at 39 mg/dL (range 23–86 mg/dL). Where recorded, opening pressure for lumbar punctures ranged from 15 to 44 cm ($n = 6$). Herpes simplex virus polymerase chain reaction was performed on 32 patients (68%), and all results were negative.

**Neurologic and Radiographic Testing**

Computed tomography (CT) scan of the brain was performed for 28 of the patients (60%). The results of only 1 examination were abnormal, with findings consistent with edema and mass effect (3%). Twenty patients (43%) had MRI examinations of the brain. Of these, 12 (60%) had abnormalities, mostly showing diffusion signal changes consistent with meningoencephalitis. One patient was diagnosed with acute demyelinating encephalomyelitis by MRI. EEGs were performed in 20 patients (43%). Background slowing or epileptiform changes were noted in 60% of those assessed.

**Hospital Course and Interventions**

The median LOS was 5 days (range 1–15 days). More than one-third of patients received intensive care (38%), with 13 patients directly admitted and 5 patients transferred after admission. Parenteral or enteral (via nasogastric tube) nutrition was required by 7 (15%) patients, and 4 (9%) received mechanical ventilation support. Nine patients (19%) showed seizure activity during hospital stay, 7 of which had seizure activity at admission. Three patients (6%) developed hyponatremia during their hospital stay. Severe complications developed in 3 patients. One patient developed nephrotoxicity due to acyclovir administration, 1 patient received steroids for acute demyelinating encephalomyelitis, and 1 patient died of severe hypoxic changes and cerebral edema due to status epilepticus before admission.

![FIGURE 2 Lymphocyte and neutrophil composition of CSF graphed by the number of days from symptom onset to hospital admission. Trend lines are shown.](http://hosppeds.aappublications.org/)
Most patients (98%) were given continuous isotonic intravenous fluids with dextrose 5% in normal saline solution (D5NS) or D5NS with 20 mEq/L KCl at two-thirds weight-based maintenance rate and were placed on our SIADH protocol (Fig 3). Antibiotics were administered for at least 48 hours to 41 (87%) of the patients, and acyclovir was administered to 26 (55%) of the patients while herpes simplex virus polymerase chain reaction results were pending. Antiseizure medication or prophylaxis was received by 22 patients (47%), with 19 patients (40%) discharged on maintenance seizure prophylaxis.

**Association of Signs and Symptoms With Prognosis**

In multivariate, linear analysis, seizure and vomiting at hospital admission showed the strongest association with LOS. Having a seizure at admission was associated with a median 2.4 day increase in LOS, adjusting for vomiting at admission, in comparison with patients not having seizure at admission (95% confidence interval 0.7–4.1). Vomiting at admission was associated with a median 2.1-day decrease in LOS, adjusting for seizure activity at admission (−2.1 days, 95% confidence interval −4.1 to −0.1). Other recorded signs and symptoms were not associated with LOS. Insurance status also did not influence LOS. Additionally, none of the assessed signs and symptoms at presentation were significantly associated with the development of other common complications during the hospital stay such as developing seizure, receiving parenteral or enteral (via nasogastric tube) nutrition, receiving mechanical ventilation, developing hyponatremia, or transferring to intensive care.

**SIADH Protocol**

**Fluid Assessment and Management**

**Assessment of hydration**

- Adequate intake
- Inadequate intake
  - No free water*
  - NGT feeds
  - IVF
  - Monitor for SIADH
    - NS Bolus (if concern for dehydration)
    - Isotonic fluids at 2/3 maintenance IVF
    - Monitor for SIADH

**Monitoring**

- Every 1 hour input and output checks
- Urine dipstick every void or every 6 hours if Foley in place

**Intervention**

- Perform Basic Metabolic Panel when:
  - Intake exceeds output by >250 mL (<10 kg admission weight) during period of admission time to 7 AM or any subsequent 24-hour period of 7 AM to 7 AM
  - Intake exceeds output by >500 mL (10–20 kg admission weight) during period of admission time to 7 AM or any subsequent 24-hour period of 7 AM to 7 AM
  - Intake exceeds output by >750 mL (> 20 kg admission weight) during period of admission time to 7 AM or any subsequent 24-hour period of 7 AM to 7 AM

**Notification**

- Notify physician for sodium < 133 mEq/L
- Sodium has decreased by > 4 mEq/L from admission sodium

**FIGURE 3** SIADH protocol for patients admitted with suspected La Crosse infection. IVF, intravenous fluids; NGT, nasogastric tube; NS, normal saline; SIADH, syndrome of inappropriate antidiuretic syndrome. *Oral administration of electrolyte-containing fluids only.

**DISCUSSION**

Although historically a disease of the Midwest, the largest number of reported neuroinvasive La Crosse cases in 2010 were from Western North Carolina. Our institution’s role as Western North Carolina’s largest tertiary referral center ensures that we treat most of the severe pediatric La Crosse cases in the region. This retrospective review describes our hospital’s experience with pediatric La Crosse disease, including a summary of clinical presentation, illness course, and management strategies.

Overall, the patient demographics in our study population are similar to
those reported in previous studies describing La Crosse illness in other areas.5–10 Over half of our patients had seizure activity during their disease course, consistent with previous findings.5–7,9,10 Similar to previous studies, symptoms of headache, vomiting, and fever were found in the majority of our patients.5–7,9,10 Notably, only half of our patients presented with fever at admission. Only 1 other study has reported on fever at presentation specifically, with positive findings in 86% of their participants.6 Given these results, fever may be a less useful indicator in initial diagnosis. This is notable in the setting of the recently updated CDC case definition for neuroinvasive arboviral diseases published in February 2011. The new clinical criteria for neuroinvasive disease include fever (≥100.4°F) and meningitis, encephalitis, acute flaccid paralysis, or other acute signs of neurologic dysfunction in the absence of a more likely clinical explanation.11 As a further diagnostic consideration at admission, we found a lower rate of nuchal rigidity in our patient population in comparison with previous studies.5,7,9,10 This clinical information may be helpful in differentiating patients with La Crosse viral infection from those presenting with bacterial meningitis. In this retrospective review, results of CSF analysis (including cell differential and protein and glucose values) did not always fit with expected values for viral infection, which underscores the difficulty in making assumptions for diagnostic purposes based on initial laboratory findings. Most notably, where we would expect a predominance of lymphocytes, indicative of a viral infection, our patients tended to have a fair percentage of neutrophils, suggestive of a bacterial etiology. The finding of higher-than-expected neutrophil proportion could be due to the early timing of lumbar punctures during the course of illness. This is supported by our finding of a shift toward an increasing proportion of lymphocytes and a decreasing proportion of neutrophils in the CSF of the patients with a more delayed hospital admission. Other studies have identified this same trend for viral meningitis,12–14 although these studies have not included patients with La Crosse infection. Because CSF analysis is not always accurate in predicting viral versus bacterial etiologies, we support starting empiric antibiotics for presumed bacterial meningitis and the use of acyclovir for potential herpes encephalitis in the setting of seizures associated with central nervous system infection.

Other diagnostic testing used on this patient population included head CT scans, brain MRI, and EEGs. Head CT scans provided little information of clinical relevance owing to the non-specific findings. The radiographic findings on head CT scans for encephalitis can range from normal to edema to blurring of gray-white matter differentiation. These findings rarely provided guidance for treatment. Brain MRI was more useful in the diagnosis of encephalitis for this patient population; however, again, it provided little guidance in directing treatment strategies. Based on our findings, we recommend MRI if there is an acute change in mental status and to evaluate for acute demyelinating encephalomyelitis. EEG was useful when subclinical seizures were suspected and did aid in guiding medical therapy.

In an effort to better communicate with families regarding disease course and prognosis, we reviewed the impact of a variety of presenting signs and symptoms on LOS. We found only seizure activity and vomiting on presentation to affect LOS at a statistically significant level. Having seizure activity on presentation was associated with an increased LOS. Unexpectedly, vomiting was associated with a decreased LOS. This could be due to increased attention to fluid management or increased likelihood of an earlier lumbar puncture, leading to symptomatic relief of intracranial pressure.

SIADH is a known complication of La Crosse viral infection and other central nervous system infections. It occurs when antidiuretic hormone secretion is not appropriately suppressed by low serum osmolality, leading to enhanced water reabsorption. Our inpatient team developed a protocol for early detection of SIADH in patients with encephalitis after a patient developed severe hyponatremia on hypotonic fluids. Because treatment of SIADH is fluid restriction, per our protocol, on admission, patients are placed on isotonic fluids of D5NS with or without 20 mEq/L KCl at two-thirds maintenance intravenous fluids rate. The protocol also includes an order set that provides nursing guidelines for monitoring urine output, urine specific gravity, and serum sodium levels. Patients with SIADH develop decreased urine output, decreased serum sodium levels, and increased urine osmolality. By routinely monitoring these values, SIADH can be identified early allowing for treatment before complications, including seizures and cerebral edema, develop. We identified 10 (21%) patients with hyponatremia, 1 component of SIADH. This is similar to previously reported results for patients with La Crosse infection.19 Of our 10 patients with hyponatremia, 7 were identified to have hyponatremia on...
presentation and 3 developed hyponatremia during their clinical course. Because no other studies report on the development of hyponatremia during hospitalization, the possible benefits of our SIADH protocol need to be formally assessed.

Other complications that developed during hospital stay included intensive care placement, seizure activity, parenteral or enteral (via nasogastric tube) nutrition, mechanical ventilation, and, in 1 case, death. Recorded presenting signs and symptoms were not significantly associated with development of these complications during hospital stay. Analysis was limited, however, by the low number of patients who developed some of the assessed complications. The 1 death was attributable to preadmission status epilepsy that resulted in extensive hypoxic ischemic injury.

At this time, only symptomatic management strategies exist for La Crosse illness. A recent pharmacokinetic study looking at ribavirin showed increased adverse effects with higher dosing needed to reach therapeutic levels in the CSF; therefore, the trial was discontinued.15 As of now, the data do not support the routine use of ribavirin for the treatment of La Crosse encephalitis.

The strengths of this study include its specific focus on the clinical course and care management for pediatric patients with La Crosse viral infection and its inclusion of a relatively large number of cases. Although La Crosse illness is endemic to our region, incidence nationwide is low, and few reports have extensively assessed the disease course. A key limitation of this study is the retrospective design, reviewing only laboratory-confirmed positive cases. La Crosse viral disease tends to be underreported, especially for milder presentations in which diagnostic testing is not performed. Therefore, our results are limited to those with a more severe disease presentation. Also, testing may be equivocal or falsely negative because it is based on antibody production, further restricting our study population.16 An additional limitation, due to the retrospective nature of this study, was insufficient information available on particular factors of interest, specifically opening pressures on lumbar punctures. These limitations restricted our ability to draw evidence-based conclusions on optimal treatment options.

La Crosse viral infection is the most commonly reported arboviral illness in children with known potential morbidity and mortality.1 This report recounted our experience with this illness in the endemic area of Western North Carolina. In addition, we introduced a patient management protocol for prevention and early detection of SIADH, a known complication of the illness. The benefits of this protocol should be better quantified through future study. Our clinical data reflect that there are, unfortunately, few indicators to suggest prognosis. Further research is needed in this area and in studying long-term outcomes, because there is evidence of a decline in attention and concentration abilities and other neurologic sequelae in affected children, with an associated social and economic burden.4-10 Additionally, improvements in diagnostic capabilities would expand our understanding of this disease and its impact on public health. Knowing the true burden of La Crosse illness may better direct public health interventions aimed at reducing the burden of this mosquito-borne illness.

REFERENCES


La Crosse Viral Infection in Hospitalized Pediatric Patients in Western North Carolina
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