



## Article Appraisal

**Article:** Utility of Neuroimaging in Children Presenting to a Pediatric Emergency Department With Ataxia.

**Date of Journal Club:** June 18, 2019

**Resident Reviewer Name(s) and Residency Affiliation:** Richard Lee PGY-3, CCFP-EM, Anas Manouzi, PEM Fellow

**Faculty Methodology/Bio-statistics Resource Person:** Dr. Frank Scheurmeyer

---

### Background and Study Objective(s):

The prevalence of childhood ataxia is estimated to be 26 per 100,000 children. While the majority of causes of acute ataxia in pediatrics are benign, ataxia can be the presenting symptom of serious intracranial pathology or the initial manifestation of a chronic or progressive neurological disease. Although neuroimaging is recommended and often performed in children who present to the emergency department with acute onset of ataxia, the authors of this article felt that a 2013 systematic review, conducted by Whelan et al, indicated that the diagnostic yield of such neuroimaging studies may be low. The authors felt that this systematic review had concluded that urgent neuroimaging is indicated for children with ataxia only in the presence of altered mental status, focal neurological signs, history of trauma, or when there is a clinical concern for a mass lesion.

Currently, evidence-based guidelines regarding neuroimaging for children who present with acute-onset ataxia to the ED are lacking. The authors' primary objective of this study was to evaluate the utility of neuroimaging in previously healthy children who presented to our pediatric ED with acute- or subacute-onset ataxia.

### Study Design:

This observational study included a retrospective chart review performed to identify patients evaluated for acute or subacute ataxia in an urban, academic children's hospital Pediatric ED from 2007 to 2013 in Detroit, Michigan. Patient demographics, historical features, physical examination findings, laboratory results, and neuroimaging results were collected. Neuroimaging studies that were classified as abnormal by a neuroradiologist not included in the study were further reviewed and classified by the study neurologist as clinically significant or not. Clinically significant neuroimaging findings were defined as any radiological finding that resulted in medical or surgical treatment that would not have been otherwise initiated but for the results of the test.

Participants included previously healthy children between the ages of 15 months and 18 years. Study patients were

identified using the International Classification of Diseases, Ninth Revision, Clinical Modification selecting the diagnostic codes for gait abnormality, cerebellar symptoms, and ataxia.

Children younger than 15 months were excluded because of difficulty in accurately diagnosing ataxia in children of this age group. Children with ventriculoperitoneal or ventriculoatrial shunts, developmental delay, and cerebral palsy were also excluded. Furthermore, children who had an established diagnosis of a condition where ataxia may be a primary or associated feature, such as multiple sclerosis, mitochondrial encephalopathy lactic acidosis and stroke-like symptoms, ataxia-telangiectasia, or Friedreich ataxia were excluded. However, if the child presented with ataxia and was diagnosed with multiple sclerosis after the completion of workup, they were included in the study. Acute ataxia was defined as symptom onset within 72 hours prior to presentation to their pediatric ED and subacute ataxia was defined as symptoms starting less than 1 week prior to initial evaluation, in a child with no underlying neurological disorder.

Focal findings were defined as hemiparesis, paraparesis, cranial nerve signs other than nystagmus, papilledema, pathologically brisk or absent tendon reflexes, positive Babinski sign, aphasia, or dysphasia.

## Results:

A total of 141 patients were evaluated for acute/subacute ataxia during the study period. 70.2% (99/141) were subsequently evaluated by a pediatric neurologist. The mean age of the patients was  $5.3 \pm 4.5$  years. Most children presented with acute ataxia (80.1%) and were admitted to the hospital. Of the 20 children who were discharged from the ED, 13 (65%) were seen in follow-up, and none had any further examination findings or symptoms of ataxia.

Neuroimaging was performed in 104 children (73.8%) and was abnormal in 63 children (60.6%). However, these abnormalities were deemed by the study neurologist to be "clinically significant" in only 14 children (13.5%). Focal neurological findings were noted in 12 of the 14 children (85.7%) with clinically significant neuroimaging. For the two children with a nonfocal neurological exam on initial presentation but clinically significant neuroimaging, one was diagnosed with acute demyelinating syndrome, and the other with an ependymoma.

Focal neurological deficits were found in 11.3% (16/141) of patients. Six of the patients (37.5%) with focal neurological deficits had no abnormalities noted on neuroimaging.

Computed tomography of the brain was performed in 41.1% (58 /141) of patients, MRI of the brain was performed in 51.1% (72/141) of patients, and 18.4% (26/141) of patients had both a CT and MRI. Computed tomography was abnormal in 17 patients (29.3%), and MRI was abnormal in 46 patients (63.9%).

## Validity of Results:

To our knowledge the approach in this study has not been previously validated, so it is difficult to say that the measures truly reflect what the authors would want them to—that is whether having a single study neurologist in follow-up deem a scan "clinically significant" or not for clinical management in the Emergency Department truly affects decision making at initial presentation. Moreover, the case could be made that normal neuroimaging may alter clinical management in certain presentations, or lead to further diagnostic workup such as lumbar puncture. In addition, our group felt it may have been more robust to have more than one neurologist involved as the "study neurologist" to see if they agreed on how they rated "clinically significant" findings, reducing the chances of classification bias. Furthermore, a possible confounding factor that was not discussed includes the fact that different emergency physicians and possibly neuroradiologists who had seen the children at initial presentation may have had different individual thresholds to image the child at that time.

### **Generalizability of Results:**

This study was a single center study conducted in an urban, academic children's hospital in Detroit, Michigan, with an annual volume of 90,000 visits to the pediatric ED. At this institution, pediatric neurologists are available for consultation in person or over the phone at all hours. This may be similar in nature to the capabilities of most tertiary centres within North America. However, a significant limitation is the size of this cohort, a total of 141 patients evaluated in this pediatric ED for acute/subacute ataxia during the study period. Although the authors felt these results were in keeping with the previous systematic review by Whelan et al, drawing further conclusions and generalizing the results is challenging.

### **The Bottom Line:**

Overall the group felt that based off the methodology, cohort size, one non-blinded neurologist reviewing the cases, it would be hard to draw strong clinical conclusions for practice from this article. Although this study appears to be in keeping with the previously cited systematic review, there continues to be limited evidence available and more needed in order to draw significant conclusions with respect to defining evidence-based guidelines around which pediatric patients with ataxia could forgo neuroimaging or not.