WHAT DO I DO NOW?

SECOND EDITION

PEDIATRIC NEUROLOGY

Gregory L. Holmes
Peter M. Bingham

Pediatric Neurology

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Preface

Pediatric neurology is a challenging yet fascinating discipline that studies neurological diseases in a growing and maturing nervous system. The variety of clinical presentations, responses to therapy, and outcomes all reflect the highly plastic, impressionable nature of the developing human nervous system. Considering the evolving nature of clinical work and practice standards in this field, it is timely and appropriate for the editors to provide an updated edition of *What Do I Do Now?* Pediatric Neurology.

The 31 cases that make up this book come from our experience as pediatric neurologists over the past 30 years. Pediatric neurology has developed into a broad specialty, incorporating disciplines ranging from neuromuscular disease to neurogenetics to neurometabolic disorders. The cases presented here represent a mere snapshot of some common and some less common disorders encountered by pediatric neurologists. This book is by no means a comprehensive review of any of the topics; rather, we compare this book to wine tasting, where one can sample wine in small aliquots; the interested reader gets a brief taste of a variety of pediatric cases. The scenarios are designed to entice the reader to consider what he or she would do next. While we have included lists of differential diagnoses for many of the cases, most astute clinicians can reduce the differential diagnosis to a few possibilities after taking a history and performing an examination. We have therefore purposely tried to eliminate rare and unlikely conditions from the differential diagnoses.

This book is targeted toward pediatricians, family practitioners, adult neurologists, medical students, and nurse practitioners. Most of the cases presented here could be managed by interested healthcare professionals without formal pediatric neurology training, as in many parts of the country pediatric neurologists aren't readily available for consultation. Each case is short, encompassing salient features of the diagnosis. The cases are not meant to be tricky or misleading.

We hope this book will convey our own excitement as we work on a daily basis with children with neurological disorders. Ideally this book will motivate readers to dig deeper into the literature to learn more about the disorders. If this book is successful in helping even a single child with a neurological disorder, the effort will have been worthwhile.

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SECTION I

Paroxysmal Disorders

1 The Girl Who Wouldn't Answer

You are called by a pediatrician who is seeing a 7-year-old girl with staring episodes. According to the pediatrician, teachers have noted the child stares off into space frequently. During the episodes the girl does not respond to questions. The pediatrician suspects the child is daydreaming but calls you to see if he should obtain an EEG.

What do you do now?

ABSENCE SEIZURES

When questioned about a child who is having staring episodes, the physician should consider daydreaming, attention-deficit/hyperactivity disorder (ADHD), a sleep disorder, or a seizure disorder. The correct diagnosis can usually be made by asking a few questions. The family or teacher should be asked:

- Is a motor arrest witnessed, or is the child more often "discovered" in the midst of staring?
- Can the episodes be terminated by questioning or touching the child?
- Are there any motor signs during the event?
- Does the child quickly return to baseline after the event?
- How long do the episodes last?

Absence seizures are generalized seizures, indicating bi-hemispheric initial involvement clinically and on EEG. Absence seizures have an abrupt onset and offset. There is typically a sudden cessation of activities with a blank, distant look to the face. As the seizure continues, there are often automatisms and mild clonic motor activity such as jerks of the arms and eye blinking. It is unusual for a child with typical absence seizures to simply stare without any other behavioral manifestations. An absence seizure typically lasts less than 30 seconds, usually less than 10 seconds.

Focal seizures with impairment of consciousness or awareness (formerly termed complex partial seizures) may begin with an aura and then progress to a period of unresponsiveness. As in absence seizures, focal seizures with impairment of consciousness or awareness are associated with automatisms such as lip smacking or gestures of the hands. Focal seizures with impairment of consciousness or awareness are longer than absence seizures, typically averaging 1 to 2 minutes, and are often followed by a period of confusion and tiredness.

Daydreaming usually occurs in a child who is bored. The child may stare but does not have the distinct change in facial expression seen in children with seizures. Motor activity does not occur during daydreaming and there is no post-staring confusion or tiredness. Usually, witnesses do not report an abrupt onset of behavioral staring events, and the child

can be redirected with questions. Children with ADHD, while inattentive, typically do not have long periods of staring, unless they are overmedicated. As with daydreaming, ADHD is not associated with motor activity or post-staring impairment. Children with autism frequently have episodes of staring. While the EEG in autistic spectrum disorder is often abnormal, paroxysmal changes are more often compatible with focal seizures in this group.

It is important for any physician seeing a child with staring spells to have the child hyperventilate for 3 minutes. Even toddlers can sometimes be coaxed into hyperventilating with a pinwheel. A very high percentage of children with untreated absence seizures will have an absence seizure with hyperventilation. It is far less likely that hyperventilation will elicit a seizure in a child with focal seizures.

If the physician is concerned that the child has epilepsy, an EEG can be very useful. The EEG signature of a typical absence seizure is the sudden onset of 3-Hz generalized symmetrical spike or multiple spike-and-wave complexes (Fig. 1–1). The EEG should include hyperventilation, photic

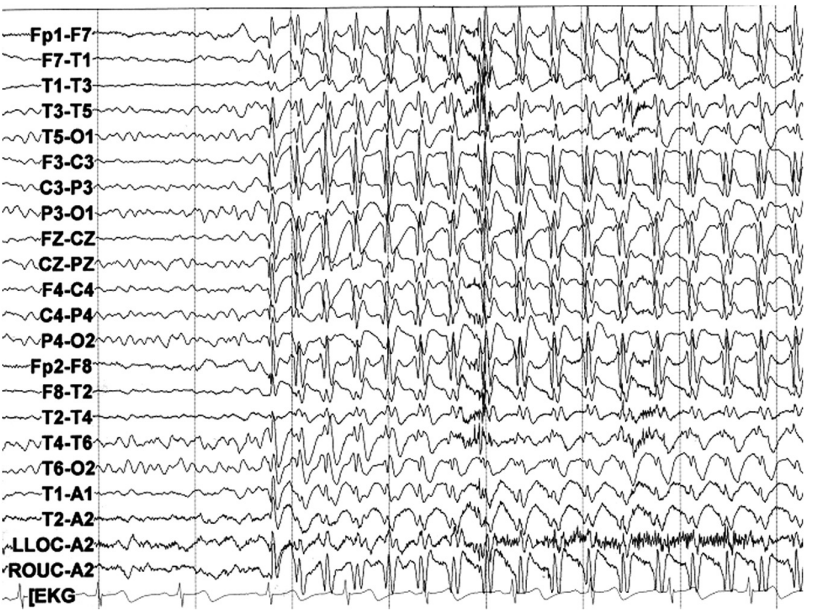

FIGURE 1–1 Generalized spike-and-wave discharge in a 7-year-old with absence seizures.

stimulation, and sleep, any of which may increase the likelihood of seeing generalized spike-and-wave activity.

Children with focal seizures with impairment of consciousness or awareness are more likely to have temporal or frontal lobe spikes (Fig. 1–2). A normal EEG during wakefulness, sleep, hyperventilation, and photic stimulation would make the diagnosis of absence seizures quite unlikely. However, children with focal seizures can have normal EEGs. Table 1.1 provides a summary of key differentiating points between absence seizures, focal seizures with impairment of consciousness or awareness, daydreaming, and ADHD.

After making the diagnosis, appropriate therapy can be initiated. For absence seizures, treatment with ethosuximide, valproate, or lamotrigine should be considered. In the case of focal seizures the range of drugs that could be used is much broader.

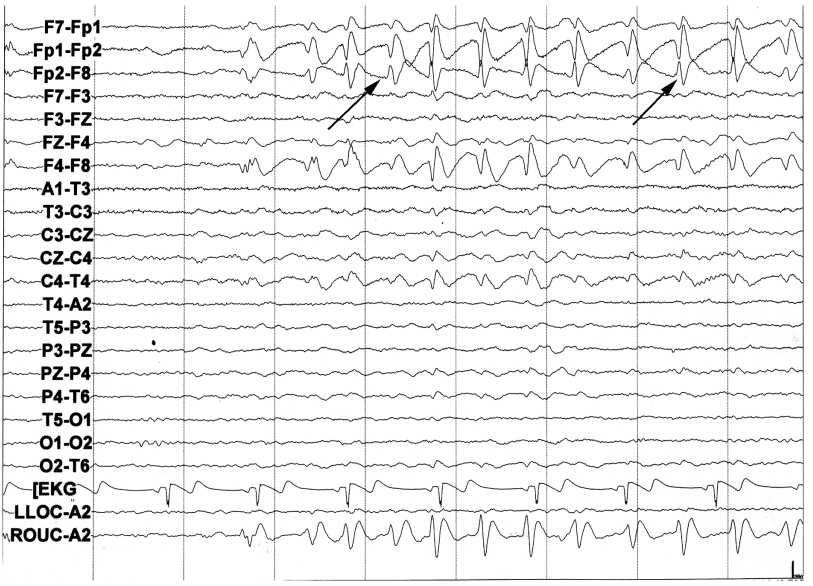

FIGURE 1–2 Right frontal sharp waves (*arrows*) in a 9-year-old with focal seizures.

TABLE 1.1 **Differential Diagnosis of Staring Attacks**

	Absence Seizure	Focal Seizures with Impairment of Consciousness or Awareness	Daydreaming	ADHD
Aura	No	Frequently	No	No
Duration	<30 seconds	1–2 minutes	Minutes	Seconds
Automatisms	Frequently	Frequently	No	No
Frequency	Multiple daily	Infrequent, unusual to have >2/day	Frequent, situation-dependent	Frequent
Post-staring impairment	No	Yes	No	No
EEG	Generalized spike-and-wave	Normal or focal discharges	Normal	Normal

KEY POINTS TO REMEMBER

- It is unusual for staring to be the only manifestation of an absence seizure.
- Must be differentiated from focal seizures with impairment of consciousness or awareness and non-epileptic events
- Seizures are short but occur frequently.
- Readily diagnosed with hyperventilation
- EEG shows generalized spike-and-wave activity in most cases.

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2 Ephemeral Weakness: Which Side Are You On?

You are consulted by parents who believe their 7-year-old son has been incorrectly diagnosed with epilepsy. The parents tell you they became concerned about the child during the first year of life when he was felt to be more “floppy” than their two other children at a similar age. They also noted that the child was delayed in regards to sitting and walking and had bizarre, darting eye movements. During the second year the boy began having episodes where he would develop the sudden onset of right- or left-sided weakness. The weakness would last minutes to hours. The weakness would sometimes seem to alternate between the right and left side during the same attack. The boy was diagnosed with epilepsy by the neurologist. However, the parents said the neurologist was puzzled by the fact that EEGs during the attacks failed to show clear seizures.

The neurologist concluded that the seizures must be arising from a focus deep in the brain.

Over the years the parents described episodes of eye jerking and problems with balance. The child is now quite delayed and is receiving special educational services. He currently is taking clonazepam, valproate, and lamotrigine. The family feels these drugs, as with previous trials of other antiepileptic drugs in their son, have not reduced the number of attacks, although they believe that clonazepam has made the attacks less severe and shorter in duration.

You ask to examine the child, and note that he has a short attention span with poor eye contact. He speaks slowly and is dysarthric. He has nystagmus, which increases on lateral gaze bilaterally and has a rotatory component. He has diffuse hypertonia, hyperreflexia, and ataxia. During the examination he has an attack where his right arm drops to his side and he begins to bend to the right. When he starts crying you note that he has no clear facial weakness. The attack lasts about 10 minutes and resolves without any intervention.

What do you do now?

ALTERNATING HEMIPLEGIA OF CHILDHOOD

This child has alternating hemiplegia of childhood. It is not surprising that the neurologist made an incorrect diagnosis since this is a very rare condition that often mimics epilepsy. Indeed, some children may also have epilepsy as a distinct manifestation of the disorder, whose predominant features include episodic hypotonia, lateralized weakness, and episodic dystonia, usually superimposed on a global developmental delay. The EEG is often abnormal (variable slowing) but during the hemiplegia attacks there are no ictal discharges. Most, but not all, cases harbor a mutation in a gene that relates to function of a Na^+/K^+ ATPase channel, ATP1A3. Thus there is no uniformly reliable laboratory diagnostic test for alternating hemiplegia, and the diagnosis rests primarily on clinical criteria for this sporadically arising disorder. Spontaneous mutations of ATP1A3 can often be identified. ATP1A3 may also underlie other disorders, including rapid-onset dystonia/parkinsonism; episodic ataxia; and cerebellar ataxia, areflexia, pes cavus, optic atrophy, and sensorineural hearing loss (CAPOS) syndrome.

There are seven criteria for the diagnosis of alternating hemiplegia of childhood:

1. Onset before 18 months of age
2. Repeated episodes of hemiplegia involving the right or left side of the body
3. Episodes of bilateral hemiplegia or quadriplegia
4. Other paroxysmal disturbances, including tonic/dystonic attacks, nystagmus, strabismus, dyspnea, and other autonomic phenomena during hemiplegic attacks or in isolation
5. Immediate disappearance of all symptoms on going to sleep, with recurrence 10 to 20 minutes after awakening in long-lasting attacks
6. Evidence of developmental delay, learning disability, neurological abnormalities, choreoathetosis, dystonia, or ataxia
7. Not attributed to another disorder

As in this child, early hypotonia and floppiness and abnormal eye movements precede the onset of hemiplegia, usually by several months. Frequent