

Childhood Absence Epilepsy

An Underrecognized
Condition, Yet Easily
Diagnosed & Treated

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White Paper**

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About the Clinical Neurological Society of America

Established in 1974, the Clinical Neurological Society of America is a non-profit 501(c)(6) made up of neurologists and other health care professionals practicing in clinical and academic settings. CNSA's mission is to improve clinical practice and patient care through education and thought leadership.

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Introduction

Childhood absence epilepsy (CAE) is one of the most common pediatric epilepsy syndromes, affecting 10 to 18% of all children with epilepsy in the United States.¹⁻⁴ Most children with CAE experience only absence seizures, which are short staring spells that cannot be interrupted by voice or touch. Due to the subtle nature of these seizures and their close association with learning difficulties, particularly attention deficit and hyperactivity disorder (ADHD), diagnosis of CAE can be delayed. Such delay can result in poor educational, social and employment outcomes in both the short- and long-term. However, expanding awareness of CAE, its symptoms and its impact on learning and mental health among patients, parents, teachers, pediatricians/family physicians and the community, may help with early recognition and treatment of the disease. Indeed, recognizing and treating CAE sooner would help improve the current and future quality of life of those with this disease and their families.

“ I think when most people think epilepsy, they think tonic-clonic (convulsive) seizures, like what is shown on TV. People don't think of absence seizures, so raising awareness of CAE is tough.”

–Allison Conravey, MD

Absence Seizures in Childhood Absence Epilepsy

The primary feature of CAE is absence seizures, which are brief (typically 3 to 20 second) staring spells or pauses in behavior, which may be accompanied by subtle repetitive movements (automatisms), such as eye blinking or lip smacking. These pauses can happen at any time, during any activity, without warning and without the child realizing that any loss of awareness has occurred. Absence seizures also cannot be interrupted by voice or touch.⁵⁻⁸ Once the seizure is over, the child will immediately return to whatever activity was in progress before the seizure started. These seizures occur daily, often multiple (even up to 100+) times a day.^{1,2,9-11} Interestingly, absence seizures eventually stop (remit) in around 60% of children with CAE. Such remission usually occurs within 2 years of onset or by early adolescence.²



Cause severe loss of awareness that cannot be interrupted by voice or touch



Typically last 3 to 20 seconds



May include subtle, repetitive movements, such as eye blinking or lip smacking



Occur daily, often multiple times per day



Will show a 2.5–4 Hz generalized spike-wave pattern on an EEG



Can be induced by hyperventilation



Occur without warning



Often stop within 2 years of onset or by early adolescence

Diagnosis & Seizure Treatment

Staring spells or episodes of “zoning out” in children are common, but such spells are not necessarily due to seizures. ADHD is a common presenting concern in children with inattention in school or at home but ruling out other causes, such as seizures, is recommended.⁵² When a child is brought into the doctor’s office because of a concern about staring, diagnosing the problem generally involves determining whether the behavior is due to a non-epileptic cause, such as daydreaming or ADHD, or an epileptic cause, such as absence seizures or focal impaired awareness seizures (formerly called complex partial seizures).⁶

Typical Features of Common Staring Spells

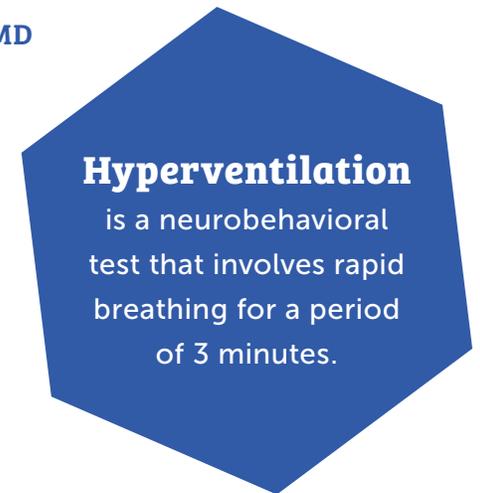
	NON-EPILEPTIC (BEHAVIORAL)	ABSENCE SEIZURES	FOCAL IMPAIRED AWARENESS SEIZURES
Length of spell	Variable	Typically 3 to 20 sec.	Typically 30 sec to 3 min.
Can be interrupted by touch	Yes	No	No
Occur at any time, even during activity	No – tend to be situational	Yes	Yes
Frequency	Variable	At least daily, often multiple times per day	Typically less than daily
There are warning signs	No	No	Sometimes
Aftereffects	None	None	Confused and tired immediately after
Include automatisms (repetitive movements)	No	May have subtle movements like eye blinking or lip smacking	Commonly occur
Can be induced by hyperventilation	No	Yes	Very rarely

CAE is usually diagnosed in otherwise healthy and normally developing children when they are between the ages of 4 and 10 (peak age of onset is 6 to 7 years).^{2,9} It is also found more often in females than males, making up 60 to 75% of cases.²

“ I don’t think most kids with CAE are aware of their seizures. I think that what they’re aware of is that suddenly, every so often, they realize they have missed something, and people may be staring at them.”

–Elaine C. Wirrell, MD

A diagnosis of CAE is most commonly made by a neurologist during an office visit that includes a thorough health history, a physical exam and a hyperventilation test. The diagnosis is then confirmed with a routine electroencephalogram (EEG) that also includes a period of hyperventilation. Hyperventilation is particularly important for the diagnosis of CAE because it has been shown to provoke absence seizures in up to 90% of children with the disease.^{9,12} Furthermore, such hyperventilation-induced absence seizures are fairly unique to the childhood and juvenile forms of absence epilepsy.



Once a child has been diagnosed with CAE, an anti-seizure medication is prescribed. The most common first-line therapies for CAE (used as monotherapies) are ethosuximide, valproic acid and lamotrigine. Of these, ethosuximide is the drug of choice for initial treatment of CAE because it was found, in the short term (<1 year), to be more effective and have fewer adverse side effects than lamotrigine and valproic acid, respectively.^{3,13,14} In addition, those treated with ethosuximide were less likely than those treated with valproic acid to experience a relapse of their epilepsy in the long term (≥5 years).¹⁵ However, even as the best initial therapy, ethosuximide still fails in approximately 50% of cases due to either its inability to control seizures or because of intolerable side effects;¹³ thus, the need to try more than one drug is relatively common.

“ There are a lot of patients who experience side effects, such as stomach aches or rashes, with a medication. So, even though it’s safe and effective medicine, we may still have to switch it.”

–Katy Lalor, MD

It is important to note that there is no substitute for the appropriate use of prescribed anti-seizure medications for controlling absence seizures. While properly managing sleep and stress may help improve seizure control, such behavior modifications cannot be used alone to effectively manage seizures.^{16,17}

“ Getting enough sleep and managing stress may help with seizure control, but it definitely won’t prevent all seizures.”

–Allison Conravey, MD



Burdens of Childhood Absence Epilepsy

Learning and mental health problems

CAE was originally considered a “benign” type of epilepsy due to its high frequency of remission and because absence seizures are relatively easily controlled compared to seizures seen in other types of epilepsy.^{3,18} However, it is now clear that children with CAE also often suffer from significant cognitive, linguistic and behavioral/social problems, including ADHD, anxiety and depression.^{3,4,18–22} These problems often result in learning and behavioral problems at school and also tend to be worse in those with poor seizure control.^{18,19}

“The ability to piece together stuff that your teacher is trying to teach you is more challenging if you have ongoing absences. It’s like watching a movie with 10 to 30 second segments of the movie going away on you and then trying to figure out what the movie was about.”

–Elaine C. Wirrell, MD

Multiple studies have observed that children with CAE are at greater risk of having attention-related problems that are independent of their seizures.^{3,19,23} The most common of which is the inattentive type of ADHD, which often appears prior to seizure onset.^{3,19,20,23} In this type of ADHD, the children are not hyperactive but have difficulty paying attention, are easily distracted and are also forgetful and disorganized. Such problems paying attention often result in learning, performance and/or discipline problems at school that may result in punishments or require the child to attend special classes or repeat a grade.^{9,18,19}

“Unfortunately, some children are subjected to disciplinary action at school for their staring spells, which are actually absence seizures. Their teachers think they aren’t paying attention or aren’t answering and are being willful, and then they get punished for it.”

–**Sudha Kilaru Kessler, MD**

In addition to learning challenges, children with CAE are also more likely to be diagnosed with mental health problems. Indeed, anxiety rates of 22 to 24% and depression rates of 4 to 6% have been reported in patients with CAE. This is significantly higher than the 7% and 3% rates of anxiety and depression, respectively, that are observed in the general population.^{19,21,22}

“Absence seizures occur all day until they are treated, so kids will miss questions in class and run into things when walking in line with other people. This can be extremely embarrassing and cause significant anxiety. Unfortunately, this anxiety and embarrassment isn’t something that my patients often bring up to me voluntarily.”

–**Katy Lalor, MD**

Unfortunately, the difficulties experienced as children may also have significant consequences later in life. Studies have shown that those who had absence epilepsy as children are less likely to graduate high school and complete college, and they are more likely to be underemployed or have an unplanned pregnancy.^{9,18,19,24} Following remission, those who had CAE may also continue to have learning, social and emotional issues that lead to high rates of work difficulties, relationship issues with family and friends and less social engagement.¹⁹

“When children with CAE reach adulthood, they will often have more social issues, even though their absence epilepsy has remitted. We also just finished a study in which 43% of our population-based cohort with childhood absence epilepsy ended up with ADHD by adulthood. This rate is very, very high.”

–**Elaine C. Wirrell, MD**

Developing other types of epilepsy

Although children with CAE often experience remission before they turn 12, it is still possible that they will develop another type of epilepsy in their lifetime. In approximately 15% of patients, CAE evolves to juvenile myoclonic epilepsy, and multiple studies have reported the development of generalized tonic-clonic seizures 5 to 10 years after the onset of absence seizures.^{4,6,9}

“Around 15% of patients with CAE will go on to have another kind of epilepsy later in life, and not everyone outgrows absence epilepsy.”

–**Sudha Kilaru Kessler, MD**

Increased risk of injury

Because absence seizures can cause a loss of awareness at any time, during any activity, children with CAE have an increased (3%) risk of being injured.²⁵ Indeed, injury is common, with 20% of young adults with CAE reporting a previous injury during a seizure, particularly if the seizure occurred while riding a bicycle.^{4,25} Children with epilepsy should also take extra precautions around water to avoid drowning.²⁶ However, while parents and schools should be vigilant about safety, they should also be careful not to restrict a CAE child's activity too much because being overprotective can also have negative developmental impacts.

“The child's wellbeing really needs to be considered. Anxiety about the diagnosis should not prevent them from participating in safe activities.”

–**Katy Lalor, MD**

“Hovering too much and not letting them have any natural childhood experiences can be worse than the seizures themselves.”

–**Sudha Kilaru Kessler, MD**

Family stress

Having a child diagnosed with CAE can be stressful for parents. Parents often experience a great deal of anxiety associated with their child's diagnosis. This can be due to guilt for not recognizing the seizures sooner, uncertainty related to not knowing the long-term outcome of the disease (e.g., whether it will respond to medication, whether/when it will be outgrown and how it will affect learning and development), as well as apprehensiveness associated with protecting their child from injury and/or social stigma.^{27–29} Such anxiety can have a negative impact on the overall family dynamic, resulting in a lower quality of life for all members of the family.³⁰

“Parents can have guilt when their kid is first diagnosed, particularly if it's been a while and their kid has been struggling in school – they feel guilty that they didn't recognize it earlier.”

–**Elaine C. Wirrell, MD**

“There is a lot of guilt, but letting parents know that the average time to diagnosis is sometimes years, that they're not the only ones that missed it, and that this happens a lot does make them feel better.”

–**Allison Conravey, MD**

Difficulties accessing care

Another burden of childhood absence epilepsy can be accessing appropriate care. In addition to having to navigate issues related to medical insurance coverage and referral processes, the availability of specialists and diagnostic technologies can vary widely depending on geographic area. This is particularly true for families that live in rural areas who have to travel long distances to see a neurologist or get an EEG. However, living in an urban area does not necessarily guarantee quick access to care. Because EEGs require specialized resources, their availability can be limited, resulting in long wait times for appointments.³¹

“Wait times are completely different all across the country. Where you live determines how fast you can see somebody and how fast you can get an EEG.”

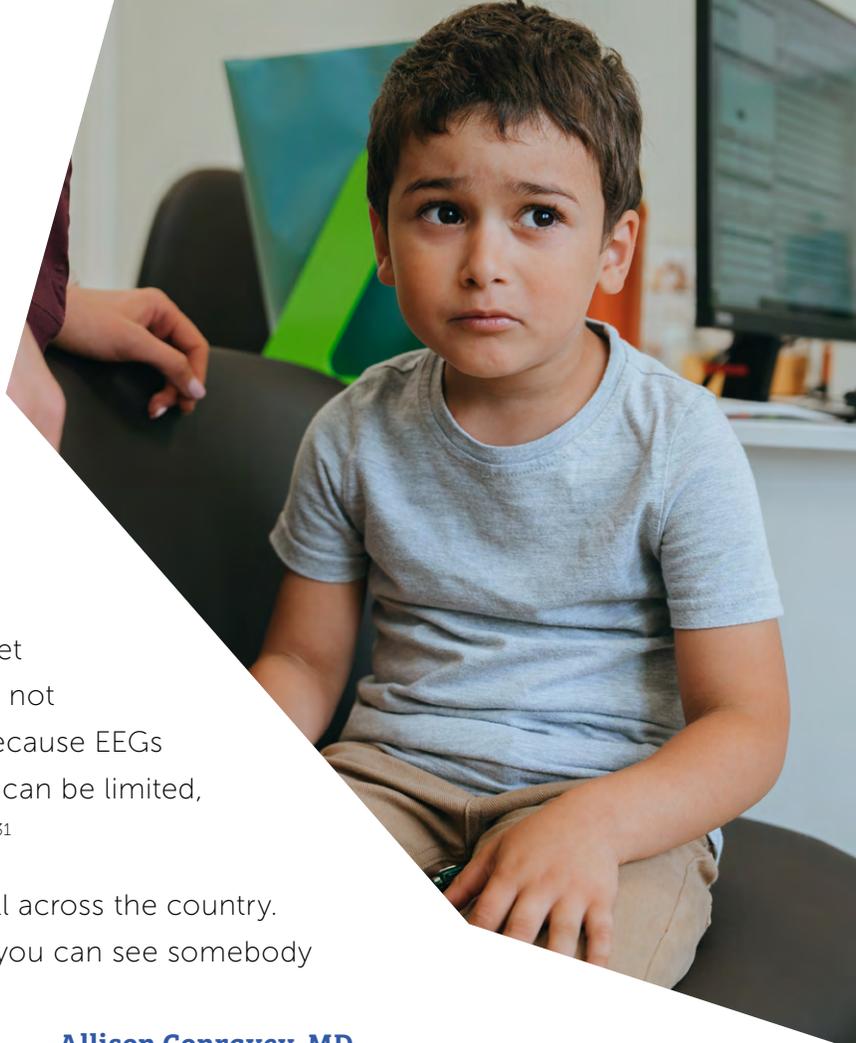
–Allison Conravey, MD

“In Alabama, there are several counties that don’t even have a pediatrician, so access to care is a big problem. We also have a wait time of two months or more to get an outpatient EEG, and if the referral to the neurologist is sent after the pediatrician gets the results of the EEG, it can be another couple of months before the child is seen. This really delays the diagnosis.”

–Katy Lalor, MD

There are also difficulties associated with accessing resources to identify and treat the learning disorders and mental health challenges that are often associated with a CAE diagnosis. In one study, researchers found that 25% of their subjects with CAE had subtle cognitive difficulties, 43% had linguistic deficits and 61% had psychiatric diagnoses, particularly ADHD and anxiety disorder. However, only 23% of these children were receiving appropriate interventions for these comorbidities.¹⁹

Neuropsychological testing is the most comprehensive way to identify learning or language disorders as well as difficulties with skills such as planning, organizing or paying attention. Such testing can also evaluate children for mental health issues, including anxiety and depression.³²



However, it is not always easy to have the testing done because it may be difficult to get an appointment with a neuropsychologist to administer the test, it can be time consuming (takes 2 to 8 hours of contact time with the child) and it can be expensive (hundreds to thousands of dollars), depending on the tests used and whether it is covered by insurance.³³⁻³⁵

“ We cannot get every single kid with epilepsy neuropsychological testing, even though we really wish we could. There just aren’t enough neuropsychologists.”

–Allison Conravey, MD

Economic impacts

The cost of pediatric epilepsy has been described as “substantial,” with the actual financial costs to families depending on a variety of factors, including the severity of disease and any comorbid conditions, the response to treatment, insurance coverage and access to care.^{36,37} Care tends to be more expensive in the first year following diagnosis because of the number of neurology clinic visits, laboratory tests and diagnostic procedures that are needed to identify an effective medication regimen and address associated conditions, such as ADHD and/or mental health disorders.³⁶ In addition to these direct (medical) costs of care, indirect (non-medical) costs, such as travel expenses and wages lost to take children to appointments, may place additional financial burdens on families, particularly those of lower socioeconomic status and/or those who live in rural areas.

Burdens of Childhood Absence Epilepsy

- ⚡ Learning and mental health problems
- ⚡ Developing other types of epilepsy
- ⚡ Increased risk of injury
- ⚡ Family stress
- ⚡ Difficulties accessing care
- ⚡ Economic impacts



Improving Outcomes of Childhood Absence Epilepsy

Early recognition and treatment

Due to the subtle nature of absence seizures, they can easily be missed by surrounding adults (i.e., parents, teachers, caregivers) during day-to-day life. Indeed, it can be difficult to first recognize that children with CAE are having absence seizures because the staring can easily be mistaken for not paying attention (daydreaming or ADHD), focusing in on screens (TV or mobile devices) or thinking about something else. The children are also unaware that the seizures are happening so they cannot tell anyone. Unfortunately, such difficulties can result in delayed diagnosis of CAE.

“It’s tricky because kids have staring spells that aren’t seizures all the time.”

–**Sudha Kilaru Kessler, MD**

“Constant screen time can be problematic. If your child is watching TV and they stare, are you going to notice? However, if you’re having a conversation with your child and they stop and they stare, you’re going to notice that much more readily.”

–**Elaine C. Wirrell, MD**

One way to help speed up the diagnosis of CAE is to improve overall awareness of the disease in the community. This includes educating parents, teachers/school staff and caregivers about the features of absence epilepsy to improve recognition of the disease so that children can be evaluated sooner by a physician and treatment can be started in a timely manner.

“I think there are significant delays to diagnosis, partially because people don’t really know what to look for and it is hard to tell the difference between normal child behavior and something more significant.”

–**Katy Lalor, MD**

“Class size can also make a difference. In a class with 40 kids, the teacher is never going to pick up on absence seizures, but in a class of 15 or 20 kids, the teacher may notice, and it could make a huge difference.”

–**Allison Conravey, MD**

CAE Educational Resources



Health care providers

- Neurologist
- Pediatrician
- General Practitioner



Advocacy groups

- Epilepsy Foundation
- Epilepsy Alliance America



Websites

www.epilepsy.com



Adults who had CAE



Parents of children with CAE

It is also important for pediatricians/general practitioners to be aware of CAE when they are evaluating their patients for staring episodes, inattention and/or difficulty in school. This is because CAE and ADHD often co-occur and have some similar symptoms,^{12,19,20,38} so the CAE diagnosis may initially be missed, with ADHD being diagnosed instead.

“ I think just having CAE on the radar of more general practitioners and pediatricians would be helpful. I think ADHD is so common that a lot of CAE kids are mistakenly diagnosed with ADHD at first.”

–**Elaine C. Wirrell, MD**

“ Awareness among pediatricians and the community is key for early recognition of CAE.”

–**Allison Conravey, MD**

While CAE and ADHD can be distinguished by taking a careful history and performing an EEG,¹² wait times for EEGs can be long, delaying the referral to the neurologist, and, ultimately, delaying proper treatment. However, performing a hyperventilation test during an office visit is a safe and easy way to differentiate CAE from ADHD and prevent such delays in correct diagnosis.

“ If you are a pediatrician who has a patient with staring spells, have them perform a three-minute hyperventilation test. It’s easy and safe, and it’s likely that if they have untreated CAE, they will have an absence seizure right in front of you. This way you won’t have to wait for an EEG and the CAE will be picked up more quickly.”

–**Elaine C. Wirrell, MD**

How to perform a hyperventilation test

Hyperventilation tests are very safe and easy to perform, with simple materials that are readily available. To perform the test, have the child sit up and blow on a pinwheel or a strip of paper for 2 to 3 minutes, ideally at a rate of 20 to 24 breaths per minute, and watch for an absence seizure.⁹ If an absence seizure occurs, the child may stop blowing, will have a vacant stare and could have eyelid fluttering. Commands can also be given or questions can be asked to assess for unresponsiveness. As previously mentioned, hyperventilation has been shown to provoke absence seizures in up to 90% of children with CAE,^{9,12} the vast majority of which will occur in the first 90 seconds of the test.³⁹ It can also be very helpful to record a video of the test to show the neurologist.

Please note that while hyperventilation is recommended by the American Clinical Neurophysiology Society as part of a standard EEG and it is rarely associated with adverse events, it should not be performed in patients who are unable or unwilling to cooperate for the test. Due to the increase in heart rate and blood pressure that occurs during the test, it should not be performed in those with certain medical conditions, such as sickle cell or significant cardiopulmonary disease, or those who have had a subarachnoid hemorrhage, ischemic stroke or intracranial hemorrhage in the last 12 months.^{40–42}



Education can also promote a higher quality of life for CAE children and their parents by relieving anxiety and helping them cope with the diagnosis.

“Educating and speaking to the child matter-of-factly on what an absence seizure is can go a long way – children sometimes fill in their gaps in knowledge with really scary things, which can be a source of a lot of their anxiety.”

–Sudha Kilaru Kessler, MD

“Education is important because people are naturally afraid of seizures. You don’t want people to think that a CAE diagnosis is something terrible or overreact by saying that the kid can’t swing on the swings or slide down the slides. These kids still need to have the chance to be kids.”

–Sudha Kilaru Kessler, MD

Moreover, having a better understanding of CAE and its association with ADHD and other mental health problems can help make sure that appropriate measures are taken at school and at home to minimize learning loss and promote proper social development. Early recognition and treatment of not only CAE but also its associated comorbidities is an important aspect of helping children with CAE build the cognitive and emotional foundation that they need to become successful adults.⁴³

Improving access to care

Multiple avenues are currently being explored to improve access to care for those with CAE. While telemedicine is not generally preferred for the initial exam by a neurologist, it may be used for follow-up appointments, which may decrease travel time and time lost from school or work for such visits.

Early application of the hyperventilation test by pediatricians may also improve access to care by facilitating quicker referrals to neurologists/epilepsy clinics, which should result in quicker diagnosis and treatment. Furthermore, once the diagnosis is made, using the hyperventilation test at home to help determine the effectiveness of medications could potentially decrease the number of follow-up visits needed and help decrease the strain on neurology resources.

“Using the hyperventilation test for following the kids is really helpful, particularly because of the limited access to neurology resources. Once the child has hit the target dose of medication and has been on the target dose for five or seven days without noticing any absences, you can get the parent to hyperventilate the child. If they see absences, they need to call you. If they don’t, you are probably in a good place. Hyperventilating at home can also be helpful when tapering off the medication.”

–Elaine C. Wirrell, MD

Different technologies are also in development that may help patients and parents detect and monitor absence seizures. Such technologies include wearable devices^{31,44} and smart phone

video/eye analysis tools/applications.⁴⁵⁻⁴⁷ If eventually proven to be accurate and effective, these tools may improve access to care by providing ways to confirm a CAE diagnosis without having to wait for an EEG, thus enabling earlier treatment. They may also be able to assist with optimizing drug treatment by providing more accurate seizure counts, which can help determine whether the medication and/or the dose is sufficiently reducing the number of seizures.

“If new mobile apps or technologies would increase the pediatrician’s comfort level with taking that next step on their own to do a screening test, then it could help with time to diagnosis.”

–Katy Lalor, MD

“There are new seizure tracking technologies that have potential, but they definitely need to be well-validated.”

–Sudha Kilaru Kessler, MD

The International League Against Epilepsy recommends that all children who are newly diagnosed with epilepsy be screened for cognitive, behavioral and mental health challenges.⁴⁸ Furthermore, because of the high rate of attentional and mental health problems associated with CAE, children with CAE should be regularly monitored by their health care providers and schools for such difficulties. This includes when the child’s seizures are fully controlled as well as after remission occurs. Such regular, long-term follow up will help ensure that children with CAE have the learning and mental health support that they need as they continue to grow and mature.³

“When a child outgrows their CAE and they come off medication, there’s such a low number of child neurologists that we can’t continue to follow them. That’s why pediatricians need to be looking more carefully at ADHD and anxiety in these patients.”

–Elaine C. Wirrell, MD

However, comprehensive neuropsychological testing to identify learning and behavioral/social difficulties can be expensive and is not always readily available. Therefore, alternative screening methods are currently in use or are being explored to speed up the diagnosis and treatment of such conditions. For example, the National Institute for Children’s Health Quality Vanderbilt Assessment is often used by physicians to evaluate children with CAE for ADHD.

“The NICHQ Vanderbilt Assessment Scale is a set of questionnaires, one for parents and one for teachers, that is freely available, not proprietary. That’s how we do our standardized ADHD screening.”

–Sudha Kilaru Kessler, MD

One study also showed that the Mini-Mental State Examination (MMSE) and the Digit Letter Substitution Test (DLST) have potential for being useful tools to monitor cognitive deficits in children with epilepsy.³⁴ In addition, developing computerized versions of neuropsychological tests may provide easier access to these tools during diagnosis and follow up; however, not all neuropsychological tests can be replicated digitally, limiting the scope of their results.⁴⁹

Medication adherence

Consistently taking anti-seizure medication is an important part of preventing or minimizing the negative effects of CAE. Some may question whether medication is really needed because the absence seizures are short and seem harmless; however, there is increased potential for injury when the seizures are not controlled.^{4,25} In addition, because absence seizures are a loss of consciousness, having uncontrolled seizures can mean prolonged trouble with learning and may make it difficult to socially engage with peers.⁵⁰ Accordingly, educational, social and professional outcomes have been shown to be worse for those with poor seizure control,^{18,19,51} ultimately resulting in a lower quality of life for patients and their families. Therefore, taking medications consistently, as prescribed, to keep absence seizures under control is essential for achieving the best long-term results possible.

“Medication compliance, or taking medication every day as prescribed, can fall off the radar more easily with this diagnosis than with others. Sometimes the parents stop looking for seizures and stop being quite as diligent about giving the medication. And, of course, on their next visit, the kid is definitely still having seizures.”

–Katy Lalor, MD

Conclusion

CAE is the most common type of pediatric epilepsy in the United States and is characterized by the frequent occurrence of absence seizures, brief staring spells that involve a loss of awareness at any time, during any activity. Due to the subtle nature of absence seizures, CAE can be difficult to detect and may be mistaken for other phenomena, such as daydreaming or ADHD. As a result, diagnosis and treatment of CAE are often delayed. Such delays are problematic because absence seizures are associated with an increased risk of injury, difficulty learning and mental health challenges that can lead to poor educational, professional and social outcomes in adulthood.

Educating parents, teachers, school staff and caregivers about the initial signs of CAE would significantly help with earlier recognition of the disease. Furthermore, increasing awareness among pediatricians/general practitioners about the symptoms of CAE, as well as the use of the hyperventilation test during the differential diagnosis, would help speed up access to neurology resources and result in quicker treatment. Such early recognition, combined with prompt and continuous treatment and long-term follow up, should result in better cognitive and social development of kids with CAE, ultimately resulting in more positive outcomes when they are adults.

CNSA's Clinical Proceedings

The Clinical Neurological Society of America has 50 years of experience bringing together leading experts and clinical neurologists for educational programming. CNSA's Clinical Proceedings – a white paper series – are informational resources intended to raise awareness and address unmet needs in neurology. CNSA recognizes the expert panel members who contributed to the development of this white paper.



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Chair



Allison Conravey, MD



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Elaine C. Wirrell, MD

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References

1. Kessler, S. K. et al. Pretreatment seizure semiology in childhood absence epilepsy. *Neurology* 89, 673–679 (2017).
2. Hirsch, E. et al. ILAE definition of the Idiopathic Generalized Epilepsy Syndromes: Position statement by the ILAE Task Force on Nosology and Definitions. *Epilepsia* 63, 1475–1499 (2022).
3. Masur, D. et al. Pretreatment cognitive deficits and treatment effects on attention in childhood absence epilepsy. *Neurology* 81, 1572–1580 (2013).
4. Tenney, J. R. & Glauser, T. A. The Current State of Absence Epilepsy: Can We Have Your Attention?: The Current State of Absence Epilepsy. *Epilepsy Curr* 13, 135–140 (2013).
5. Myers, T. & Fecske, E. The “staring” child. *The Nurse Practitioner* 41, 9 (2016).
6. Khan, A., Hussain, N. & Whitehouse, W. P. Evaluation of staring episodes in children. *Archives of Disease in Childhood - Education and Practice* 97, 202–207 (2012).
7. Focal Impaired Awareness Seizures. Epilepsy Foundation <https://www.epilepsy.com/what-is-epilepsy/seizure-types/focal-onset-impaired-awareness-seizures>.
8. Absence Seizures | Symptoms & Risks. Epilepsy Foundation <https://www.epilepsy.com/what-is-epilepsy/seizure-types/absence-seizures>.
9. Kessler, S. K. & McGinnis, E. A Practical Guide to Treatment of Childhood Absence Epilepsy. *Paediatr Drugs* 21, 15–24 (2019).
10. Sivaswamy, L. Childhood Absence Epilepsy: 5 Things Pediatricians Need to Know. *Contemporary Pediatrics* <https://www.contemporarypediatrics.com/view/childhood-absence-epilepsy-5-things-pediatricians-need-know> (2012).
11. Johns Hopkins Medicine. Absence Seizures. <https://www.hopkinsmedicine.org/health/conditions-and-diseases/epilepsy/absence-seizures> (2019).
12. Auvin, S. et al. Systematic review of the screening, diagnosis, and management of ADHD in children with epilepsy. Consensus paper of the Task Force on Comorbidities of the ILAE Pediatric Commission. *Epilepsia* 59, 1867–1880 (2018).
13. Glauser, T. A. et al. Ethosuximide, Valproic Acid, and Lamotrigine in Childhood Absence Epilepsy. *N Engl J Med* 362, 790–799 (2010).
14. Glauser, T. A. et al. Ethosuximide, valproic acid, and lamotrigine in childhood absence epilepsy: initial monotherapy outcomes at 12 months. *Epilepsia* 54, 141–155 (2013).
15. Berg, A. T., Levy, S. R., Testa, F. M. & Blumenfeld, H. Long-term seizure remission in childhood absence epilepsy: might initial treatment matter? *Epilepsia* 55, 551–557 (2014).
16. Sleep. Epilepsy Foundation <https://epilepsyfoundation.org.au/managing-epilepsy/living-with-epilepsy/sleep/>.
17. Stress. Epilepsy Foundation <https://epilepsyfoundation.org.au/managing-epilepsy/living-with-epilepsy/stress/>.

18. Wirrell, E. C. et al. Long-term Psychosocial Outcome in Typical Absence Epilepsy: Sometimes a Wolf in Sheep's Clothing. *Archives of Pediatrics & Adolescent Medicine* 151, 152–158 (1997).
19. Caplan, R. et al. Childhood absence epilepsy: Behavioral, cognitive, and linguistic comorbidities. *Epilepsia* 49, 1838–1846 (2008).
20. Ahmed, G. K., Darwish, A. M., Khalifa, H. & Haridy, N. A. Relationship between Attention Deficit Hyperactivity Disorder and epilepsy: a literature review. *The Egyptian Journal of Neurology, Psychiatry and Neurosurgery* 58, 52 (2022).
21. Gruenbaum, B. F. et al. Absence seizures and their relationship to depression and anxiety: Evidence for bidirectionality. *Epilepsia* 62, 1041–1056 (2021).
22. Caplan, R. et al. Depression and Anxiety Disorders in Pediatric Epilepsy. *Epilepsia* 46, 720–730 (2005).
23. Vega, C. et al. Differentiation of Attention-Related Problems in Childhood Absence Epilepsy. *Epilepsy Behav* 19, 82–85 (2010).
24. Berg, A. T. et al. Determinants of Social Outcomes in Adults With Childhood-onset Epilepsy. *Pediatrics* 137, e20153944 (2016).
25. Wirrell, E. C., Camfield, P. R., Camfield, C. S., Dooley, J. M. & Gordon, K. E. Accidental Injury Is a Serious Risk in Children With Typical Absence Epilepsy. *Archives of Neurology* 53, 929–932 (1996).
26. Water Safety | Epilepsy & Swimming. Epilepsy Foundation <https://www.epilepsy.com/lifestyle/summer-camp/water-safety>.
27. Nickels, K. Seizure and Psychosocial Outcomes of Childhood and Juvenile Onset Generalized Epilepsies: Wolf in Sheep's Clothing, or Well-Dressed Wolf? *Epilepsy Curr* 15, 114–117 (2015).
28. England, M. J., Liverman, C. T., Schultz, A. M. & Strawbridge, L. M. Epilepsy across the spectrum: Promoting health and understanding.: A summary of the Institute of Medicine report. *Epilepsy & Behavior* 25, 266–276 (2012).
29. Jacoby, A. Stigma, epilepsy, and quality of life. *Epilepsy & Behavior* 3, 10–20 (2002).
30. Cianchetti, C. et al. The perceived burden of epilepsy: Impact on the quality of life of children and adolescents and their families. *Seizure* 24, 93–101 (2015).
31. Japaridze, G. et al. Automated detection of absence seizures using a wearable electroencephalographic device: a phase 3 validation study and feasibility of automated behavioral testing. *Epilepsia* n/a, (2022).
32. What Is a Neuropsychological Evaluation? | Columbia University | Child Psychiatry. <https://childadolescentpsych.cumc.columbia.edu/articles/what-neuropsychological-evaluation>.
33. Wagner, J. L. et al. Current behavioral health and cognitive screening practices in pediatric epilepsy. *Epilepsy Behav* 101, 106214 (2019).
34. Balwani, M. & Passi, G. R. Screening Children with Epilepsy for Cognitive Deficits Using the Modified Mini-Mental Scale Examination and the Digit Letter Substitution Test. *Ann Child Neurol* 30, 75–81 (2022).
35. How Much Does Neuropsychological Testing Cost? | HowMuchIsIt.org. <https://www.howmuchisit.org/neuropsychological-test-cost/>.
36. Ryan, J. L. et al. Health care charges for youth with newly diagnosed epilepsy. *Neurology* 85, 490–497 (2015).
37. Examining the Economic Impact and Implications of Epilepsy. *The American Journal of Managed Care* (2020).
38. Uliel-Sibony, S., Chernuha, V., Tokatly Latzer, I. & Leitner, Y. Epilepsy and attention-deficit/hyperactivity disorder in children and adolescents: An overview of etiology, prevalence, and treatment. *Frontiers in Human Neuroscience* 17, (2023).
39. Waterberg, N. et al. Hyperventilation During Routine Electroencephalography: Are Three Minutes Really Necessary? *Pediatric Neurology* 52, 410–413 (2015).
40. Sinha, S. R. et al. American Clinical Neurophysiology Society Guideline 1: Minimum Technical Requirements for Performing Clinical Electroencephalography. *Journal of Clinical Neurophysiology* 33, 303 (2016).
41. Oommen, K. J. & Kopel, J. Optimum duration of hyperventilation during electroencephalography. *Proc (Bayl Univ Med Cent)* 36, 325–328 (2023).
42. Kane, N., Grocott, L., Kandler, R., Lawrence, S. & Pang, C. Hyperventilation during electroencephalography: Safety and efficacy. *Seizure - European Journal of Epilepsy* 23, 129–134 (2014).
43. Epilepsies, I. of M. (US) C. on the P. H. D. of the, England, M. J., Liverman, C. T., Schultz, A. M. & Strawbridge, L. M. Educating People with Epilepsy and Their Families. in *Epilepsy Across the Spectrum: Promoting Health and Understanding* (National Academies Press (US), 2012).
44. Mitsuhashi, T., Sonoda, M., Iwaki, H., Sakakura, K. & Asano, E. Detection of absence seizures using a glasses-type eye tracker. *Clinical neurophysiology: official journal of the International Federation of Clinical Neurophysiology* 132, 720 (2021).
45. Wo, T. et al. Assessment of the Predictive Value of Outpatient Smartphone Videos for Diagnosis of Epileptic Seizures. *JAMA Neurol* 77, 593–600 (2020).
46. Amin, U. et al. Value of smartphone videos for diagnosis of seizures: Everyone owns half an epilepsy monitoring unit. *Epilepsia* 62, e135–e139 (2021).
47. Eysz. Eysz Hyperventilation Recorder. Eysz, Inc. <https://eyszlab.com/products>.
48. Wilson, S. J. et al. Indications and expectations for neuropsychological assessment in routine epilepsy care: Report of the ILAE Neuropsychology Task Force, Diagnostic Methods Commission, 2013–2017. *Epilepsia* 56, 674–681 (2015).
49. Witt, J.-A., Alpherts, W. & Helmstaedter, C. Computerized neuropsychological testing in epilepsy: Overview of available tools. *Seizure* 22, 416–423 (2013).
50. Albuja, A. C. & Khan, G. Q. Absence Seizure. in *StatPearls* (StatPearls Publishing, Treasure Island (FL), 2023).
51. Williams, J. et al. Academic Achievement and Behavioral Ratings in Children with Absence and Complex Partial Epilepsy. *Education and Treatment of Children* 19, 143–152 (1996).
52. Subcommittee on Attention-Deficit/Hyperactivity Disorder, S. C. on Q. I. and M. ADHD: Clinical Practice Guideline for the Diagnosis, Evaluation, and Treatment of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents. *Pediatrics* 128, 1007–1022 (2011).



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