New Onset Seizures Guideline

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Definition:

For the purposes of this guideline, a **new onset seizure** is defined as a first time unprovoked seizure, without a prior diagnosis of epilepsy. This seizure does not meet criteria for "febrile seizure", a term exclusively used to describe a seizure within 24 hours of a fever, occurring in a child age 6 months to 6 years old, without known structural or functional neurologic deficits (i.e. no abnormalities on neuroimaging and no developmental delay). Due to the specific prognostic and management implications of "febrile seizures", a "new onset seizure" does not necessarily exclude a seizure in the context of a fever. For management of febrile seizure, please refer to the Febrile Seizure Guideline.

Etiology:

Structural or lesional etiologies should be considered. Nearly any insult to the cerebral cortex can cause a seizure. Seizures can arise from any site in the brain but are typically localized to the neocortical gray matter and the limbic system, particularly the hippocampus and amygdala.

Differential Diagnosis:

- Meningitis/encephalitis
- Behavioral staring or inattention
- Movement Disorder (e.g. status dystonicus, motor tics)
- Cardiac arrhythmia
- Breath-holding spell
- Syncope
- Toxic encephalopathy
- Hemiplegic migraine or migraine with aura
- Alternating hemiplegia of childhood
- Psychogenic nonepileptic events (PNEE)

Children older than 6 years with a seizure predisposition might be triggered by an intercurrent illness, especially with fever. This includes children with a pre-existing neurological injury, children with underlying neurogenetic/neurodevelopmental conditions (e.g. autism), previously established epilepsy patients, and patients with neurosurgical hardware (e.g. VP shunt).

Guideline Inclusion Criteria:

- Age ≥ 3 months w/ clinical findings of convulsive or nonconvulsive seizures
  - For patients > 6 years, do **not** exclude seizure in the context of fever, as this may be triggered by an intercurrent illness

Guideline Exclusion Criteria:

- Age < 3 months
- Known epilepsy
- Febrile seizures (i.e. child aged 6 mos - 6 yrs, w/ a seizure in the context of fever)

Diagnostic Evaluation:

History: Assess for

- Seizure onset and semiology (e.g. which parts of the body are involved, the patient's actions prior to seizure onset, body/facial movements)
- Context of seizure onset (e.g. out of sleep or wakefulness, early morning seizures, any identified triggers)
- Known epilepsy
- History of febrile seizures
- Birth history (e.g. pregnancy complications or exposures, delivery complications, NICU stay)
- Ingestion
- Fever or other signs of infection or illness
- Medications
  - Received prior to presentation (type, dose, dosage, route)
  - Use of psychopharmacologic medications
- Metabolic abnormalities
- Trauma, both acutely and any prior history of traumatic brain injury
- Prior neurosurgical intervention

Physical Examination:

- Ensure patient's ABCs (Airway, Breathing, and Circulation) are intact and address any needs, if present.
  - Obtain vital signs, including pulse oximeter
  - Provide respiratory support, as appropriate (suction secretions, secure the airway, administer O_2)
  - Assess perfusion (cap refill, lip color, etc.)
  - Obtain intravenous access
  - Cardiac monitor, if indicated
- Neurologic Exam
  - Mental status (GCS)
  - Any ongoing seizure activity (assess pupils, eye movement) (manage per the Status Epilepticus Pathway)
  - Motor, reflex, and gait assessment for focal motor deficit and/or ataxia
  - Assess for meningeal signs
- Examine for specific rashes or ticks
- Examine for neurocutaneous findings (e.g. hypomelanotic macules, facial angiofibromas, neurofibromas, cafe au-lait macules, port wine stain)

Seizure Classification:[4]

SEIZURE CLASSIFICATIONS	
Type	**Characteristics**
Motor	• Tonic-clonic seizures • Myoclonic seizures • Clonic seizures • Tonic seizures • Myoclonic atonic seizures • Atonic seizures • Hypermotor (hyperkinetic) seizures • Automatisms
Non-motor	• Absence (typical, atypical, or absence w/ special features (e.g. myoclonic absence, eyelid myoclonia) • Focal (e.g. sensory, emotional, autonomic, cognitive, behavior arrest)
Epileptic Spasms	• May be focal or generalized • May outlast infancy or begin after infancy • Example: infantile spasms

A seizure is defined as **focal** if the initial clinical or EEG changes originate within networks limited to a specific region or hemisphere of the brain. The patient's level of alertness should be a part of the description and documentation. A patient experiencing a seizure (particularly a focal seizure) may or may not have impaired awareness during the seizure.

A seizure is defined as **generalized** if both hemispheres are involved at seizure onset (originating within and rapidly involving networks of both hemispheres), and as a result, nearly always involves impaired awareness.

ELECTROCLINICAL SYNDROMES / OTHER EPILEPSIES (EPILEPSY + EPILEPSY SYNDROMES) *Specific and recognizable clinical diagnoses that involve certain clinical signs and symptoms*	
Factors	**Characteristics**
Genetic	• Results from a genetic abnormality (known or presumed, based on a complex of specific clinical and investigative findings • Examples include: Juvenile Myoclonic Epilepsy
Structural	• Seizures are directly linked to a specific structural condition • Examples include: malformations of cortical development (focal cortical dysplasia, lissencephaly, schizencephaly), vascular malformations, HIE, tumors
Metabolic	• Seizures are related to underlying disorders of metabolism • Examples include: GLUT1 disorder, pyridoxine dependent epilepsy, pyruvate dehydrogenase deficiency
Unknown	• No structural, metabolic, or genetic causes have been identified

The goal of classifying seizures and determining etiology is to identify any epilepsy syndrome that the patient may have, which may guide appropriate treatment for the patient.

Critical Points of Evidence

Evidence Supports

- Obtaining an EEG in a child with an unprovoked seizure, to evaluate for risk of seizure recurrence (does not require an inpatient admission).[5]
- Obtaining neuroimaging in a child with an unprovoked focal seizure, to evaluate for structural abnormalities (does not require an inpatient admission).[6]
- Toxicology screening should be considered in any child with concern for drug or toxin exposure.[5]
- Consider routine laboratory screening (e.g. blood glucose, basic blood chemistry, etc.) in patients with altered mental status, dehydration, vomiting, and for children with increased risk for metabolic derangement.[5]
- Emergent neuroimaging should be considered for patients who meet certain high-risk criteria (e.g. < 18 months old), have persistent neurologic deficits, or are otherwise not well-appearing; however, in the well-appearing child older than 18 months, emergent imaging is less likely to be useful.[7,8]
- If neuroimaging is obtained, MRI brain is preferred over head CT, when possible.[5]
- Driving safety: It is recommended that anyone with a suspected seizure or other unexplained loss of consciousness should refrain from operating a motorized vehicle, ATV, tractor, etc. for at least 6 months. Texas law requires seizure freedom for at least 3 months.[10]
- Water safety: Children with seizures should be directly supervised by an adult with any swimming, boating, or bathing.[11]

Evidence Lacking/Inconclusive

- Use of lumbar puncture for febrile children with deficient or unknown immunization history.[5]
- Use of lumbar puncture for febrile children pretreated with antibiotics.[5]

Evidence Against

- Routine laboratory screening (e.g. blood glucose) and toxicology studies may not yield helpful diagnostic data without a specific clinical indication.[5]

Practice Recommendations & Clinical Management

Evaluation:

Laboratory Testing[5]	Imaging[6,7,8]
● Consider a CMP in a child of any age w/ **any** of the following: ○ Dehydration ○ Vomiting ○ Diarrhea ○ Persistent altered mental status ● Lumbar puncture should be considered in the following circumstances: ○ Clinical signs or symptoms concerning for meningitis ○ Infant (6-12 months) presenting with seizure, fever, and/or ill appearing, with deficient or unknown immunization history ○ Presents with seizure and a fever and is pretreated with antibiotics ● Specific toxicology testing (if history or physical exam suggests a specific toxin) ● Consider a comprehensive toxicology screen in a child w/ suspected drug use or persistent altered mental status	● Consider urgent MRI or CT in a child of any age w/ **any** of the following: ○ Focal seizure w/ a persistently focal neurological exam ○ Persistent encephalopathy ○ Age < 6 months ○ Closed head injury ○ Recent shunt revision ○ Suspicion for neurocutaneous disease (previously undiagnosed) ○ Sickle cell disease ○ Malignancy

Diagnosis:

- EEG should be performed in children of any age who present with suspected, probable, or definite afebrile seizure, and is preferred to be performed in an outpatient setting if the patient returns to their neurological baseline.
- A 3T MRI epilepsy protocol can be performed[6] in an outpatient setting for patients who return to their neurological baseline and do not have other indications for inpatient admission.

Consults/Referrals:

- All patients should receive a Neurology referral
  - A New Onset Seizure clinic is offered by the Neurology team at DCMC and DCN, with EEG and clinic appointments available within two weeks of referral

Patient Disposition:

Admission Criteria	● Admit for any of the following: ○ Recurrent seizures at onset ○ Persistent encephalopathy ○ Focal deficit ○ Parental anxiety ○ Concerns regarding follow-up ○ Other medical indications
Observation Criteria	● Consider observation for any of the following: ○ Recurrence w/n 24 hrs ○ Extreme parental anxiety ○ Social concerns
Minimum Discharge Criteria	● Seizure cessation ● Appropriate mental status; return to baseline mental status ● Appropriate support system (e.g. primary care physician, caregiver/family)

Inpatient Treatment

- Refer to Status Epilepticus Guideline if seizures require treatment
- For any patient with an active order for seizure precautions, a first-line abortive antiseizure medication (e.g. lorazepam) should be ordered in the patient's prn MAR. A second-line abortive antiseizure medication should also be strongly considered at the time of admission.

Outpatient Rescue

- Rescue medication (e.g. Valtoco, Diastat, Nayzilam) can be considered for patients with convulsive seizures.

Diastat Dosing

2-5 Years		6-11 Years		12+ Years	
0.5 mg/kg		0.3 mg/kg		0.2 mg/kg	
Weight (kg)	Dose (mg)	Weight (kg)	Dose (mg)	Weight (kg)	Dose (mg)
6-10	5	10-16	5	14-25	5
11-15	7.5	17-25	7.5	26-37	7.5
16-20	10	26-33	10	38-50	10
21-25	12.5	34-41	12.5	51-62	12.5
26-30	15	42-50	15	63-75	15
31-35	17.5	51-58	17.5	76-87	17.5
36-44	20	59-74	20	88-111	20

*If in between doses when calculating the dose of Diastat, please round up to the higher Diastat dose, i.e calculation gives you a dose of 8.5mg, round up to 10mg

NAYZILAM

DOSING AND USAGE

(For 12 years of age and older)

FIRST DOSE: Use one 5 mg nasal spray in one nostril.

SECOND DOSE (if needed): If the seizure cluster is continuing 10 minutes after the first dose, a second dose may be used if you have been told to do so by your healthcare provider.

If a second dose is used, give the second dose in the other nostril.

DO NOT GIVE MORE THAN 2 DOSES TO TREAT A SEIZURE CLUSTER.

Valtoco Dosing

6-11 Years (0.3 mg/kg | 0.66mg/lb)

Weight (Kg)	Weight (Lb)	Dose (Mg)	Given as
10-18	22.0-39.7	5	One **5 mg** nasal spray device in one nostril
19-37	41.96-81.6	10	One **10 mg** nasal spray device in one nostril
38-55	83.8-121.3	15	Two **7.5 mg** nasal spray devices, one in each nostril
56-74	123.5-163.1	20	Two **10 mg** nasal spray devices, one in each nostril

12+ Years (0.2 mg/kg | 0.44mg/lb)

Weight (Kg)	Weight (Lb)	Dose (Mg)	Given as
14-27	30.9	5	One **5 mg** nasal spray device in one nostril
28-50	61.7-110.2	10	One **10 mg** nasal spray device in one nostril
51-75	112.4-165.3	15	Two **7.5 mg** nasal spray devices, one in each nostril
76 and up	167.6 and up	20	Two **10 mg** nasal spray devices, one in each nostril

Follow-Up Care

Children with a referral should be evaluated in the Neurology clinic within one month

Addendums

None

Outcome Measures

1. Re-presentation rate to the Emergency Department (w/n 30 days)
2. Readmission rate to DCMC (w/n 30 days)
3. Inpatient average length of stay
4. Time to outpatient Neurology clinic follow-up
5. Number of inappropriate Neurology referrals (balancing measure)
6. Missed Neurology outpatient appointment d/t patient "no-show"

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EBOC Project Owner: Kristen Arredondo, MD and Chelsey Ortman, MD

Approved by the New Onset Seizure Evidence-Based Outcomes Center Team

Guideline Revision History	
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May 2020	Seizure Diagnostic Evaluation table added.
July 2020	Status Epilepticus Critical Care Pathway added. Seizure Clusters Pathway removed.
May 2025	Full Guideline revision. Line by line review and update. Separated neuro documents into three individual guidelines: 1) Status Epilepticus Guideline 2) New Onset Seizures Guideline and 3) Febrile Seizures.

New Onset Seizures EBOC Team
(Either as direct collaborators or reviewers):
Kristen Arredondo, MD
Dave Clarke, MD
Breanna Bunting, RN
Berenitse Hickman, RN
Kelly (Claire) Bundick, PharmD, BCPPS
Chelsey Ortman, MD
Cristina Gomez, BSN, RN
Victoria (Tori) Miller, MSN, RN
Michael Cronin, MD, MPH
Carmen Garudo, EBOC PM
Benjamin Lang, MD
Daniel Freedman, MD
Jamie Fitzgerald, RN
Monica Targett, MSN, RN
Richard Thompson, MD
Thanhhao Ngo, MD
Olivia Martino, RN

EBOC Committee:
Lynsey Vaughan, MD
Sarmistha Hauger, MD
Patricia Click, MSN, RN
Melissa Cossey, MD
Sheryl Yanger, MD
Tory Meyer, MD
Nilda Garcia, MD
Meena Iyer, MD
Amanda Puro, MD