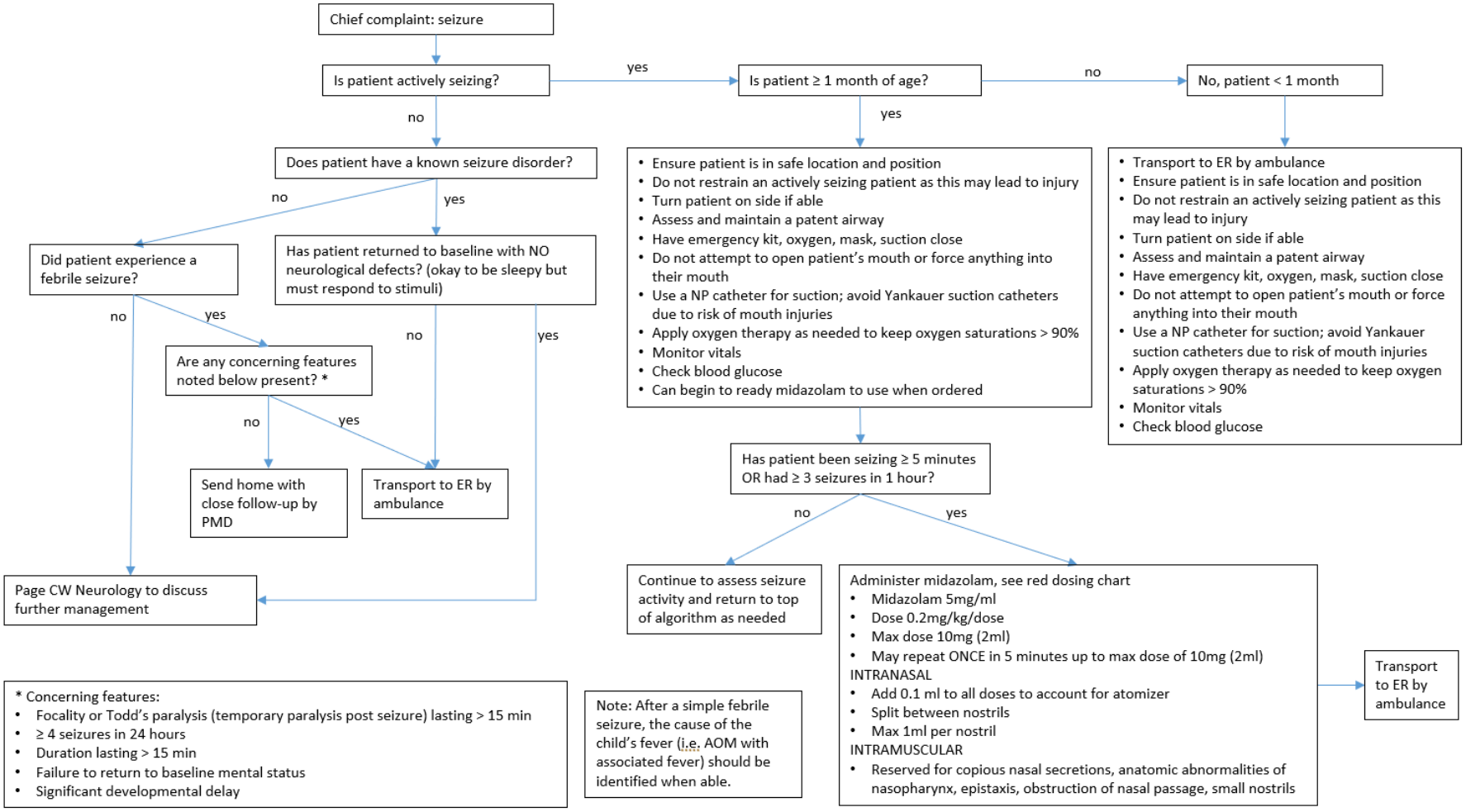
Children's Hospital and Health System, Inc.
Patient Care Treatment Guideline
CW Urgent Care

SUBJECT: Acute Seizure



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Purpose: To evaluate and initiate treatment of acute seizure(s).

Refer to CW Patient Care Policy and Procedure:

- *Seizure Precautions and Management*
- *Medication – Controlled Substances*

Definition: Many clinicians define status epilepticus as "continuous convulsive activity greater than 5 minutes duration" to underscore the urgent need for aggressive seizure management. This definition recognizes that, after a certain period of time, a threshold is crossed where a seizure becomes unlikely to self-terminate. During this time, pathophysiologic changes occur that promote pharmacoresistance, reducing the likelihood that status epilepticus will respond to initial anti-seizure medications. In children with new-onset seizures, after continuously seizing for 5-10 minutes, a seizure becomes unlikely to stop without pharmacologic intervention. (Smith, Management of status epilepticus in children., 2016)

- **Phases of Seizure**
    - Pre-ictal phase: Occurs immediately before the seizure
        - Precipitating events can include illness, trauma, toxins, or sleep deprivation (System, Co-management guidelines for 1st time seizures, 2024)
        - May include an aura. An aura is a warning of an impending seizure and is actually a focal aware seizure. Auras may include a headache, weakness, sense of fear, aphasia, unpleasant odor, visual or auditory hallucinations, strange smell or taste, or epigastric sensation. (Wilfong, 2018)
    - Ictal Phase: Seizure activity
        - Characterized by paroxysmal, uncontrolled, excessive discharge of electrical activity in the brain with corresponding EEG changes.
        - Symptoms during a seizure can include retention or loss of awareness, cry, gasp, garbled or slurred speech, head and eye deviation, posturing, stiffening, and rhythmic jerking, automatisms such as purposeless repetitive movements like lip smacking or picking at clothes, movements of whole body or focal, change in breathing or cyanosis, drooling, pupillary dilation, or incontinence (System, Co-management guidelines for 1st time seizures, 2024)
    - Post-ictal phase: Period immediately after the seizure
        - May include a change in the level of consciousness or behavior, numbness or weakness of the affected extremity or side of the face (Todd's paralysis) lasting from minutes to hours.
        - May also include lack of recall of event, confusion, lethargy, nausea or vomiting, headache, muscle aches, or fatigue) (System, Co-management guidelines for 1st time seizures, 2024)

- **Classification of seizures**

- **Focal onset seizure:** Abnormal neuronal discharges involving one area in the brain. Accounts for approximately 40% of seizures in children.
  - Focal aware (sensory or motor) seizure does not involve any change in consciousness. These can take the form of sensory seizures (aura) or a motor seizure. Patient is alert and oriented but is unable to control the symptoms.
  - Focal impaired awareness seizure involves alteration of consciousness. Usually last 1-2 minutes and are often preceded by an aura. There is decreased responsiveness, staring and/or automatic semi purposeful movements (automatism) such as eye blinking, chewing, lip smacking, gagging, or picking at clothes.
  - Focal seizure evolving to a bilateral tonic-clonic seizure (formerly secondary generalized seizure) begins in a focal part of the brain and then spreads leading to bi-hemispheric involvement with progression of a partial seizure to a generalized one with loss of consciousness. (Wilfong, 2018)

- **Generalized onset seizure**
  - Absence seizure (Petit mal seizure) is brief loss of consciousness with staring spell, associated with automatism. Has no post-ictal state.
  - Atonic seizure (Drop attack) is associated with loss of muscle tone leading to the dropping of head, trunk or limb.
  - Tonic seizure is associated with sustained stiffening of extremities.
  - Clonic seizure is rhythmic limb jerking.
  - Tonic-clonic seizure (grand mal seizure) begins with loss of consciousness followed by both tonic and clonic activity.
  - Myoclonic seizure is a quick muscle jerk of body, face, trunk, extremity or entire body.
  - Infantile spasm is a specific type of seizure seen in an epilepsy syndrome of infancy and childhood. Consists of a sudden bending forward of the body with stiffening of the arms and legs; some children arch their backs as they extend their arms and legs. Spasms tend to occur upon awakening and often occur in clusters of up to 100 spasms at a time.

- **Febrile seizure:** A febrile seizure refers to an event in infancy or childhood, between 6 months and 5 years of age, associated with fever without evidence of intracranial infection or defined cause. Seizures with fever in children who have suffered a previous non-febrile seizure are excluded from this definition. The exact pathophysiology of febrile seizures is not known. (Pediatrics, Febrile seizures: Clinical practice guidelines for the long-term management of the child with simple febrile seizures., 2008) It is important for clinicians to identify patient's cause of fever (Pediatrics, Febrile seizures: Guideline for the neurodiagnostic evaluation of the child with simple febrile seizure, 2011)
  - Simple febrile seizures are the most common type of seizures – occurring in 2-5% of children. It is a generalized tonic-clonic seizure that lasts less than 15 minutes and does not recur in a 24-hour period. (Pediatrics,

Febirle seizures: Guideline for the neurodiagnostic evaluation of the child with simple febrile seizure., 2011) (Pediatrics, Febrile seizures: Clinical practice guidelines for the long-term management of the child with simple febrile seizures., 2008)

- Simple febrile seizures plus meet all criteria for simple febrile seizures but occur more than once in 24 hours. (Mastrangelo, 2014)
- Complex febrile seizures are characterized by episodes that have a focal onset (i.e. shaking limited to one limb or one side of the body), lasts longer than 15 minutes or occurs more than once in 24 hours (Pediatrics, Febirle seizures: Guideline for the neurodiagnostic evaluation of the child with simple febrile seizure., 2011) (Pediatrics, Febrile seizures: Clinical practice guidelines for the long-term management of the child with simple febrile seizures., 2008)

Etiology:

- Structural: congenital anomalies, birth injury, hypoxic encephalopathy, stroke, brain hemorrhage, vascular injury, brain contusion; head trauma, ischemia, hemorrhage
- Genetic: known gene mutation or presumed hereditary cause, such as Childhood Absence Epilepsy, Juvenile Myoclonic Epilepsy
- Infections: meningitis, encephalitis, brain abscess
- Metabolic: hypocalcemia, hypoglycemia, hyponatremia, hypomagnesemia, hypoxia, hypercarbia, inborn error of metabolism
- Immune: autoimmune encephalitis
- Unknown (formerly cryptogenic): arising from a presumed cause that is ill-defined.

Differential Diagnosis

- Breath Holding
- Syncope
- Myoclonus (facial or body twitching)
- Movement disorders including dystonia, chorea, tics
- Hyperventilation
- Movement related gastroesophageal reflux (Sandifer syndrome)
- Sleep disorders like narcolepsy-cataplaxy, night terrors
- Drugs/Medication: acetylsalicylate, cocaine, amphetamine, alcohol, sympathomimetics, isoniazid, lindane, lithium
- VP shunt malfunction
- Poisonings: organophosphates, lead
- Migraine
- Psychogenic non-epileptic events (i.e. pseudoseizure)
- Behavioral disorder

Guideline

Subjective Data/History

- Description of seizure activity including time of occurrence and duration
- Onset, duration, characteristic, frequency of previous seizures
- Presence or absence of fever, duration of fever if present, length of preceding illness
- Previous history of seizure
- Change in anti-seizure medication (with previous history)
- Neurologic abnormality, developmental delay, head trauma, history of headaches

Past Medical History:

- Birth and developmental: gestational age, perinatal complications
- Maternal or neonatal infections
- Family History: seizures, neurocutaneous disorders, developmental delays
- Verify immunization status

Objective Data/Physical Exam

- Vital signs including blood pressure and oxygen saturation
- Signs of head trauma/abuse (i.e. retinal hemorrhage; evidence of intracranial hypertension including elevated BP, bulging fontanelle, sunsetting eye in babies)
- Signs of systemic infection: Meningismus (nuchal rigidity, photophobia, headache), Kernig sign (knee cannot be fully extended when patient is supine and hip flexed at 90^{o}) and Brudzinski sign (passive flexion of neck causes flexion of both legs and thighs).
- Skin: cafe-au-lait, ash leaf spots, facial hemangioma
- Neurological examination: mental status, papillary asymmetry, fixed eye deviation, focal motor weakness, focal hypo/hypertonia

Diagnostic Studies

None indicated for Urgent Care setting – May need EEG, MRI, lab work, CT scan, or lumbar puncture as part of overall work up. (Pediatrics, Febirle seizures: Guideline for the neurodiagnostic evaluation of the child with simple febrile seizure., 2011)

Treatment (See management algorithm and Appendix B: Midazolam Dosing)

- Most seizures are self-limiting and will last less than 2-3 minutes. Once a seizure lasts longer than 5 minutes it is unlikely to stop without medications. It is imperative that treatment is ready to administer as close to 5 minutes of seizure activity without further delay, recognizing that every minute of delay in treating seizures beyond 5 minutes may make the seizure less likely to respond to medical therapy. (System, Patient care policy and procedure: Seizure precautions and management, 2022)
    - Midazolam is the treatment of choice, however is not indicated in < 1 month old.
    - Administration of midazolam requires a double check by 2 licensed professionals who must verify the correct medication and dosage (2 RN/LPNs, 2 providers, 1 RN/LPN & 1 provider)

- Midazolam will be kept in the locked medicine cabinets within each clinic (System, Patient care policy and procedure: Medication - controlled substances , 2024)
- Midazolam may be given by intranasal or intramuscular routes. (Glauser, 2016) (Humphries, 2013)

- **Post seizure care:**
  - Keep patient in the side-lying recovery position until alert enough to handle secretions
  - Monitor vital signs (HR, RR, and BP) at least once after seizure is completed. If abnormal, this would require further evaluation.
  - Monitor pulse oximetry until alert enough to handle secretions.
  - Monitor for response to verbal stimuli, ability to follow directions, and ability to verbalize (if verbal at baseline) every 1-2 minutes until able to perform.
  - If any residual weakness, monitor motor strength every 10-15 minutes until at baseline (System, Patient care policy and procedure: Seizure precautions and management, 2022)

- **Criteria for discharge home** (see algorithm for when to transfer to ER)
  - Return to neurological baseline
  - Well-appearing, tolerating PO
  - Fever source does not require further evaluation or inpatient treatment
  - Parental concerns addressed
  - Follow-up plan established

Education of Patient/Family

- For patients who have experienced a febrile seizure:
  - High rate of recurrence
    - < 12 months with first seizure: > 50% chance of recurrent seizure
    - > 12 months with first seizure: 30% chance of recurrent seizure
    - Those who have a second seizure: 50% chance of having at least 1 additional recurrence
  - No greater risk for developmental delays, learning disabilities or seizures without fever
  - Antipyretics ineffective in preventing recurrent febrile seizures

Follow-up

- With primary care doctor and/or neurologist PRN
- Consider neurology referral:
  - 5 or more episodes of febrile seizures in lifetime
  - Significant developmental delay
  - Parental reports of complex seizure with concerning features that occurred more than 24 hours ago and child back to baseline

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This guideline is designed to serve as a reference for clinical practice and does not represent an exclusive course of treatment nor does it serve as a standard of medical care. Providers should apply their professional judgment to the management of individual patient conditions and circumstances. Children's Hospital and Health System (CHHS) does not make any representation with respect to any sort of industry recognized standard of care for the particular subject matter of this clinical guideline. Additionally, CHHS form documents are subject to change, revision, alteration, and/or revocation without notice.

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Treatment information also provided by Rhonda Werner, APN, Clinical Nurse Specialist, Neurology, and Raquel Farias-Moeller, Physician, Neurology, Children's Wisconsin (personal communications, August 2020 and October 2024).

Appendix A: Midazolam Dosing

SEIZURE

INTRANASAL or INTRAMUSCULAR
Midazolam 5mg/ml
Dose 0.2mg/kg, max dose 10mg (2ml)
May repeat ONCE in 5 minutes up to max dose
INTRANASAL doses:

- Add 0.1 ml to all doses to account for atomizer
- Split between nostrils
- Max 1ml per nostril

INTRAMUSCULAR

- Reserved for copious nasal secretions, anatomic abnormalities of nasopharynx, epistaxis, obstruction of nasal passage, small nostrils

Midazolam not indicated for seizing infants < 1 month

WEIGHT (KG)	WEIGHT (LB)	DOSE (MG)	VOLUME (ML)
5	11	1	0.2
6	13.2	1.2	0.24
7	15.4	1.4	0.28
8	17.6	1.6	0.32
9	19.8	1.8	0.36
10	22	2	0.4
11	24.2	2.2	0.44
12	26.4	2.4	0.48
13	28.6	2.6	0.52
14	30.8	2.8	0.56
15	33	3	0.6
16	35.2	3.2	0.64
17	37.4	3.4	0.68
18	39.6	3.6	0.72
19	41.8	3.8	0.76
20	44	4	0.8
21	46.2	4.2	0.84
22	48.4	4.4	0.88
23	50.6	4.6	0.92
24	52.8	4.8	0.96
25	55	5	1
26	57.2	5.2	1.04
27	59.4	5.4	1.08
28	61.6	5.6	1.12
29	63.8	5.8	1.16
30	66	6	1.2
31	68.2	6.2	1.24
32	70.4	6.4	1.28
33	72.6	6.6	1.32
34	74.8	6.8	1.36
35	77	7	1.4
36	79.2	7.2	1.44
37	81.4	7.4	1.48
38	83.6	7.6	1.52
39	85.8	7.8	1.56
40	88	8	1.6
41	90.2	8.2	1.64
42	92.4	8.4	1.68
43	94.6	8.6	1.72
44	96.8	8.8	1.76
45	99	9	1.8
46	101.2	9.2	1.84
47	103.4	9.4	1.88
48	105.6	9.6	1.92
49	107.8	9.8	1.96
≥50	≥110	10	2

Last update 8/2020