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

SUBJECT: Seizure

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

Refer to CW Patient Care Policy and Procedure:

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

Definition: Definitions of status epilepticus have varied with time. Previously, a definition of recurrent seizures without complete recovery of consciousness between attacks or virtually continuous seizure activity for more than 30 minutes was widely used. More recently, 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 min, a seizure becomes unlikely to stop without pharmacologic intervention.

- **Phases of Seizure**
    - Pre-ictal phase: Occurs immediately before the seizure
        - May include an aura. An aura is a warning of an impending seizure and is actually a simple partial seizure. Auras may include a headache, weakness, sense of fear, aphasia, unpleasant odor or visual or auditory hallucinations.
    - Ictal Phase: Seizure activity
        - Characterized by paroxysmal, uncontrolled, excessive discharge of electrical activity in the brain with corresponding EEG changes.
    - 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 lasting from minutes to hours; with tonic-clonic seizures there may be amnesia, confusion, or fatigue.

- **Classification of seizures**
    - **Partial (Focal) seizure:** Abnormal neuronal discharges involving one area in the brain. Accounts for approximately 40% of seizures in children.

- Simple partial (sensory or motor focal) 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.
- Complex partial (dyscognitive) 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.
- Secondary generalized seizure begins in a focal part of the brain and then spreads leading to bihemispheric involvement with progression of a partial seizure to a generalized one with loss of consciousness.

- **Generalized 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.
  - Generalized 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.
  - 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. Simple febrile seizures plus includes all criteria for simple febrile seizures but allows for more than 1 seizure in 24 hours.
  - Simple febrile seizures plus meet all criteria for simple febrile seizures but occur more than once in 24 hours.

- 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

Etiology:

- Idiopathic or hereditary – known or presumed gene mutation that causes epilepsy, such as Childhood Absence Epilepsy, Juvenile Myoclonic Epilepsy
- Cryptogenic or arising from a presumed cause that is ill-defined
- Developmental or Congenital: Genetic (Inborn error of metabolism), Congenital anomalies, birth injury, hypoxic encephalopathy, stroke, brain hemorrhage, vascular injury, brain contusion
- Mechanical or Traumatic: VP shunt malfunction, accidental or abusive head trauma
- Infections: meningitis, encephalitis, brain abscess
- Drugs/Medication: acetylsalicylate, cocaine, amphetamine, alcohol, sympathomimetics, isoniazid, lindane, lithium
- Metabolic: hypocalcemia, hypoglycemia, hyponatremia, hypomagnesemia, hypoxia, hypercarbia
- Poisonings: organophosphates, lead

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
- 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-epileptic 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
- 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.

Treatment (See Appendix A: Seizure Management & Appendix B: Midazolam Dosing)

- Do NOT restrain an actively seizing patient as this may lead to musculoskeletal injury.
- Maintain a patent airway.
    - Use a soft tip catheter for suction; avoid Yankaur suction catheters due to risk of mouth injuries.
    - Apply oxygen therapy as needed to keep oxygen saturations above 90%.
- Check blood glucose level
- 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.
    - Midazolam is the treatment of choice, however is not indicated in < 1 month old.
    - Administration of midazolam requires a double check documented on the MAR
    - 2 licensed professionals must verify the correct medication and dosage (2 RNs, 2 providers, 1 RN & 1 provider)
    - Midazolam will be kept in the locked medicine cabinets within each clinic
    - **INTRANASAL or INTRAMUSCULAR**
        - **Midazolam 5mg/ml**
        - **Dose 0.2mg/kg, max dose 10mg (2ml)**

- **May repeat ONCE in 5 minutes up to max dose of 10mg (2ml)**
- **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**

- **After the seizure:**
  - Keep the patient in the side-lying recovery position until alert enough to handle secretions
  - Monitor vital signs (P, HR, and BP) 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.
- **Discharge criteria** (See Appendix A: Seizure Management)
  - 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 (See Appendix A: Seizure Management)
- 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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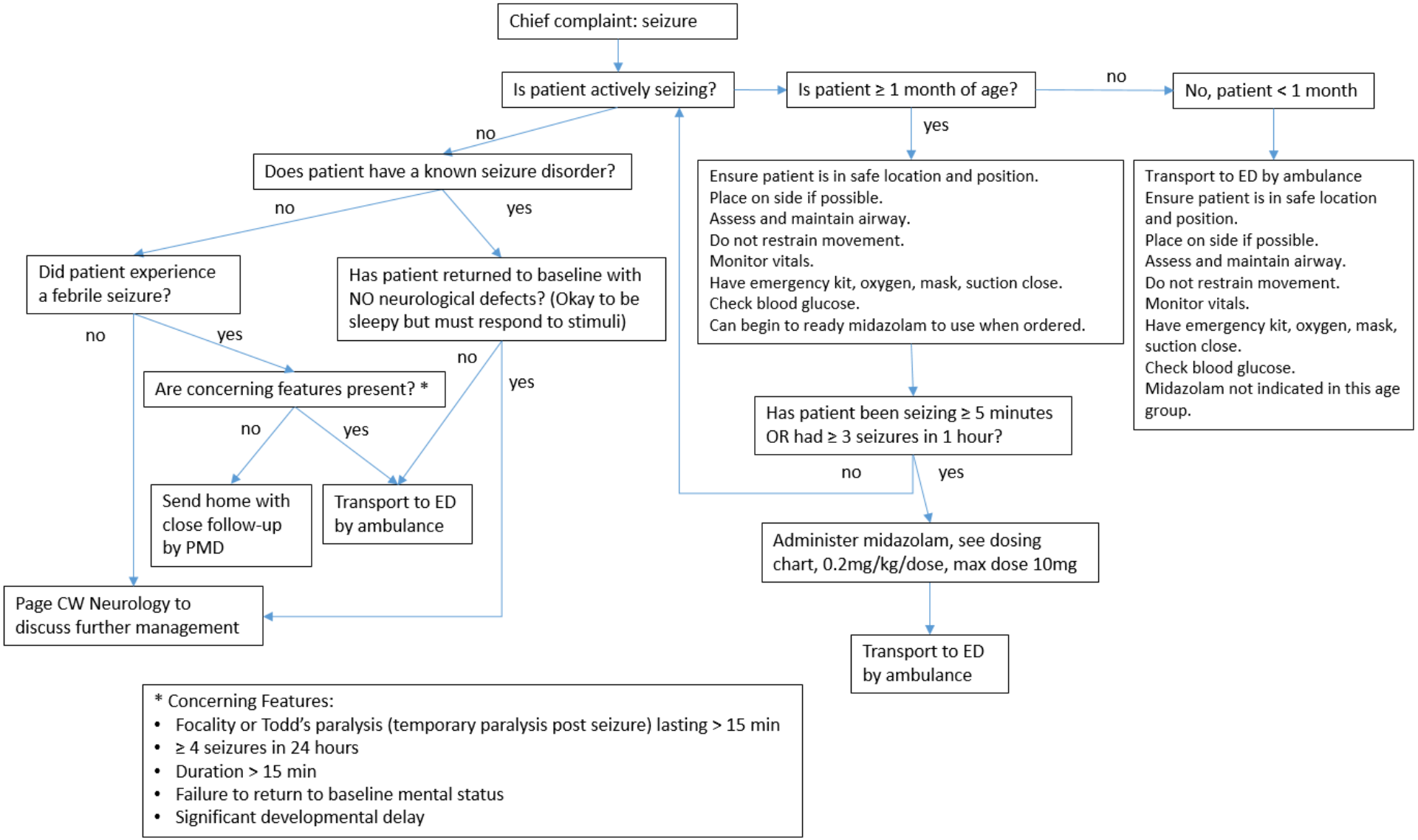
Treatment information also provided by Rhonda Werner, APN, Clinical Nurse Specialist, Neurology, and Raquel Farias-Moeller, Physician, Neurology, Children's Wisconsin (personal communications, August 2020).

Appendix A: Seizure management



Appendix B: 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