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Status Epilepticus in Adults- A Brief Commentary for a Critical Care Nursing Perspective

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Abstract

Background: Status epilepticus has been defined in the literature as a medical emergency. This kind of medical condition requires rapid diagnosis and treatment of the underlying condition to prevent clinical deterioration. Due to lack of visible physical symptoms of nonconvulsive status epilepticus, it has been noted to be underdiagnosed and therefore undertreated, which can cause permanent neuronal damage and thus resulting in disability or death. This topic has received little attention within the literature although there is frequent occurrence and morbidity associated with status epilepticus.

Definition

Status epilepticus has been defined in many different ways in the literature. Brophy et al note status epileptics as "5 minutes or more of continuous clinical and/or electrographic seizure activity or recurrent seizure activity without recovery (returning to baseline) between seizures" [1]. The patient may return to baseline mental status after the seizure is treated. The criteria included in the current definition replicate the need for urgent treatment. Refractory status epilepticus is defined as "clinical or electrographic seizures after adequate dosing of an initial benzodiazepine and a secondary antiepileptic drug (AED)" [1].Convulsive status epilepticus is noted to have jerking rhythmic movements of the arms and/or legs. Non-convulsive status epilepticus (NCSE) is noted to be electrographic and ongoing seizure activity without the motor findings of convulsive status.

Pathophysiology

A normal human brain functions as a result of a sensitive balance between inhibition and excitation of the neurons. Glutamate is noted to be the most common excitatory neurotransmitter and γ-aminobutyric acid (GABA) is the most common inhibitory transmitter in the brian [3]. During status epilepticus, it is noted to be a dysfunction of the inhibitory GABAergic mechanisms which can cause the seizures to become self-sustaining and pharmacoresistant [4]. Due to changes in the synaptic physiology, benzodiazepine resistance may develop after 10 to 45 minutes of status epilepticus. This occurs due to a reduction in the number of GABAAreceptors [4] (Table 1 and 2).

Age, years	Contributing Factors
<35	Brain trauma, alcohol withdrawal, brain tumors, and illicit drug use
>35	Cerebrovascular disease, brain tumors, alcohol withdrawal, metabolic disorders such as uremia and electrolyte imbalances, neurodegenerative diseases, and idiopathic causes

Table 1: Risk Factors for status epilepticus by age [2].

Psychiatric medications	Tricyclic antidepressants
	Bupropion
	Venlafaxine
	Citalopram
	Quetiapine
Recreational Drugs	Cocaine
	MMDA (ecstasy)
Antibiotics	b-lactam antibiotics
	carbapenems (lower seizure threshold)
	isoniazid
Other medications	Carbamazepine/oxcarbazepine
	Diphenhydramine
	Flumazenil (in benzodiazepine-dependent patients)

Table 2: Drugs that can affect seizure threshold [5].

Patient assessment and electroencephalography (EEG)

A basic knowledge of electroencephalographic (EEG) patterns is critical for a bedside critical care nurse in order to determine when to alert the neurologist to request an official reading. Although an EEG pattern recognition is not the primary duty of the critical care nurse, having a basic familiarity with typical EEG patterns and glancing at the bedside EEG monitor while caring for the patient may instantaneously add attention by the physician team. This may lead to early identification of seizures and prompt treatment escalations. A patient with status epilepticus requires crucial electrographic monitoring, early collection of blood samples and necessary central nervous system imaging.A patient's history and clinical findings coupled with

laboratory evaluations such as comprehensive toxicology panel, liver function tests, measurement of troponin levels, arterial blood gas analysis, and lumbar puncture with measurement of protein and glucose levels, cell count, and culture should be considered immediately.

Management

A systematic approach to treatment starts with the basics-management of airway, breathing, and circulation. This must be followed by administration of benzodiazepines and intravenous AEDs, and rapid escalation of therapy to prevent morbidity and mortality. Table 3 comprises of a short summary of initial management of status epilepticus in critical care settings as provided by the Neurocritical Care Society.

Priorities for the first 0-5 min	Evaluation/treatment of airway with noninvasive management Check initial vital signs and telemetry Obtain intravenous access Neurological examination Finger-stick blood glucose Administration of dextrose if hypoglycemic Administration of benzodiazepine (first-line AED) Fluid resuscitation if hypotensive
Priorities for the first 15 min	Intubation if airway or gas exchange is compromised Second-line intravenous AED Vasopressor support if hypotensive Blood sample collection for laboratory evaluation (complete blood cell count, chemistry panel, calcium, magnesium, AED levels) Electrocardiogram
Priorities for the first 15-60 min	Administer a third-line AED for refractory status epilepticus Electroencephalography Computed tomography of the head Lumbar puncture Additional laboratory tests as clinically determined(liver function tests, troponin levels, coagulation tests, arterial blood gases, comprehensive toxicology panel)
Within first 12-24 h	Magnetic resonance of the brain

Table 3: Initial management of status epilepticus in the hospital [1].

Commentary

A seizure is a critical symptom which with early recognition and prompt treatment can turn the patient course. It is frequently encountered in clinical practice and critical care nurses are the first providers for these patients. Frequently a critical care scenario of seizure progresses to status epilepticus. Thorough clinical and pharmacological knowledge for the treatment of status epilepticus in adults is crucial for intensivists including physician and nurses. Early recognition of signs and symptoms for rapid escalation of treatment for patient in status epilepticus and recognizing untoward effects of antiepileptic medications is crucial in a critical care setting.

Nursing consideration for status epilepticus

Seizures are a known medical emergency; in patients with progression of seizures to status epilepticus with lack of appropriate treatment, permanent neuronal damage may occur within 24 hours. Lawson et al note that recognition of convulsive status epilepticus in patients is obvious but nonconvulsive status epilepticus is less apparent and frequently undertreated. The provision of emergent treatment measures is fundamental. All seizures should be treated with prompt attention to securing airway, breathing, and circulation followed by administration of benzodiazepines, urgent follow-up administration of intravenous AEDs, and rapid escalation of therapy, often to general anesthesia, to prevent morbidity and mortality from permanent neuronal damage.

The role of critical care nursing staff for early identification of pharmacological toxicities with use of AEDs can direct patient care. The side effect profile of commonly used anesthetics for their antiepileptic effect is vital for nursing education. The precipitation of bradyarrythmias and hemodynamic instability with phenytoin and phosphenytoin, hemodynamic suppression with infusion of midazolam, pentobarbital and propofol warrants close critical care level of monitoring. Major side-effect with propofol such as propofol-related infusion syndrome (PRIS) although rare is typical of the usage patterns of the drug in this group of patients and can be often encountered in intensive care settings.Pentobarbital is notorious for elevated rates of ventilator-associated pneumonia, gastrointestinal dysmotility and urinary tract infections. There has been evidence noted for increased mortality and morbidity with use of anesthetic agents for their antiepileptic effect and hence close critical care monitoring is vital to patient condition. I concur with the author's statement that to be aware of what to watch for in this population of critically ill patients, nurses are exceptionally positioned to support the identification and prompt management of status epilepticus in order to minimize the unfortunate and intractable sequela of the natural course of the disease.

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