

Epidemiology of Status epilepticus

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Status epilepticus is one of the most severe neurological emergencies in children, associated with significant morbidity and mortality; and it has a profound influence on the child and their families. The epidemiology of status epilepticus has been complicated by variable definitions, difficulty in identifying all the cases and inaccurate estimates of the denominator. The International League Against Epilepsy (ILAE) has revised the definition of status epilepticus since the original definition proposed in 1964¹, with the most recent definition published in 2015². This conceptual definition of status epilepticus introduced two operational dimensions: the duration of the seizure with the time point (t1) beyond which the seizure should be regarded as “continuous seizure activity”; and time point (t2) as the time of ongoing seizure activity after which there is a risk of long-term consequences. It further classified status epilepticus into those with motor symptoms (which includes convulsive status epilepticus (CSE), myoclonic, focal motor, tonic and hyperkinetic) and those without motor symptoms (non-convulsive). For CSE t1 is defined as seizures activity > 5 minutes and t2 as >30minutes. CSE has three sub-categories: generalised convulsive, focal onset evolving into bilateral convulsive and unknown whether focal or generalized CSE.

Mitchell et al set out to use the ILAE’s most recent definition of CSE and examine the impact of buccal midazolam and epilepsy specialist nurses on the epidemiology of CSE in the Lothian region from 2011-2017 (ref). This is a retrospective study, but includes data before the 2015 definition was introduced. They excluded children with focal seizures and non-convulsive status, but it is unclear if they excluded other forms of CSE e.g. focal onset evolving into bilateral convulsive. Furthermore they only included children attending emergency departments with status epilepticus, using the t1 but were not able to validate the duration of the seizure. Thirty one percent of the seizures appeared to last more than 30 minutes, giving an annual prevalence (incidence) of 0.18/1000 according to the t2 definition which is in the range of the annual incidence of CSE using comparable definitions in a systematic review (0.04-0.23/1000/year)³ and a large study conducted in London (0.17-.23/1000/year)⁴. Thus there does not appear to have been a reduction in the annual incidence of CSE according to the more severe (t2) definition, despite the widespread use of out of hospital treatment and the introduction of epilepsy nurse specialists. It is difficult to assess the impact of midazolam from this study. This study does show using the t1 definition, the incidence is four times that of the t2 definition. These studies are likely to underestimate of the incidence of status epilepticus, since they most do not include many of the other categories of status epilepticus (e.g.

non-convulsive), rarely include cases that are treated out of hospital, and the duration of the seizures is difficult to determine robustly.

This study does suggest that the causes of CSE has changed, with a decreased proportion associated with provoked seizures secondary to infections and structural causes. This is likely to improve the outcome since aetiology is strongly associated with neurological sequelae and death. The case fatality is low, even if the two deaths had seizures lasting > 30 minutes ie 0.5%.

The epidemiology of status epilepticus remains incompletely described; with problems of ascertainment, lack of classification of seizure types, the difficulties in establishing seizure duration, the exclusion of non-convulsive status or boundary syndromes e.g. myoclonic status in coma and identification of refractory status epilepticus⁵. More comprehensive studies are needed to determine the impact of this serious neurological condition.

1 Commission I. A Proposed International Classification of Epileptic Seizures. *Epilepsia* 1964; 297-306.

2 Trinka E, Cock H, Hesdorffer D, Rossetti AO, Scheffer IE, Shinnar S, Shorvon S, Lowenstein DH. A definition and classification of status epilepticus - Report of the ILAE Task Force on Classification of Status Epilepticus. *Epilepsia* 2015.

3 Chin RF, Neville BG, Scott RC. A systematic review of the epidemiology of status epilepticus. *Eur.J.Neurol.* 2004; **11**: 800-10.

4 Chin RF, Neville BG, Peckham C, Bedford H, Wade A, Scott RC. Incidence, cause, and short-term outcome of convulsive status epilepticus in childhood: prospective population-based study. *Lancet.* 2006; **368**: 222-9.

5 Shorvon S, Sen A. What is status epilepticus and what do we know about its epidemiology? *Seizure : the journal of the British Epilepsy Association* 2020; **75**: 131-6.